Proceedings of the 2nd Annual International Conference held on 24th-26th April 2019, Machakos University, Kenya

MACHAKOS UNIVERSITY

BOOK OF PROCEEDINGS OF THE 2ND ANNUAL INTERNATIONAL CONFERENCE

DATES:

24TH – 26TH APRIL 2019

THEME:

Supporting Green Growth and Knowledge Economy through Research, Innovation and Technology for Sustainable Development

Supported by:

EQUITY Bank The Listening, Caring Financial Partner

Coca-Cola

NRF KENYA

National Bank

SidianBank Owns Tomorrow

KONZA Technopolis

Soaring Heights in Tranforming Industry and Economy

ISO 9001:2015 CERTIFIED

Machakos University Press

ISBN: 978-9966-117-37-3

MACHAKOS UNIVERSITY

BOOK OF PROCEEDINGS
OF MACHAKOS UNIVERSITY 2ND ANNUAL INTERNATIONAL CONFERENCE

HELD AT

MACHAKOS UNIVERSITY HOTEL AND CONFERENCE CENTRE

DATES: 24th -26th APRIL 2019

THEME:

Supporting Green Growth and Knowledge Economy through Research, Innovation and Technology for Sustainable Development

Editorial Board
Dr. Wycliffe Amukowa
(Editor-in-Chief)
Editors: Dr. Elijah Muange
Dr. David Wekesa
Ms. Lucia Daisy Mbithe

PROCEEDINGS OF THE MACHAKOS UNIVERSITY 2ND ANNUAL INTERNATIONAL CONFERENCE HELD AT MACHAKOS UNIVERSITY HOTEL, 24TH-26TH APRIL 2019

Supporting Green Growth and Knowledge Economy through Research, Innovation and Technology for Sustainable Development

Suggested citation:

Authors (2019). Title of the Paper. In: Machakos University (2019): Proceedings of the 2nd Annual International Conference on Supporting Green Growth and Knowledge Economy through Research, Innovation and Technology for Sustainable Development, Machakos University, 24th -26th April, 2019. Machakos, Kenya. (Page numbers) ISBN: 978-9966-117-37-3

Editors: Dr. Wycliffe Amukowa
Dr. Elijah Muange
Dr. David Wekesa
Ms. Lucia Daisy Mbithe

Copyright

© 2019 Machakos University

ISBN: 978-9966-117-37-3

Fundamental Statements

Our Vision

A preferred University of Excellence in Scholarship and Service Delivery

Our Mission

Provide scholarly education through Training, Research and Innovation for Industrial and socio-economic transformation of our communities.

Our Identity

Machakos University is an academic institution committed in transmitting knowledge, skills and attitude through science, Technology and Innovation for the benefit of humanity.

Our Philosophy

The Philosophy of Machakos University is to provide transformative leadership in Teaching, Training, Research, Innovation, Industrial and Technology transfer for wealth creation.

Core Values

Integrity

Accountability

Professionalism

Inclusivity

Creativity

Teamwork

Equity

Conference Committee Members

1) Prof. Peter N. Mwita, PhD- Chairman
2) Dr. Wycliffe Amukowa-Secretary
3) Prof. Geoffrey Maroko- Alternate-Chair
4) Prof. Fredrick Ogola - Alternate-Secretary
5) Prof. Josephat Kiweu
6) Prof. Robert Arasa
7) Prof. Richard Simwa
8) Prof. James Muola
9) Mr. Duncan Shirandula
10) Dr. Charles Mwaniki
11) Dr. Richard Kimiti
12) Dr. Peter KibetKoech
13) Dr Stephen Mailu
14) Dr. Jacob J. Konyango
15) Dr. Julius Nzeve
16) Dr. Esther Nduku
17) Dr. TindihSheltone
18) Dr. Sophia Njeru
19) Dr. Elizabeth Ndunda
20) Dr. Cornelius Okello
21) Dr. MartherNgigi
22) Dr. Larry Ndivo
23) Dr. David Wekesa
24) Dr. Euna Nyarige
25) Dr. Mark Kimathi
26) Dr. Elijah Muange
27) Dr. George Waswa
28) Mr. Paul Mutua Kombo

Conference Secretariet Team

1. Ms. Nancy Ingoshe
2. Ms. Elizabeth Mbatha
3. Mr. Erick Muok
4. Ms. Lucia Daisy Mbithe
5. Ms. Jenipher Rhobby

Message from The Vice-Chancellor



The just concluded Machakos University 2nd Annual International Conference purposed to take an in-depth reflection on global, regional and national interests, as espoused by Sustainable Development Goals adopted by the United Nations, Africa Union 2063 Agenda, Vision 2030 and the Kenya Government's Big Four Agenda. As you will find from this Book of Proceedings, the participants indeed did put forward and share their knowledge and experiences with regard to the place of Green Growth and Green Economy in the quest for sustainable development, and I convey my profound joy and happiness to you.

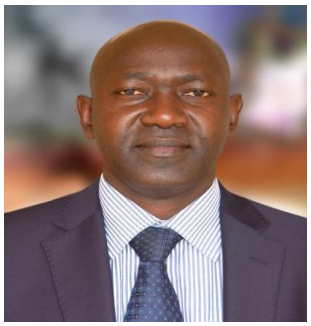
I wish to urge the readers of this Book, not only to use the papers for the purposes of referencing literature review while writing scholarly papers, but also to put to practice the recommendations. By so doing, we shall all witness the positive impact of Conference to the society. Likewise, as we may be aware, conferences provide moments to network, build collaborative synergies, linkages, and partnerships that continue on. I would like to share with both those who turned up for the Conference and those who interact with this Book of Proceedings to solidify such partnerships that arose or may arise so that we widen our scope, beyond the three days that we were gathered at Machakos University.

As you read the proceedings of the conference, I wish to further share with you that since its inception as a Technical School in 1957, the university has made a niche in Engineering and Technology especially in Mechanical Engineering, Electrical & Electronics Engineering Civil Engineering and Hospitality. The researchers and scholars participating from various universities, industry and other organizations' in sharing their knowledge, shall propelled not just this university but Kenya, Africa and the entire globe in general.

Finally, I wish to thank our Chief Guests, Keynote Speakers, Guests Speakers, sponsors and all the participants, for finding time to be with us during the auspicious occasion of Machakos University 2nd Annual International Conference.
Thank you and God bless you.

Prof. Lucy W. Irungu,
PhD VICE-CHANCELLOR & PROFESSOR OF ENTOMOLOGY
MACHAKOS UNIVERSITY

Message from The Chairman, Conference Committee



After successfully hosting the 1st International Conference in April 2018, we organized our 2nd International Conference with great enthusiasm pivoted on the lessons learnt earlier. I am therefore filled with joy to welcome you to read this Book of Proceedings of the conference. As you are aware, the theme of the Conference was "Supporting Green Growth and Knowledge Economy through Research, Innovation and Technology for Sustainable Development," and this underscored Machakos University's inherent efforts to the realization of Sustainable Development while being conscious of the environmental implications. Accordingly therefore, the Book of Proceedings has been organized according to the Conference sub-themes as follows:

1. Agriculture, Food and Nutrition Security
2. Health care, Leisure and Tourism Innovation
3. Language, Culture, Social Equity and Governance
4. Built Environment and Infrastructure Development, Industrialization: Emerging Technologies, Manufacturing &Agro- processing
5. Energy, water, climate Change and Environmental Sustainability
6. Mathematics, Statistics & Data Science, Basic and Applied Sciences
7. Issues in Education and Training
8. Business, Entrepreneurial Innovation, SMEs & Marketing

It is my hope and trust that the Book of Proceedings will not only be a memory lane as a chronicle of events, but shall be a scholarly reference as we seek insights into the place of Green Growth in the realization Sustainable Development. All cannot, nonetheless pass without me mentioning how the Conference was prepared and the support received in this regard.

Preparation of the conference started in August 2018 and the first call went out in October 2018, while final call closed on 15th March, 2019. I wish to thank participants for their informative presentations and discussions during the Conference. I further wish to appreciate you for choosing to come to Machakos University and appreciate you for choosing to share your scientific and academic work and experiences.

On behalf of the conference committee, I wish to acknowledge and appreciate support received from Machakos University, National Research Fund, Konza Technopolis Development Authority, National Bank of Kenya, Equity Bank, Coca-Cola and Sidia Bank. Your support made the 2nd Conference possible. May I further appreciate fellow Conference Committee members that I chair, upon whose collective effort, the Conference came forth.

Thank you.

Prof. Peter N. Mwita, PhD
DEPUTY VICE-CHANCELLOR (RESEARCH, INNOVATION AND LINKAGES) &
CHAIRMAN, CONFERENCE COMMITTEE

Members of Machakos University Council



Prof. Gideon Hanjari
Chairman

MEMBERS



Mr. Patrick Ranga Abelle



Ms. Florence Muthoni Gichohi



Ms. Harriette Chiggai



Mr. Richard Mativu Musau



Ms. Lorna Mbatia



Mr. Peter Njoroge
Rep. CS National Treasury



Mr. Paul Mwangi
Rep. PS State Dept of University Education



Prof. Lucy Irungu
Council Secretary/Vice Chancellor

Members of University Management Board



Prof. Lucy Irungu
Vice-Chancellor



Prof. Peter N. Mwita
Deputy Vice Chancellor
(Research, Innovation & Linkages)



Prof. Joyce Agalo
Deputy Vice-Chancellor
(Academic& Students' Affairs)



Prof. Douglas Shitanda
Deputy Vice-Chancellor
(Administration, Finance & Planning)



Dr. Wycliffe Amukowa
Registrar
(Research, Innovation &Linkages)



Prof. Ezara Ondari-Okemwa
Registrar
(Academic& Students' Affairs)



Dr. Susan Nzioki
Registrar
(Administration & Planning)



Ms. Aileen Nyatuga
Chief,
Finance Officer

TABLE OF CONTENTS

Fundamental Statements iv

Conference Committee Members v

Message from The Vice-Chancellor vi

Message from The Chairman, Conference Committee vii

Members of Machakos University Council viii

Members of University Management Board ix

Chief Guest Official Opening xv

Chief Guest Official Closing xvi

Key Note Speakers xvii

Guest Speakers xviii

SUB-THEME 1-AGRICULTURE, FOOD AND NUTRITION SECURITY 1

Effective Methods for Data Collection in Rural Setup: A Pilot Study Focusing on Agricultural Practices in North Kinangop, Nyandarua County, Kenya 2

School Feeding Programmes, National Food Policies, Action of Plan and Strategies on School Meals and Food Security Among School Children in Kenya. (Review) 17

Large Hive Beetle: A Potential New Pest of Honeybees in Kenya 27

Human and Physical Variables in The Adoption of Cash Crop Farming in Gem Sub County, Siaya County, Kenya 36

Determinants of Participation of Young Farmers with And Without Disability in Capacity-Building Programs Designed for The Public in Uganda 50

Integrating Information and Communication Technology (ICT) In the Farming System for Livelihood Improvement, "A Case of Kieni East Constituency, Nyeri County, Kenya" 62

Tomato Leaf Miner (*Tuta Absoluta*) Incidence and Severity in Kirinyaga County, Kenya 73

Influence of Secondary School Students' Attitude Towards Agriculture on Employment Creation in Vihiga County, Kenya 83

Agricultural Interventions and & Sustainability of Rural Livelihoods: A Case of Rural Women Potatoes Production Farmers Groups in Njoro Sub-County Kenya. 100

Women Technological Empowerment in Agriculture: Issues, Challenges and Policy Option: A Case of Rural Women Farmers Groups in Njoro Sub-County Kenya. 128

Extension Environment Characteristics Influencing the Use of Video Mediated Technology in Teaching Agricultural Knowledge and Skills to Farmers in Homa-Bay County, Kenya. 142

Evaluation Of Effects Of Sewage Farming Vegetables To Consumers And Their Awareness In Peri-Urban Areas: A Case Study Of Ruai, Nairobi County. 152

SUB-THEME 2-HEALTHCARE, LEISURE AND TOURISM INNOVATION 159

Significance of Social Media in The Kenya Tourism Industry 160

Factors Associated with HIV Affected Clients' Behavioral Practices and Health Outcomes 166

A Review of Literature on Local Community Participation Towards Sustainable Tourism Development in East Africa. 176

Welfare Initiatives and Their Roles on Job Stability of Catering Employees in Selected Universities in Nairobi City County, Kenya. 188

Tourism Product Innovation: Positioning Meetings, Incentives, Conferences And Exhibitions, As A Strategy For Product Diversification In Beach Hotels of Mombasa County, Kenya 211

How Much Does Labour Turnover Cost? A Case Study of Kenyan Small and Medium Tour Operators 224

Improving Health Care Delivery by Community Health Workers Through Mobile Phones 235

SUB-THEME 3: -LANGUAGE, CULTURE, SOCIAL EQUITY AND GOVERNANCE 245

Effects Of Gender Stereotyping On Women's Social Development: A Case Of Urbanized Turkana Women In Eldoret Town-Kenya 246

The Role Of The 'Path' And The 'Container' Image Schemas In Political Discourse In Kenya 253

Research and publish, publish or perish, so what? 270

The Contribution of the Bantu Mother Languages to Tanzanian Socio-economic Development through Media 280

The Contribution of ICT in Teaching and Learning Tone of Tanzanian Bantu Languages 291

Usawiri Wa Vijana Katika Ujenzi Wa Jamii Mpya Katika Riwaya Teule Ya Kiswahili 305

Itikadi katika Riwaya za *Dunia yao* (2006) na *Mhanga Nafsi Yangu* (2013) za S. A. Mohamed 323

Depiction of The Roles of Youth in The National Development in Selected Swahili Novel 334

Mustakabali wa Ufundishaji na Ujifunzaji wa Fonolojia ya Kiswahili kwa kutumia Uwili Lugha katika Elimu ya Juu Tanzania: Mifano kutoka Programu za Uzamili 347

Mifanyiko Ya Unyambulishaji Wa Vitenzi Katika Kigĩchũgũ 364

Linguistics Elements and Meaning: Imagery as a Subtle Communication of Ideologies in Poetry. 392

The Legacy of Cecil John Rhodes: His Role in the expansion of the British Empire 402

The Place of an Applied Linguist in Actualising the Big Four Agenda 418

How much does labour turnover cost? A case study of Kenyan Small and Medium Tour Operators 426

Tathmini Ya Ujumi Mweusi Katika Tamthilia Ya *Mashetani Wamerudi* (S.A.M 2016) 438

SUB-THEME 4: BUILT ENVIRONMENT, INFRASTRUCTURE DEVELOPMENT, INDUSTRIALIZATION: EMERGING TECHNOLOGIES, MANUFACTURING AND AGRO-PROCESSING 449

Flexibility of Interior Spaces For Low Cost Housing In Kenya- A Case Study Of The Kibera Soweto East Housing Project In Nairobi, Kenya 450

Comparative Analysis of Compressive Strength of Bamboo Leaf Ash and Baggash Ash Concretes 476

A Stage Model for Cloud Computing Adoption in E-Government Implementation 491

Solar PV Potential and Energy Demand Assessment in Machakos County 522

A Service Oriented Architecture Approach to Implementing an Omnichannel Personal Health Record System. 544

Supporting Green Growth and Knowledge Economy through Research, Innovation and Technology for Sustainable Development 557

SUB-THEME 5: ENERGY, WATER, CLIMATE CHANGE AND ENVIRONMENTAL SUSTAINABILITY 575

Importance of Applied Geology in Mining 575

Landslide Disaster Preparedness and Mitigation Measures: A Case of Kapkese Village, Kokwet Location, Kipkelion West Constituency, Kipkelion District, Kenya 607

Limestone Production Optimization by Fragmentation Control – Case Study of Bissel Quarry 628

Exploration Targets During Gold Exploration in Kakamega, Western Kenya. 637

Optimizing Access to Safe Water Through Chlorinated Dispensers in Rural Kenya, Uganda and Malawi 654

Mapping Geographical Features: Case Study of Bungoma County 670

Spatio-Temporal Analysis of Rainfall Trends and in Northwestern Nigeria 678

Community Lessons on Participatory Forest Management (PFM) Performance within the Mau Forest Complex, Kenya 690

Small Holder Tea Industry Sustainability: Environmental Accounting and Reporting as a Strategy to Cushion on Environmental Concerns 704

Land cover change and its Implications on Urban Heat Island in Nairobi County: A GIS and Remote Sensing Approach. 717

Assessing The Constrains of Water Supply for Irrigation in Hadejia Valley Irrigation Project Area, Jigawa State Nigeria. 734

Community Participation in Sustaining Safe and Clean Water: The Case of Kyampisi Child Care Ministries Water Project in Mukono District, Central Uganda 745

SUB-THEME 6: MATHEMATICS, STATISTICS & DATA SCIENCES; BASIC AND APPLIED SCIENCES 755

Change point analysis in the generalized Pareto distribution 756

Modeling Stock Returns Volatility Using Regime 768

Control Volume Analysis of Unsteady Mhd Mixed Convection Nanofluid Flow as A Result of Stretching Surface with Suction 788

Nonparametric Prediction Interval for Conditional Expected Shortfall Admitting a Location-Scale Model using Bootstrap Method 802

Threshold Determination For Maximum Product Of Spacing Methodology With Ties For Extreme Events 809

Change Point Estimation in Volatility of a Time series using a Kolmogorov Smirnov Type Test Statistic 822

Results on Robust Model Based Estimation in Finite Populations 837

Effects of Problem - Solving Approach to Teaching Mathematics on Students' Achievement in Secondary School in Murang'a County, Kenya 852

The Effects Of Holidays On The Ghanaian Equity Market 874

SUB-THEME 7: ISSUES IN EDUCATION AND TRAINING 907

A Comparative Study of Academic Performance of Students Admitted Through Pre-Nce & Direct Entry In Final Nce Examination (A Case Study Of English Department Federal College Of Education, Yola) 908

Technical Vocational Education And Training Institutions' Contribution To Promoting Sustainable Development 914

Influence of Teacher's Preparation Of Professional Documents On Students' Academic Achievement Of Kiswahili Language In Public Secondary Schools In Kathonzweni Sub-County, Kenya 932

Influence of participation of student councils in conflict resolution in management of public boys' and girls' boarding secondary schools, nyeri county, kenya. 940

Comprehensive sex education in Kenya: Islamic perspective 958

Good Governance Practices And Promotion Of Child Friendly Schools Model 976

Influence of Non-Governmental Organizations Education Support Activities On Academic Performance Of Students In Public Primary Schools In Kenya: A Case Of Machakos County 1001

Influence of Afrocentric Evaluation Methods on Societal Norms among Secondary School Learners in Meru County, Kenya 1012

Influence Of Educational Support On Academic Performance Of Orphans And Vulnerable Children In Public Primary Schools In Kalama Sub County, Machakos County, Kenya 1021

Effect of Level of Enforcement of Knec Rules and Regulations On The Prevalence Of Examination Malpractice In Public And Private Secondary Schools In Kisii County. 1036

E-Learning: The Emerging Technologies In Instruction 1052

An Investigation On Student-Teachers' Acquisition Of New Knowledge During Teaching Practice Exercise. A Case Study Of University Of Embu. 1063

Kenyan Curriculum and Self-reliance: A Decolonizing Perspective 1068

The Educational Role of *Nation* And *Standard* Newspapers In Creating Awareness On Functions Of County Governments Among Residents Of Embakasi East Sub County, NAIROBI 1080

The smart phone Revolution Has Arrived in Classroom! What Are my Options? 1091

Assessing Skills Supply and Youth Employability in Kenya: secondary school education graduates training (miss-) match with Mumias Sugar Company labour market needs 1103

Analysis of Human And Social Capitals And Community Participation In Development Initiatives Among The Rural Households In Coastal Region Of Kenya 1113

The Craze for Students' Numbers In Kenya's Public And Private Universities And The Optimal Operation Of Masinde Muliro University Of Science And Technology: Towards A COST RECOVERY STRATEGY 1125

Higher Education Curriculum Orientation and Performance of Universities in Kenya: Industry Linkage Strategies 1142

Philosophical Foundations And Ethics: A Deconstruction And Reconstruction Of Kenyan Education System 1155

Indigenous Methods Of Education As Practised By The Kipsigis 1168

Teachers' Professional Development Issues and their Impact on Teachers' Service Delivery. A Case Study of Msimba Secondary School in Mombasa County, Kenya 1179

Rediscovering The Core Cognitive Processes That Define Scientific Competence. 1200

Academic Advising Needs of University Students: The Case of Machakos University 1207

SUB-THEME 8: BUSINESS, ENTREPRENEURIAL INNOVATION, SMES & MARKETING 1222

Influence of Budget Efficacy On Household Effects In Kenya 1223

An Assesment of Health System in Kenya: Towards The Achievement Of Universal Health Coverage 1234

Service Quality Delivery And Customers' Satisfaction In Nigeria Banking Industry 1249

Creating Favorable Macroeconomic Environment for Manufacturing Industry in Kenya 1263

Determinants of tax compliance by small and medium businesses in Embu County, Kenya 1280

Effect Of Risk Retention Techniques On Theft In Saccos In Embu County, Kenya 1287

Merger Strategy and Its Effects On Profitability for Commercial Banks Listed in The Nse in Kenya 1301

Examination Of Government Policies That Address Tacit Knowledge Sharing And How Well These Policies Have Been Applied And Fortified To Enhance Public Sector Performance. 1315

Influence Of Entrepreneurial Skills And Innovation On Performance Of Small And Medium Enterprises (Smes) Review From Theoretical Literature 1328

Chief Guest Official Opening



HON. MR. KERIAKO TOBIKO

(Cabinet Secretary for the Ministry of Environment and Forestry.)

Before his appointment, Tobiko was the Director of Public Prosecutions, the first holder of the office under the Constitution of Kenya 2010 having been first appointed in 2005. He was re-designated as the Chief Public Prosecutor in August 2010 and appointed to head the independent constitutional office in June 2011. He is an advocate of the High Court of Kenya and formerly a lecturer at the University of Nairobi. Hon. Tobiko is an alumnus of the University of Nairobi and Cambridge University. He is the winner of GadhiSmarak Award for Best "A" Level student 1984 (Kenya), Barclays Cambridge Commonwealth Scholarship, 1990 for Kenya and Pegasus Cambridge Scholarship, 1990 as well as Fellow of Cambridge Commonwealth Society (FCCS).

He has served in other national institutions namely: The Commission of Inquiry into the Land Law Systems in Kenya (The Njonjo Land Commission, between 1999 – 2002) where he was a Commissioner; The Constitution of Kenya Review Commission (CKRC, between 2000-2005) where he was a commissioner; Appointed as Director of Public Prosecutions in 2005; Member of the Commonwealth Group of contact persons on International Cooperation in criminal matters from 2007 to date; From 2007 to-date, member of the Governing Council of the National Crime Research Centre (NCRC); Member of the Advisory Board of the Witness Protection Agency (WPA) from 2008 to date; Ad hoc Secretary to the Constitutional Advisory Committee on Prerogatory of Mercy in 2009; Served as Alternate to Hon. Attorney-General as member of the Ransely Task Force on Police Reforms in 2008-09; Re-designated as Chief Public Prosecutor in August 2010; Alternate to Hon. Attorney General as a Member of The Police Reforms Implementation Committee (PRIC) from 2010 to date; Appointed by the Hon. Attorney-General as the National contact person in relation to cooperation with ICC from March 2010 to-date; Appointed to team up with Hon. Attorney-General and Solicitor-General to represent GOK in the proceedings before the ICC in relation to the 2007/08 Post Election Violence in Kenya from March 2011.

Chief Guest Official Closing



PROF. CHACHA NYAIGOTTI-CHACHA

(Chairman, Commission for University Education)

Professor Chacha Nyaigotti-Chacha is a Kenyan playwright and consummate Swahili language educationalist. He has served as an executive secretary of the Inter-University Council for East Africa (2000–2010), and was the first CEO of the Kenyan Higher Education Loans Board (1995–2000). He is currently serving as the Chairman of the Kenyan Commission for University Education (CUE) and he has been the chairman of Kenya Institute of Mass Communication (KIMC).

He was educated at Kenyatta College, receiving a BEd (Swahili Language), and later studied at Yale University, gaining an MA in Anthropological Linguistics and a Ph.D. in Swahili Language Linguistics. He has been a Tutorial Fellow and Lecturer in Swahili Language and Linguistics at Kenyatta University and later Egerton University in Kenya. He was a Research Professor at the Institute of Regional Integration and Development of the Catholic University of East Africa.

In 1994 Awarded Head of State Commendation (HSC) Medal (Kenya) for Distinguished Service and 2004 he was Awarded the Order of the Grand Warrior (OGW) Medal (Kenya).

Key Note Speakers



HON. JEROME OCHIENG

Principal Secretary, ICT & Innovation

Mr. Jerome Ochieng is Principal Secretary for ICT and Innovation. Until his appointment, Mr. Ochieng was the Director of the Integrated Financial Management Information System (IFMIS) at the National Treasury and a member, Board of Directors at the Information, Communication Authority. He has 17 years' work experience in the field of information and communication technology in the Public Service. Mr. Ochien'g has also served as ICT Manager with Public Procurement Oversight Authority for 6 years. He holds a Masters' Degree in Information Engineering from the University of the Ryukyus, Okinawa, Japan. He is a registered fellow of the Computer Society of Kenya and a Licentiate Member of the Institute of Management Information Systems (IMIS), UK.



PROF. GILIAN WESTHORP

Charles Darwin University-Australia

Prof. Gill is a realist research and evaluation methodologist and a Professorial Research Fellow at Charles Darwin University, where she leads the Realist Research Evaluation and Learning Initiative (RREALI). She also runs a private consultancy business specialising in realist research and evaluation. She is co-author of the international publication standards and quality standards for realist evaluation and realist literature review. Prof. Gill has provided in excess of 70 training workshops in 14 countries, developed several new methods for realist research and evaluation, and published in realist methodologies. In 2018 she was made a Fellow of the Australian Evaluation Society. She is currently working on two aspects of realist philosophy – epistemology (knowledge) and axiology (value) - and their implications for evaluation methods.



PROF. FABIO SANTONI

Sapienza University of Rome

Prof. Fabio Santoni received the Dr. Eng. degree in Aeronautical Engineering (cumlaude) and the PhD in Aerospace Engineering both at Universita' di Roma "La Sapienza", in 1992 and 1996.In 1996 he was visiting scholar at Stanford University, were he participated in the small satellite programs Sapphire and Opal. He had technical management responsibility in the education program UNISAT at University of Rome "La Sapienza", till 2009.He is presently Associate Professor in Aerospace Systems at the Dipartimento di IngegneriaAstronautica, Elettricaed Energetica (DIAEE) of University of Rome "La Sapienza", where he established the Aerospace Systems Laboratory. His research activity is mainly devoted to nanospacecraft design, attitude determination and control, space debris observation, mitigation and remediation techniques, including end-of-life disposal and active debris removal.

Guest Speakers



PROF. WILLIAM FAUSTINE EPEJU

William Epeju is a Professor of Agricultural Education and Extension at Kyambogo University, Uganda with diverse interest and experience in Agricultural Education. He holds a PhD in Agricultural Education (Extension) and has been the Dean of the Faculty of Vocational Studies which houses and administers the Department of Agriculture at Kyambogo University. He has been a member of several professional committees and bodies including Uganda Society and Association of Third World Studies, Kenya Chapter. His major area of interest is improving agricultural productivity through improved education and training of the farmers. He has special interest in poverty reduction and eradication on smallholdings through improved productivity to assure food security and better incomes. He is active in matters of tree planting and participated in national environmental action plan process (NEAP) in Uganda during the 1990s. He is the Guest Speaker for Sub-Theme 1: Agriculture, Food and Nutrition Security.



PROF. ELIJAH GITONGA RINTAUGU

Professor Elijah G. Rintaugu is a Professor at Kenyatta University in the Department of Recreation and Sport Management. He holds Doctor of Philosophy (Socio-Psychology of Sport) from Kenyatta University. Elijah is a member of several professional bodies such as International Council for Health, Physical Education, Recreation Sport and Dance (ICHPER-SD) Africa Association for Health, Physical Education, Recreation, Sport and Dance (AAHPERD) and Kenya Association of Health, Physical Education Recreation Sport and Dance. He serves as a reviewer for many international journals and has sat in a number of Committees in the University. He is the Guest Speaker for Sub-Theme 2: Health care, Leisure and Tourism Innovation.



PROF. MARTIN NJOROGE

Prof. Martin C. Njoroge is a Professor of Languages & Linguistics, holds PhD in Linguistics (KU. Prof. Njoroge is an accomplished scholar and researcher and has conducted extensive research on Multilingual Education, English language teaching and sociolinguistics. He is co-editor of Multilingualism and Education in Africa: The State of the State of the Art, and Springer's Multilingual Education in Africa journal. He is also a peer reviewer for the Commission for University Education. He is the Guest speaker for Sub-theme 3: Language, Culture, Social Equity and Governance.



PROF. MUGENDI K M'RITHAA

Professor Mugendi K. M'Rithaa is a transdisciplinary industrial designer, educator and researcher. He studied in Kenya, the USA, India and South Africa and holds postgraduate qualifications in Industrial Design, Higher Education, and Universal Design. He has taught in Kenya, Botswana, South Africa and Sweden and is passionate about various expressions of socially conscious design, including Designerly Strategies for Mitigating Climate Change; Design for Social Innovation and Sustainability; Distributed Renewable Energy; Indigenous Knowledge Systems; Participatory Design; and Inclusive/Universal Design. He is a founding member of the Network of Afrika Designers (NAD), a member of the Association of Designers of India (ADI). He is the Guest Speaker for Sub-theme 4: Built Environment, Infrastructure Development Industrialization: Emerging Technologies, Manufacturing & Agro-processing.



PROF. BERNARD KIPSANG ROP

Kipsang is a Professor of Petroleum Geology andformerly, Chairman Mining, Materials &Petroleum Engineering Department, Jomo Kenyatta University of Agriculture Technology, Kenya. He holds a Ph.D. in Petroleum Geology, fromUniversity of Pune, India. He has attended and facilitated various local and international symposia/ workshops among them; The East Africa Petroleum Conference and Exhibition (EAPC'15), Kigali, Rwanda, Governing Council Meeting at the Southern Eastern African Mining Center, Dar ES Salaam, Tanzania, Governing Council meeting at the Southern Eastern African Mining Center, in Luanda, and United Nations Commission on Sustainable Mining Extractive Developments, Geneva, Switzerland, UN HQs. Mineral Extractive Industry Development. He is the Guest Speaker for Sub-theme 5: **Energy, water, climate Change and Environmental Sustainability.**



PROF. ANNE W.T. MUIGAI

Prof Anne Muigai is a molecular population geneticist with over 15 years' experience in the field of Genetics and Biotechnology. She is a Professor of Genetics at JKUAT and a member of the Animal Genetic Taxonomy Advisory Group (AnGR-TAG) of the African Union. She is also a Commissioner with the Commission for University Education and a Director with the Kenya Plant Health Inspectorate Service (KEPHIS), a state corporation within the Ministry of Agriculture that regulates the agricultural sector. She was recently appointed to become a member of the World Health Organization international advisory committee on the future of human gene editing. She is the Guest Speaker for Sub-theme 6: **Mathematics, Statistics & Data Science, Basic and Applied Sciences.**



PROF. KISILU KOMBO

Professor Kombo holds a PhD in Sociology of Education, and currently the Acting Dean, School of Education, Kenyatta University. Some of the significant researches he has done include the Impact of Nairobi-Thika Super Highway on Ruiru Town in Kenya and Cactus Pilot Project on Health Promotion in Selected Primary Schools in Nairobi, Kenya. His areas of interest include Education, Research and Community Development. He is the Guest Speaker for Sub-theme 7: **Issues in Education and Training.**



PROF. SIMMY MARWA

Simmy is a Professor and practitioner of Strategic Quality Management and has well over 20 years' academic practice in Higher Education Institutions (HEIs) and international experience in consultancy (both public and private sector) in UK, Middle East and Africa. He is also a Certified Manager in Six Sigma Green and Black Belt, Process Excellence and Project Management as well as a Fellow of the Higher Education Academy (UK). Simmy has acquired considerable experience working with the public and private entities in diverse sectors and specialisms and is passionate about quality deliverables in every project. He is the Guest Speaker for Sub-theme 8: **Business, Entrepreneurial Innovation, SMES & Marketing.**

SUB-THEME 1 - AGRICULTURE, FOOD AND NUTRITION SECURITY

Effective Methods for Data Collection in Rural Setup: A Pilot Study Focusing on Agricultural Practices in North Kinangop, Nyandarua County, Kenya

Alice Kosgei[1] Leah Mutanu[2], Margaret Wachu Gichuhi[3] and David Steven Scott[4]

[1]Machakos University, P.O Box 136-90100 Machakos; 0723920753; akosgei@mksu.ac.ke
[2] United States International University (USIU), P.O Box 14634 – 00800 Nairobi. 0722661172; lmutanu@usiu.ac.ke.
[3]Jomo Kenyatta University of Agriculture and Technology. P.O Box 62000 – 00200, Nairobi. 072231178, mgichuhi@jkuat.ac.ke.
[4]University of Woverhampton, United Kingdoms, Wulfruna St, Woverhampton WV1 1LY UK D.S.Scott@wlv.ac.uk

Abstract

Agriculture sector in Kenya plays a vital role in achieving sustainable development goals of ending poverty, hunger and economic growth in the country. Conducting research on how this sector can be improved is imperative in order to improve the lives of the citizens, especially those in the rural areas. The quality of any research is highly dependent on the way data is collected. However, very little research exists that shows the most effective ways of collecting data especially in rural areas. This pilot study aimed at identifying effective data collection methods and techniques among farmers in rural areas in Kenya. To achieve this, four data collection methods were tested: Interviews, Digital Story Telling, Focus Groups and Rich Pictures that was conducted on different respondents in North Kinangop. Data was analysed using descriptive statistics. Results obtained showed that no single data collection method is adequate to address all the research objectives. Data collection methods have strengths and weaknesses that can be balanced out by using different techniques. Digital Story Telling and Rich pictures are ideal for exploring options and therefore tend to be useful during problem identification. Interviews and Focus groups are ideal for addressing specific objectives and therefore should be used after the problem identification phase when objectives have been set. The findings highlight the importance of selecting effective data collection methods when conducting research among farmers in rural Kenya. Further research needs to be conducted with large number of respondents to validate these methods.

Key words: Agricultural research, data collection methods and techniques, pilot study, rural livelihood, Rural Education

Introduction

gather Agriculture is an important source of income, food, and raw materials for industrial growth in Nyandarua County and its environs such as Nairobi. The sector employs about 69% of the population and contributes approximately 73% to household incomes. (MoALF, 2016). However, agricultural productivity is generally low and is linked to several factors. A strategy on how to improve crops, livestock, and fisheries is required to enable the county play a role to achieving the national Vision 2030 as well African Union's Agenda 2063 and United Nations' Sustainable Development Goals. This will also ensure the Kenya's government 'Big Four Agenda' of 2018 are met. In order to develop this strategy an effective method of collecting data must be developed to identify specific challenges currently facing rural

livelihoods, their requirements, existing gaps and opportunities that can be harnessed. Improved data collection methods are critical in decision making to provide sustainable solutions (Jones *et al.* 2013). These methods should factor in the complex interaction between people and the behavior of community members. Unfortunately, this information is not always available and is often specific to each rural community. A key aspect on research to improve rural livelihoods should focus on identifying effective data collection methods.

Data is a compilation of relevant information or informed observations that can be used for analysis in order to provide insight into a situation. It is important to ensure that the data gathered is of good quality by factoring in the source of the data as well as the context the data has come from (Paradis et al, 2016). Key data collection methods include questionnaires, interviews, focus groups, observation or textual analysis. According to Qu and Dumay (2011) interviews requires the use of various skills including intensive listening and note taking in addition to careful planning and sufficient preparation. Taking recordings as the interview progresses is useful in enhancing data collection through this method. Further, interviews are ideal for documenting perceptions, attitudes, beliefs, or knowledge from a predetermined sample of individuals. It is useful where detailed information are required from individual participants (Gill *et al.* 2008), which is usually possible through probing based on individual responses. Interviews can also be used to gather information face to face from an individual but can be recorded and transcribed. Focus group discussion is a qualitative approach useful in gaining an in-depth understanding of social issues aimed at obtaining data from a purposely selected individual groups rather than statistically representative sample of a population (Nyumba *et al.* 2017). Focus groups are used to information in a group setting and are ideal where a group of people's shared experiences is required. It also allows researchers to capture participants' reactions to the comments and perspectives shared by other participants. In addition,

Other methods that have been tried in other field include Digital Story Telling (DST) accompanied by videos and photographs and rich pictures. According to Rieger *et al.* (2018) digital story telling is defined as 'arts-based research method with potential to elucidate complex narratives in a compelling manner, increase participant engagement, and enhance the meaning of research findings'. It is innovative, technology-based method that is an enhancement of traditional storytelling. This can be attributed to the availability of affordable easy-to-use digital recording technology especially android phones. According to Xu *et al.* (2011) they described DTS as flexible, universal and interactive. Digital story telling has been used mainly in health sciences especially in field of mental cases (Lal*et al.* 2015; Palacios *et al.* 2015; De Vecchi, *et al.* 2016; Rieger, *et al.* 2018). It has also been used in education, where doctoral students' perceptions of digital story telling as a learning tool in understanding administrative courses was conducted (LaFrance and Blizzard, 2013) while Alismail (2015) reported that DST was an effective tool in developing students' academic skills and motivating. Further, Nam (2017) studied the use of DST in understanding online collaborative learning environments on students. Gubrium and Turner, (2011), discuss digital story telling as a community-based participatory research method used to investigate individual, group or sociocultural understandings of an issue, while also increasing community members' participation and input on other community concerns. They point out a key benefit of digital story telling ability to offers participants and researcher/facilitators the possibility to open up the social research process. Ethical challenges and methodological issues may also arise related to access to the digital story telling product, especially related to the release and target audience. Further DTS relies on individual

participant given a story on day to day life and activities which is normally recorded. The utilization of DST in the field of agricultural science is scanty hence a new area to be researched.

Rich pictures are also another method for collecting qualitative data. Armson (2011) defined it as "pictorial representations that attempt to capture an individual's perspective of a situation, including objects, ideas, people, character, feelings, conflicts, and prejudices". It is useful in understanding complex issues, situations or conditions a person experience. One is asked to make drawings using symbols and interconnections from which descriptive statistics will be useful in making meaning out the data. Just as digital story telling this method has been applied in medical science (Cristancho *et al.* 2015) and in business (Feldman & Kirkham, 2017). It is also possible to obtain different information from the same pictorial drawing which may hinder decision making. This method has not been researched in agricultural related research and there is need to explore in order to understand farmers process in decision making.

The role of the researcher in qualitative research is to attempt to access the thoughts and feelings of study participants, a task that is difficult. According to (Sutton *et al*, 2015), sometimes the experiences being explored are fresh in the participant's mind or at times recalling past experiences may be difficult. In addition, interpretation of the data will depend on the theoretical standpoint taken by researchers, and being aware of ones this is one of the foundations of qualitative work. Further, the choice of a data collection method should be guided by the research purpose, the type of respondents, the resources available and the degree of intrusiveness/interruptions to the participants. In addition, Taylor-Powell and Steele (1996) emphasized the importance of using several methods to compensate for the weaknesses of each method. Based on these review the current pilot study in Kinangop focused on utilization of more than one method with an aim of identifying best combination of methods that can be applied successfully in field agricultural rural set up outside the medical, education and business fields that have worked for some of the . A pilot study was therefore conducted in Kianagop focusing on rural farmers with the following objective; a) to identify effective methods and techniques or its combination in collecting data among rural farmers b) to identify challenges presented when collecting data among rural farmers and lessons from the techniques employed

Methodology

2.1 Sample Size

The study aimed at conducting a pilot test on four methods and techniques in data collection on approximately ten farmers selected at random in North Kinagop. The participating farmers were organized by Friends of Kinangop Plateau (FOKP) in association with Jomo Kenyatta University of Agriculture and Technology (JKUAT). The participants represented the three-demographic population, young generation (youth), middle aged and the old with a balanced gender. During the pilot study, data was collected from six respondents out of the ten participants.

2.2 Research Procedure

The general approach involved the team developing a pool of questions that were semi-structured, open ended type to help in identifying the best method for data collection with a focus on understanding agricultural practices by farmers in Northern Kinangop. The researchers agreed on the following general protocol for engaging participants:

Introduction – This was to set pace and establish a good rapport with participants. Both researchers and participants introduced themselves and researchers explained the purpose of visit

Ethical implication – The participants were guided on ethical aspects and they were asked to indicate whether they were willing to participate

Data collection using the different methods as outlined by researchers was carried out

Conclusion – After the collection of the data, each participant was given an opportunity to ask questions and give their general comment(s)

2.3 Data Collection Methods

The researchers planned to make use of semi-structure open ended questions that were designed beforehand. Participants were approached as individuals or in a group depending on the situation. The methods and techniques tested included interviews, face to face and telephone, group discussion, digital storytelling (DST) and rich pictures. Recordings and photographs were taken where possible to support the methods used. Table 1 shows the summary of type of data collection methods used on different respondents.

Table 1. Data collection methods used for each respondent

Respondents	R1	R2	R3	R4	R5	R6
Data Collection Methods	Recorded Interview	Focus Group Digital Story Telling Interview	Focus Group Digital Story Telling Interview	Rich Picture	Rich Pictures Interview	Non recorded interview Telephone interview

KEY: R1, R2…R6 represent respondents

2.4 Research Design and Analysis

The farmers were divided into groups comprising of two old men and two middle aged ladies and two participants, a young man and a lady both representing the youth. Hence, they were grouped into three categories based on their age brackets; old, middle aged and the youth. This met our expectation in terms of different demographic representation that was mixed and in addition gender balanced. There were about ten members of the community and different data collection techniques most of which were used in combination were tested on the six participants. The interview was guided by the open ended semi-structured questions, both recorded and non-recorded were tested. Digital story telling was employed on participants practicing small scale farming of crops and cattle for subsistence use. Both interview and group discussion took place at the end of the digital storytelling. Rich pictures was employed on

participants who described their crop(s) production cycle using pictorial representations, where probing and interview was also used. A follow telephone interview was conducted on one of the participants. Table 2 summarizes the demographic details for the participants during the pilot test. Analysis of data was mainly descriptive and information recorded was decoded and described. Data collected through rich pictures were also interpreted and summarized.

2.5 Assumptions of the study

The following assumptions were made:

Farmers participating in the research were many and had various demographic characteristics

All farmers were willing to participate in the research.

The research was to be conducted in actual farmers' fields

The selected methods were going to work well.

Table 2. Summary of Respondents Demographics

Respondents	R1	R2	R3	R4	R5	R6
Age	Youth	Old	Old	Middle Age	Middle Age	Youth
Gender	Male	Male	Male	Female	Female	Female
Farming Practice	Crops	Crops	Crop and Livestock	Crops	Crops	Agricultural Trainer

KEY: R1, R2…R6 represent number of respondents

Results and Discussion

3.1 Effectiveness and Adequacy of The Methods Used

The different methods conducted with different participants were tested to evaluate each approach worked in collecting data. The assessment on effectiveness and adequacy of a method was tabulated in order gauge its efficiency. Table 3 shows how participants responded to the qualitative methods used.

3.1.1 Interview

Several interviews were conducted with different approaches in each case. For the first respondent a face to face interview that was digitally recorded was conducted. From the interview the respondent was able to describe crop management practices that help in crop production e.g. adding manure and intercropping and inclusion of livestock in the cropping system. Through probing and follow up questions the researchers were able to get additional information that were useful. These included presence of skilled agribusiness farmers in the area who applied techniques such as drip irrigation, furrow (in low lying areas) and mulching. The responded further indicated that 95% of these farmers did not deal with indigenous crops. Interviews thus give researchers the opportunity to uncover information that could be obtained thorough methods such as questionnaires and observation (Blaxter et al 2006). This is because it is possible to probe for more information. Further combining interviews with other methods would give more information that can be reliable. In his review, Alshenqeeti (2014) recommended that utilization of many data collection instruments would help obtaining sufficient data and validating findings of a research.

Table 3. Farmers' Responses and Qualitative Methods Used

Respondents		R1	R2	R3	R4	R5	R6
Methodology							
		Recorded Interview	Digital Story Telling, Focus Group and Interview	Digital Story Telling, Focus Group and Interview	Rich Pictures	Rich Pictures and interview	Non-recorded Interview, Telephone interview
Research Questions							
	Daily Activities	●	●	●	●	●	●
	Crop management practices	●	●	●	●	●	●
	Prevalent Pests/Parasites	●	●	●	●	●	●
	Control Pests Measures	●	●	●	●	●	●
	Traditional pest control measures	●	○	●	○	○	●
	Pest Triggers	●	●	●	○	○	●
	Fodder crops grown	●	●	●	○	○	
	Sources of Agriculture Information	●	●	●	○	○	●
Respondents		R1	R2	R3	R4	R5	R6
Methodology							

		Recorded Interview	Digital Story Telling, Focus and Group Interview	Digital Story Telling, Focus and Group Interview	Rich Pictures	Rich Pictures Interview	Non-recorded Interview, Telephone interview
Improvements							
	Challenges	●	●	●	●	●	●
	Way forward	●	●	●	●	●	●
Post-harvest practices and records							
	Dry season activities/management	◒	◒	◒	●	●	●
	Use of harvested crop	●	◒	◒			●
	Handling Surplus Crops/value addition	●	◒	◒	●		●
	Record Keeping	●	◒	◒	○	○	●

Key:● Adequate Data Collected, ◒ Inadequate Data Collected, ○ No Data Collected

3.1.2 Digital Story Telling (DST)

A question was posed to two of the respondents each to narrate what they do in their farms on a daily basis. The respondents gave their activities in form of a story. A digital camera was used to record the story with the respondent's permission. The researchers then spend time after data collection replaying the recording and extracting useful data from it. An excerpt of the recording by one of the respondents is given below in Swahili with the English translation and the manual transcription.

> **Respondent:** *"watu kutoka mbali wamekuja kununua mashamba huku na hii inayafanya kuwa madogo sana"*
>
> **Translation:** *"people from far come to buy land making the parcel sizes much smaller"*
>
> **Manual transcription**: "People coming to settle in Kinangop end up buying small parcels of land that cannot support large scale farming."

From the excerpt it can be observed that the researchers were able to enrich the respondent's answers when transcribing, giving more meaningful data. A simple questionnaire with the respondents' answer might not have given the researchers an opportunity to put this in context. The digital story telling (DST) was very adequate in bringing out what the respondents practiced on daily basis without being restricted to the open-ended question. As reported in medicine field and education, it was possible to gather more information (Lal *et al.* 2015; Palacios *et al.* 2015; De Vecchi, *et al.* 2016; Rieger, *et al.* 2018). The participants was also free and eager to share with us his experience in farming, challenges and how he manages these challenges. At the same time focus group and interviews were used to compliment (DST) which assisted in getting more details on daily activities and the farmer could point out some gaps that needed to be addressed such as involving farmers to find out their needs and integrate them in research activities. It was reported that DST was helpful in integrating instructional messages with learning activities creating more engaging and exciting learning environments (Smeda *et al.* 2014). This is an indication that using DTS with other methods was useful in obtaining relevant information in understanding farming practices carried out by farmers. In another research it was indicated that DST can preserve and promote indigenous knowledge (Willox *et al.* 2013), which is useful in understanding the indigenous practices that can be improved through current research technologies. The video recording and photographs also helped to clarify areas where the research team needed to be sure of the information given by the respondents and later transcribed through listening and note taking.

3.1.3 Focus Group

A focus group was conducted with two of the participants and questions were directed to both of them. They were both elderly and therefore were able to discuss traditional farming practices. In addition, they were able to answer the questions presented by complementing each other and providing the general feeling of the group. For example, when asked about traditional methods of forecasting pests, one of the respondents stated that they did not exist. The other respondent clarified that Kinangop traditionally had cold weather and therefore pests did not thrive. He further clarified that this notion had changed in recent times and pests are an issue due adverse climate changes in the area. Focus group method was also aided by video recording in addition to note taking to enhance data collection and ensure no information is lost. This was also suggested by Dilshad and Latif (2013) as a way of ensuring correct and full record of information from the participants are gathered. However, they noted that it was time consuming to listen to recorded data and transcribe. This small group was easy to manage and with further probing using the open ended questions the researchers were able to gather in-depth information on farming practice in Kinangop. However, varying number has been reported where Nyumba *et al* (2018) indicated that a group should not be more than 12 participants while Krueger (2002) stated that it should range between 5 to 10 people per group, but 6-8 preferred and this small number is for ease of management.

3.1.4. Rich Pictures

Two respondents were asked to illustrate crop production cycle using pictures on charts. They were able to present the information in a cyclic diagram with few simple pictures and text. Farmers had information on the routine activities which they shared. The respondents were always seeking clarification and this was complemented with interview to assist in presenting the information. . According to Armson (2011) respondents should be given instructions on how to create rich pictures where he came up with an example using his own personal story. This indicates that respondents should have been taken through using an example. This was also emphasized by Cristancho et al (2017) that rich pictures were free-form drawings to illustrate an experience, and that does not require art skills. In some cases a diagrams may not be adequate and therefore complementing the approach with other methods such as interviews and group discussions would enrich the process. For example when asked to indicate when they start planting, the respondent had to explain that "*there is no specific planting season, rains are available and each season is planting time*". This was difficult to illustrate and therefore it was recorded separately. It is however worth noting that although the respondents were unfamiliar with this method of data collection, they appeared to be eager to try it out and excited to participate.

3.2 Challenges and Lessons

Recorded and non-recorded face to face interviews were used to collect data from respondents. There was however no observable effects to the respondent's behavior based on whether the interview was recorded or not. This could be attributed to the small number of respondents used. Further research however needs

to be conducted to investigate whether the presence of recording altered the responses provided. The use of interview was criticized by Robson, (2002) due to being time-consuming in relation to both data collection and analysis as a result of need for data to be transcribed, coded and in some cases translated. Due to this the researchers had to conduct a telephone interview to complete the interview with one of the participants. During the telephone interview the respondent was able to respond to the questions posed. However, the researchers were not able to observe sentiments usually presented through facial expressions and gestures. This would usually give an impression on the adequacy of the response given for example where doubt existed. Further telephone interview was reported that it could be expensive (Hofisi *et al* 2014).

Digital story telling enabled the farmers to broaden their answers and provide additional information that would otherwise have been constrained by the use of interview alone. For example, the excerpt below shows one of the points brought out by a respondent.

> *"Dairy farmers were affected by climate change since during prolonged droughts, cattle feeds are more expensive, more parasites such as ticks and flies that causes discomfort to livestock. The wet seasons leads to various diseases to the dairy cows"*

However, from the excerpt it can be seen that the respondent identified livestock farming practices which were not part of the researcher's objectives. It does however provide an insight on the relationship between crop and livestock production. The method is therefore prone to respondents going out of topic and therefore the researcher needs to integrate it with other methods such as interviews to maintain focus as well as probe further where clarification was required. More information from the respondents improves on data being collected. It was also observed that the respondents were not familiar with Digital Storytelling as a method of data collection. They would constantly pause in anticipation of questions during the story telling process. The respondents therefore need to be prepared by explaining the method before using the method. It would also be interesting to conduct research in actual farmer's field using DTS as observations will also be made and it will be part of combined method in data collection. The researchers noted that after the digital storytelling process some of their questions had not been answered and therefore had to conduct an interview to complete the data collection process. The combination of various methods in data collection has been reported to be important in enhancing reliability of data collected. In addition, according to Rieger et al (2018) they stated that 'given digital media's vast and nearly instantaneous impact, the use of digital storytelling as an innovative knowledge translation approach has the potential to significantly decrease the time between knowledge generation and knowledge implementation'.

Notable observations were made using focus group where researchers got an insight into some of the challenges of the approach. A key challenge was where contradicting opinions between the participants.

For example, one of the respondents stated that the fall armyworm did not exist in the area while the second respondent gave it as an example of pests in the area. Upon probing the researchers found out that the fall army warm was present in low numbers in the warmer areas of Kinangop. In addition, transcription of focus groups is more complex and time consuming which is in agreement with report by Gill et al (2008). Data analysis is also difficult as one has to integrate the information from several participants. Another challenge observed was that one member was more talkative and wanted to be the main person responding to questions i.e. exhibited a dominating behavior. In such cases the facilitator should always control the participants and ensure the size is manageable. Nyumba et al (2018) stated that more than 12 members in a group makes it unmanageable and might disintegrate into several groups each conducting separate discussion. Hence the fewer the number, the easier it is to manage and hence the better the quality of data collected. It also requires proper planning with well outlined procedure for successful execution.

Diagrammatic response on crop cycle that was to be purely pictorial turned few pictures with rich text. The respondents were unable to present the details in pure picture form. The challenge was on how to come up with an illustration to represent some information such crop pest control, post-harvest and value addition, and sources of agricultural information. As a method of data collection, researchers need to plan on how the various data items can be illustrated. According to research conducted it was reported that there was more dimensions playing a role in the surgical operation which came out after a period of one and half hours of drawing by just one surgeon (Cristancho *et al.* 2015). This indicates that it is time consuming and hence more people may not be sampled during research. In the current research where two participants were involved, a complete rich picture could not be obtained due to time constraint. Also the participants were constantly seeking researchers assistance in coming out with the information. In addition, interviewing was also used to aid in coming out with in-depth information that was to be included in the pictorial drawing. The lesson learnt in this pilot test is that more time should be allocated. Rich pictures should also come after a short interview and illustrations to help participant reflect more on their activities and actions taken during agricultural production cycle and represent the same in picture form.

Conclusion

The pilot study revealed the benefits of combining several data collection techniques. Results obtained indicated that data was collected adequately where the team had an opportunity to use a combination of data collection methods. For example where only pictorial representations were used, some of the data was not collected. Where focus groups were used, group dynamics made it impossible to get independent views and also conflicting information. But with additional method of data collection, the information obtained was clarified. The choice of data collection method is dependent on the type of data to be collected and the respondent's demographic characteristics. For example if the researchers aim at identifying gaps that can be addressed, exploratory data collection methods such as digital story telling would be ideal in combination with interviewing. On the other hand when the researchers are collecting data to answer

specific research objectives or monitoring and evaluation, interviews or questionnaires would be more effective. In all these methods, it was observed that recording the participants' responses was helpful in getting more information. The researchers however only had a limited amount of time to conduct the study and therefore only tested each method in combination on few respondents. An extensive research conducted over a longer period of time and among several respondents would provide more adequate feedback. Further, including respondents with more varied demographic characteristics would have enhanced the findings. This research therefore recommends an extensive research on data collection approaches to adequately identify effective techniques, their reliability and validity. This study however has provided insight into the significance of studying effective data collection approaches in rural communities.

Acknowledgement

The researchers wish to acknowledge the British Council, Newton Utafiti fund for sponsoring the workshop and farm visit. Other funding agency, the National Research Fund (NRF), Kenya is acknowledged. Also to Jomo Kenyatta University of Science and Technology, Kenya, and University of Woverhampton, UK , through Professor Stephen Kimani and Professor John Maurice Traxler respectively, for organizing a successful workshop and field visit. Acknowledged also is Machakos University for the opportunity to attend the workshop and all the trainers, presenters, Friends of Kinangop for organizing the respondents and to the respondents/farmers who made the data collection a success.

References

Alismail, A.A. (2015). Integrate Digital Storytelling in Education. *Journal of Education and Practice,* 6(9): 126–129.

Alshenqeeti, H. (2014). Interviewing as a Data Collection Method: A Critical Review. English Linguistics Research, 3(1): 39–45. DOI: 10.5430/elr.v3n1p39

Armson R. (2011). *Systems thinking for messy situations*. Axminster, United Kingdom: Triarchy Press.

Blaxter, L., Hughes, C. & Tight, M. (2006). *How to Research*. (3rd Ed.) New York: McGraw-Hill Education.

Cristancho,S., Bidinosti, S., Lingard, L., Novick, R., Ott, M. & Forbes, T. (2015). Seeing in Different Ways: Introducing "Rich Pictures" in the Study of Expert Judgment. Qualitative Health Research 25(5): 713–725.

De Vecchi, N., Kenny, A., Dickson-Swift, V. & Kidd S (2016). How digital storytelling is used in mental health: A scoping review. International Journal of Mental Health Nursing, 25(3):183–93. doi: 10.1111/inm.12206.

Dilshad, R.M. & Latif, M.I. (2013). Focus Group Interview as a Tool for Qualitative Research: An Analysis. Pakistan Journal of Social Sciences, 33 (1): 191–198.

Feldman, G & Kirkham, S. (2017). Using Rich Pictures to Represent Stakeholders' Role during Enterprise Systems Upgrade Decisions. 3rd International Workshop on Socio-Technical Perspective in IS development (STPIS'17), Essen, Germany.

Gill, P., Stewart, K., Treasure, E., & B.& Chadwick, B. (2008). Methods of data collection in qualitative research: interviews and focus groups. *British Dental Journal* 204 (6): 291–294. http://dx.doi.org/10.1038/bdj.2008.192.

Gubrium, A., & Turner, K. N. (2011). Digital storytelling as an emergent method for social research and practice. *Handbook of emergent technologies in social research,* 469–491.

Hofisi, C., Hofisi, M &Mago, S. (2014). Critiquing Interviewing as a Data Collection Method. *Mediterranean Journal of Social Sciences* 5(16):60–64.

Jones, S. A., Sanford Bernhardt, K. L., Kennedy, M., Lantz, K., & Holden, T. (2013). Collecting critical data to assess the sustainability of rural infrastructure in low-income countries. *Sustainability*, *5*(11), 4870–4888.

Krueger, R.A. (2002). Designing and Conducting Focus Group Interviews.https://www.eiu.edu/ihec/Krueger-FocusGroupInterviews.pdf

LaFrance, J & Blizzard, J. (2013). Student Perceptions of Digital Story Telling as a Learning-Tool for Educational Leaders. *NCPEA International Journal of Educational Leadership Preparation,* Vol. 8, No. 2– October 2013. ISSN: 2155-9635.

Lal, S., Donnelly, C., & Shin, J. (2015). Digital storytelling: an innovative tool for practice, education, and research. Occupational Theory in Health Care, 29(1):54–62. doi: 10.3109/07380577.2014.958888

MoALF. (2016). Climate Risk Profile for Nyandarua. Kenya County Climate Risk Profile Series. The Kenya Ministry of Agriculture, Livestock and Fisheries (MoALF), Nairobi, Kenya.

Nam, C. W. (2017). The effects of digital storytelling on student achievement, social presence, and attitude in online collaborative learning environments. *Interactive Learning Environments,* 25, 412–427.

Nyumba, T.O., Wilson, K., Derrick, C.J. &Mukherjee, N. (2008). The use of focus group discussion Methodology: Insights from two decades of application in observation. *Methods in Ecology and Evolution* (9):20–32. DOI: 10.1111/2041-210X.12860

Palacios, J.F, Salem, B., Hodge, F.S., Albarrán, C.R., Anaebere, A., Hayes-Bautista & T.M. (2015). Storytelling: A Qualitative tool to promote health among vulnerable populations. *Journal of Transcultural Nursing* 26(4):346–53. doi: 10.1177/1043659614524253.

Paradis, E., O'Brien, B., Nimmon, L., Bandiera, G., & Martimianakis, M. A. (2016). Design: selection of data collection methods. *Journal of graduate medical education*, *8*(2), 263–264.

Pierce, C. S., & Scherra, E. (2012). The challenges of data collection in rural dwelling samples. *Online Journal of Rural Nursing and Health Care*, *4*(2), 25–30.

Qu, S.Q & Dumay, J (2011) The qualitative research interview. Qualitative Research in *Accounting & Management,* 8 (3): 238–264. Doi/doi/pdfplus/10.1108/11766091111620702011

Rieger, K, L., West, C.H., Keny, A., Chooniedass R., Demczuk, L., Mitchel, K.M., Chateau, J & Scott, D.S. (2018). Digital storytelling as a method in health research: a systematic review protocol. *Systematic reviews* 7:41 doi: 10.1186/s13643-018-0704-y

Robson, C. (2002). *Research in the Real World,* (2nd edition). Oxford: Blackwell.

Smeda, N., Dakich, E. & Sharda, N. (2014). The effectiveness of digital storytelling in the classrooms: a comprehensive study. *Smart Learning Environments,* 1(6):1–21.

Sutton, J., & Austin, Z. (2015). Qualitative Research: Data Collection, Analysis, and Management. *The Canadian Journal of Hospital Pharmacy*, *68*(3), 226–231.

Taylor-Powell, E., & Steele, S. (1996) Collecting evaluation data: An overview of sources and methods. University of Wisconsin Cooperative Extension Service. Cir. G3658-4.

Willox, A.C., Harper, S.L., Edge, Edge L & Canada, R. (2013.) Storytelling in a digital age: digital storytelling as an emerging narrative method for preserving and promoting indigenous oral wisdom. *Qualitative Research* 13(2):127–147.

School Feeding Programmes, National Food Policies, Action of Plan and Strategies on School Meals and Food Security Among School Children in Kenya. (Review)

Angelica M. Kimwele

School of health science, Machakos University

angelica.mueni@mksu.ac.ke

Sophie A. Ochola

Department of foods, nutrition and dietitics, Kenyatta University

sochola@yahoo.com

Mary N. Mugambi

Department of Human Nutrition and Dietetics, Technical University of Kenya

nkmugambi@gmail.com

Abstract

School feeding programs have been implemented in Kenya since the 1979 with varying degrees of success (Langinger, 2011). It began in 1979 with a government led and short lived school milk programme (Ministry of Agriculture, -MoA, 2011). The ambitious initiative that provided free milk to 4.3 million primary school students failed due to high costs, low accountability, and poor road infrastructure (Langinger, 2011). This was complemented in 1989 with a World Food Programme (WFP) lead programme, that is 71% own by WFP, 15% from local communities' and 14 % Kenyan government (Galloway, 2009). The programme provided a daily ration of 150 grams of cereal, 40 grams of pulses, 5 grams of oil and 2 grams of salt per child per day (Technical Development Plan, 2012). In July 2009, the Ministry of Education (MoE) in Kenya launched the Home Grown School Meal (HGSM). It was a transition from externally-driven school feeding programmes to Home Grown School Feeding (HGSF), which was to support government action to deliver sustainable, nationally-owned school feeding programmes sourced from local farmers in sub-Saharan Africa (NEPAD, 2003). In 2011,the programme had reached a beneficiary level of 592,638 children in approximately 1,800 schools in 72 semi-arid districts(Technical Development Plan, 2012 and Langinger, 2011).

The government has also established national policies, action plans and strategies to guide school feeding programmes. The National Food Nutrition Security Policy (2011) with one of its objective as to increase efforts for improved nutrition and nutrition education in schools with an emphasis on good nutrition practice and positive food habits (Republic of Kenya, 2011). The National Nutrition Action Plan (2012-2017), it's 6th strategic objective is to Improve nutrition in schools (Republic of Kenya 2012-2017). National School Health Strategy Implementation Plan 2011-2015, where nutrition in schools is one of its eight thematic areas (Republic of Kenya, 2011-2015). National school meals and nutrition strategy (2017–2022), which aims to ensure that all children in pre-primary and primary schools receive at least one nutritious meal per school day (Republic of Kenya, 2017-2022).

With above Government commitments to curbing food insecurity, Kenyan school going children a yet to be food secure; a bean and maize mix that includes oil is encouraged and largely implemented throughout schools (The Technical Development Plan, 2012). While at the same time national food policies, strategies and action plans do not have established guidelines on the nutritional content of school programme menus (Greenhalgh et. al, 2007and Lambers, 2009).

Problem Statement

School feeding through the Ministry of Education (MoE) has had notable improvement in increasing school enrollment, attendance, retention and educational achievement (Bundy et.al. 2009). However, there is limited data on its ability to reduce vulnerability to food insecurity among school going children occasioned by food crisis (MoA, 2011). It's evident that School feeding programmes are facing funding challenges to curb food insecurity in terms of offering quality and quantity meals (langinger, 2011). The government limited and flat rate school feeding stipend and ever rising food costs have threatened viability of school feeding programmes (Finam, 2010). During the 2018/2019 financial year Ksh 2.5 billion allocated to school feeding programme in arid and semi-arid areas was far below the Ksh 4.5 billion required (Republic of Kenya, 2018). School feeding programme in Kenya provide the biggest, or even the only meal, for many school going children on a given day (Walingo and Musamali, 2008, WFP, 2010) and UNICEF projections on an increase in the number of children aged below 18 at risk of severe food insecurity to 1.8 million from 1.1 million in August 2017 (Wakaya, 2018).

Moreover, the several national food and nutrition policies strategies and action plan developed by the government: The National Food Nutrition Security Policy (2011), National Nutrition Action Plan (2012-2017), National School Health Strategy Implementation Plan 2011-2015 and National school meals and nutrition strategy 2017–2022 among others are integral part of developing an effective school feeding programs to curb food insecurity among school children (saber, 2011). This is because they provide an opportunity for national leadership to demonstrate a commitment to school feeding programmes and ensures accountability for the quality of programs (Saber, 2011). They also have a multi-sectoral approach to encourage cooperation of relevant sectors, including education, finance and health, the

challenge is the rate at which they are being implemented, and some are at draft stage while others are facing stiff challenges thus unable to benefit school feeding programs in curbing food insecurity.

Hence the need for this study to identify the gaps in the implementation of school feeding programme, the role national food policies, strategies and action plan in provision of school meals and also highlight the food security status of school children in Kenya.

Objectives of the Study

To determine the extent to which school feeding programmes have been implemented in Kenya

To determine the food security status of Kenyan school going children

To assess the role of national food policies, strategies and action of plans on the implementation and provision of school meals in Kenya.

Significance of the Study

This study provides information to the government on status of school feeding programmes, national food policies, strategies and action plan and their role in curbing food security among school going children. The study should also be useful to the ministry of education and ministry of health in implementing and improving school feeding programme, national food policies, strategies and action plan and therefore the health of school-going children. This study is a useful source of knowledge for other researchers in the area.

LITERATURE REVIEW

Origin and implementation of school feeding in Kenya

School feeding has its origins in the 1930s, when feeding schemes were introduced in the United Kingdom (UK) and the United States (US) with the explicit aim of improving the growth of children (Richter, Griesel and Rose, 2000). In the late 1960s and early 1970s this benefit was withdrawn from all, except for those children considered to be particularly needy (Tomlinson, 2007). School feeding was soon introduced to South Africa, which started as a programme to supply free milk to white and colored schools (Kallman, 2005). Since then, school feeding has broadened to include the provision of fortified biscuits, nutrient supplementation or full meals and became a practice in many other countries including, including Haiti, Liberia, Pakistan and Senegal (World Food Programmed-WFP, 2004). The meals are either at full or subsidized cost (mostly in the UK and US), or free (more typical of countries in the developing world) (Tomlinson, 2007).

Kenya began school feeding programmes in 1979 with a government and WFP assistance (Langinger, 2011).The primary role was to increase enrollment and retention children in school thus contributing to realization of universal primary education, (Langinger, 2011; Bodo, 2012; Reche, et.al.,, 2012). The programme heavily relied on foreign aid and management (Langinger, 2011). During this time 71% of programme costs were provided by WFP, 15% was local communities' obligation and only 14 % came from the Kenyan government (Galloway 2009). This limited the Kenyan government's role in the direction and stewardship of the programme, in an effort to transit to a more sustainable alternative school feeding programme, with a shift in the financial responsibility Kenya was involved in the piloting of NEPAD supported HGSFP in 2009 (Langinger, 2011). The Government of Kenya has demonstrated leadership in this field and is implementing HGSFP targeting areas of high poverty that have high and medium potential to grow food and areas that have high levels of school drop-out, poor primary school performance, and high levels of malnutrition (Langinger, 2011).

School feeding and food security status for school aged children in Kenya

Food insecurity remains one of the challenges that face our world today with 925 million people suffering (WHO, 2017). There are many approaches taken in the world from different stakeholders to combat food insecurity across many fields. The school feeding programmes are just one approach that many international organizations and governments have adopted it as a successful tool of protecting children from food insecurity and malnutrition (Abdelrahmanmossad, 2016). School meals are essential as they are the only meal, for many schoolchildren on a given day (Walingo and Musamali, 2008). However, there is limited research on the impact of school meals on household and individual food security but dependency on school meal is experienced in some school going children. In some cases, school children are fed less at home as some parents use the school feeding programme as a replacement for feeding at home, while other parents view the school feeding programme as an income transfer and tend to spend the food budget of these school children on other household purchases (Aliyar et al., 2015).

The Role of National Food Policies, Strategies and Action of Plan on School Meal

The government has also established national policies, action plans and strategies to guide school feeding programmes. The National Food Nutrition Security Policy (2011), it is the policy of the government that all Kenyans, throughout their life-cycle enjoy at all times safe food in sufficient quantity and quality to satisfy their nutritional needs for optimal health. One of its objectives is to increase efforts for improved nutrition and nutrition education in schools with an emphasis on good nutrition practice and positive food habits (Republic of Kenya, 2011). The National Nutrition Action Plan (2012- 2017), its purpose is to provide a framework for coordinated implementation of nutrition intervention activities by the government and nutrition stakeholders. Its 6th strategic objective is to improve nutrition in schools and other institutions and the activities proposed for action include; conducting a situation analysis on school/

institutional feeding and reviewing existing guidelines for school/institutional feeding and to promote adequate nutrition (Republic of Kenya 2012-2017). National School Health Strategy Implementation Plan 2011-2015, is a national school health strategic implementation plan which aims to identify and mainstream key health interventions for improved school health and education. Nutrition in schools is one of its eight thematic areas, with the following objectives: to sensitize stakeholders at all levels on the importance of school nutrition services, to ensure all schools have instituted sustainable home-grown meals programmes by 2014, to standardize home –grown school meals programmes, to address micronutrient deficiencies among others (Republic of Kenya, 2011-2015). National school meals and nutrition strategy (2017–2022), it's aim is to ensure that all children, in pre-primary and primary schools receive at least one nutritious meal per school day. A three-pillar approach is recommended for school meals in Kenya: regular provision of meals every school day throughout the school year, acknowledgement of nutrition and nutrition education as core components of school meals and linking smallholder farmers with the demand for school meals by procuring directly from these suppliers where possible (Republic ok Kenya, 2017-2022).

Summary of Literature Review

In general, the literature provides valuable information especially on the aims and objectives of the school feeding programmed, national food policies, strategies and action plan and how they should be conducted and managed. There is however, a gap on the effectiveness of school feeding programmes in improving food security status of school going children a major challenge for school aged children in Kenya (Partnership for Child Development, 2013). There is limited information on the implementation status and role of national food policies, strategies and action plan in the provision of school meals. In addition, high numbers of school going children rely on school feeding meals as a main meals (Walingo and Musamali, 2008) the beneficiary level is 72 semi-arid districts(Technical Development Plan, 2012 and Langinger, 2011)

METHODOLOGY

This is documentary research utilized information from the secondary source. Data was obtained from written materials; some are published and others not published.

RESULTS

School Feeding Status

The government of Kenya has admitted over 500,000 primary school children to school meals especially from arid and semi-arid areas) and has promised to keep on adding the number by 50,000 children each year until full coverage (Finam, 2010). Unlike before where school feeding was lead by WFP (Galloway, 2009) the government, has now taken full responsibility of school feeding, The government has transited

to HGSF with the aim of delivering a sustainable, nationally-owned school feeding programmes sourced from local farmers (NEPAD, 2003 and Langinger, 2011) with a beneficiary level of 592,638 children in approximately 1,800 schools in 72 semi-arid districts(Technical Development Plan, 2012 and Langinger, 2011). In addition Kshs.2.5 billion in the national government financial year 2018/2019 was allocated on school feeding far below the Kshs. 4.5 required (Republic of Kenya, 2018). The swelling numbers of beneficiaries of school feeding and the limited government funding to the programme has affected the quality and quantity of food hence negatively affecting food security among school going children.

Food Security Status

Approximately 47% of the Kenya's population is food insecure, and with the rising cost of living and drought the figures could rise (Republic of Kenya 2015-2022). In some regions, per-capita food availability has dropped by 10% over the last three decades (World Food Programme and Government of Kenya, 2013). **The number of food insecure persons in Kenya could increase to 3.9 million this year (2018), up from 3.4 million last year (2017),** United Nations Children's Fund (UNICEF), there is also possibility on an increase in the number of children aged below 18 at risk of severe food insecurity to 1.8 million compared to 1.1 million in March and 1.6 million in August 2017 (Wakaya, 2018). In addition a third of Kenya school children dwell in Arid and Semi-Arid regions (ASAL) where the school meals contribute to between 30-90% of the total food intake per day for over 90% of the children (WFP, 2010) or even the only meal in a day (Walingo and Musamali, 2008).The parents of the children from these areas, cannot afford to purchase of enough foods because of poverty, (Aliyar et al., 2015).

The role of National food policies, action of plan and strategies on school meals

The National Food Nutrition Security Policy (2011)

By implementing this policy, the Government was to ensure that safe and high quality food is available to all Kenyans, at all times, by creating public awareness on relevant issues, and by setting, promoting and enforcing appropriate guidelines, codes of practice, standards and a regulatory but it is recognized that not all required activities can be implemented immediately and simultaneously. While some priority actions can start immediately, others may require further development, advocacy, preliminary research or a pilot phase. This will allow a realistic approach for funding arrangements over time. Under this phased approach, the policy was to be developed covering a 15-year period, with three 5-year phases, each with carefully planned, mutually supportive activities that build from the preceding phase (Republic of Kenya, 2011) . This means it may take time to achieve the policy objectives of achieving good nutrition for optimum health of all Kenyan, increasing the quantity and quality of food available, accessible and affordable to all Kenyans at all times and protecting vulnerable populations using innovative and cost-effective safety nets.

The National Nutrition Action Plan (2012- 2017)

The purpose of the national nutrition action plan was to provide a framework for coordinated implementation of nutrition intervention activities by the government and nutrition stakeholders. The 14 priority nutrition areas spelt out in the Food and Nutrition Security Strategy (FNSS) provided a conceptual guide to the development of this plan of action, which further identifies 11 strategic objectives each with corresponding activities and expected outcomes (Republic of Kenya, 2012-2017). Under this Strategy, the Ministry responsible for health shall be directly in charge of coordinating the implementation of the Plan at national level (Ministry of public health and sanitation, 2012-2017). However, under the new governance system in Kenya, and the devolved coordination systems at the county levels, which will feed into the national level, then coordination unit could be a source of delays in the implementations.

This Nutrition Action Plan also provides an estimation of the total resources required to achieve the goal and objectives to cover the five years (2012-2017) of implementation cost as Kshs. 69 billion which is higher even than the total government financial expenditure over the ministry of health activities in the year 2018/ 2019 of 55.6 billion (Government of Kenya, 2018).

National School Health Strategy Implementation Plan 2011-2015,

This strategy intends to provide a framework for implementation of a comprehensive school health programmed in Kenya (Republic of Kenya, 2011-2015). Kenya government did not provided enough resources to effectively implement this policy (Wasonga, et.al., 2014) . Additionally, the policy covers a wide range of issues and tries to address different components of health which have been clustered into eight thematic areas, namely: i) values and life skills; ii) gender issues; iii) child rights, protection and responsibilities; iv) water, sanitation and hygiene; v) nutrition; vi) disease prevention and control; vii) special needs, disabilities and rehabilitation; viii) school infrastructure and environmental safety. However, the Kenya school health policy implementation team has focused on water, sanitation and hygiene(Wasonga et al., 2014) leaving behind the areas of food security such as nutrition and disease prevention and control which have an implication on food security of school going children.

National school meals and nutrition strategy 2017-2022

The strategy is build on a three-pillar approach: regular provision of meals every school day throughout the school year; acknowledgement of nutrition and nutrition education as core components of school meals and linking smallholder farmers with the demand for school meals by procuring directly from these suppliers where possible. To achieve the strategy objectives, the government requires multi-sectoral planning and intervention. This will be coordinated by the Ministry of Education, with the participation of key actors in agriculture, health, social protection, finance and others. This is complexity and broad undertaking requires strong multi-sectoral governance and institutional arrangements, and clear shared and specific responsibilities and accountability which my derail its implementation.

CONCLUSION

The benefits of school feeding to school children in terms of enhanced school enrolment, increased school attendance, and positive learning outcomes is well documented across the globe. There is increasing evidence, with resulting international concern, that the high level of food insecurity in this age as food insecurity remains one of the challenges that faces our world today with 66 million school children people suffering globally (WHO, 2017). There is little or limited documentation on the implementation and effectiveness of national food policies, strategies and action plan to curb food insecurity among school going children in Kenya.

Recommendation

The government should increase its financial commitment to the implementation of a school programme to handle the problem of rising food cost and frequent droughts.

There is need for more research to establish the effectiveness of school feeding programs in curbing food insecurity among school going children

National food policies, strategies and action plan on school meals should be fully implemented or reviewed because they have the potential of cubing food insecurity among school going children

REFERENCES

Abdelrahmanmossad. (2016, January 6th). Combating Hunger through School Feeding Programmes. A blog by University of Sheffield students studying on the MA for Food Security and Food Justice.

Aliyar, R., Gelli, A. and Hamdani, S.H. (2015). A review of nutritional guidelines and menu compositions for school feeding programs in 12 countries, *Frontiers in Public Health*, vol. 3 No. 148

Bodo, S. (2012). Education in Reconstruction: Kenya – A Working Brief. Tunis Belvédéré; Association for the Development of Education in Africa (ADEA)/African Development Bank (AfDB)

Finan,T. (2010). Impact Evaluation of WFP School Feeding Programmes in Kenya (1999-2008): A Mixed-Methods Approach. Rome: *World Food Programmed.*

Galloway, R., Kristjansson, E., Gelli, A., Meir, U., Espejo, F., and Bundy, D.A.P. (2009). School feeding: Outcome and costs. *Food and Nutrition Bulletin,* 30(2); 171–182.

Greenhalgh, .T, Kristjansson, E., Robinson, V. (2007). Realist review to understand the efficacy of school feeding programmes. *BMJ,* 335(7625); 858–61.

Kallmann K (2005) Food for Thought: A review of the National School Nutrition Programme. In: Leatt A & Rosa S (eds) Towards a Means to Live: Targeting poverty alleviation to make children's rights.

Lambers, W. (2009), End Child hunger. Burkinafaso: *University press ltd. Longman Publishing Group.*

Langinger, N. (2011). "School Feeding Programs in Kenya: Transitioning to a Homegrown Approach," *Stanford J. Int. Relations*, vol. XIII, pp. 30–37.

Ministry of Agriculture. (2011). Agricultural Sector Development Strategy,2009-2020. Nairobi: *Government of Kenya.*

NEPAD. (2003). The NEPAD Home-Grown School Feeding Programme: A Concept Note. *Johannesburg, NEPAD.*

Reche, G.N.,Bundi,T.K, .Riungu,J,N,.& Mbugua, Z.K (2012).Factors contributing to poor performance in Kenya Certificate of Primary Education Examinations in Public Primary SCHOOLS IN Mwimbi Division, Maara District, Kenya. International Journal of Humanities and Social Sciences. Vol,5 March.

Republic of Kenya. (2011-2015).National School Health Strategy Implementation Plan. Ministry of Public Health and Sanitation and Ministry of Education.

Republic of Kenya, (2012-2017). Kenya Nutrition Plan of Action. Ministry of Public Health and Sanitation

Republic of Kenya, (2017-2022).National School Meals and Nutrition Strategy. Ministry of Education, Ministry of Health, Ministry of Agriculture, Livestock and Fisheries.

Republic of Kenya, (2018-2019). Budget summary statement. statement of Henry Rotich speech in parliament.

Republic of Kenya,(2011). National Food and Nutrition Security Policy. Agricultural Sector Coordination Unit. Nairobi: Kenya.

Richter, L., Griesel, D. and Rose, C. (2000). The Psychological Impact of a School Feeding Project', in Donald D, Dawes A and Louw J (eds) Addressing Childhood Diversity (pages 74–93). David Philip: Cape Town.real. Cape Town: Children's Institute, University of Cape Town.

SABER, (2016). School Health and School Feeding. World Bank Group, Education Global Practice Smarter Education Systems for Brighter Futures.

Technical development plan, (2012). Home grown school meals programme. *Republic of Kenya.*

Tomlinson, M. (2007). "School feeding in east and southern Africa: Improving food sovereignty or photo opportunity," *EQUINET Discuss. Pap.*, No. 46.

Wakaya, J. (2018, February 13th).Half a million more Kenyans to face food insecurity in 2018. Capital News

Walingo, M.K., Musamali, B.(2008). Nutrient intake and nutritional status indicators of participant and nonparticipant pupils of a parent-supported school lunch program in Kenya. *Journal of Nutrition Education Behavior*.04; 353-367.

Wasonga, J., Ojeny, B., Oluoch, G., & Okech, B. (2014). Kenya Comprehensive School Health Policy: Lessons from a Pilot Program. *Journal of Public Health in Africa*, *5*(1). https://doi.org/10.4081/jphia.2014.313

WFP, (2004). School feeding programe:Why they should be scaled up now? Tanzania: WFP.

WFP, (2010). Impact Evaluation of WFP School Feeding Programmes in Kenya (1999-2008): A Mixed-Methods Approach, Vol 1; 010/005.

WFP, (2017). The State of Food Security and Nutrition in the World (SOFI) Report

World Food Programme and Government of Kenya, (2013). Market Dynamics and Financial Services in Kenya's Arid Lands.

Large Hive Beetle: A Potential New Pest of Honeybees in Kenya

*Benedict Wambua, Elliud Muli[1] Titus Kanui[2], Benjamin Muli[3]

South Eastern Kenya University, P.O Box 170-90200, Kitui, Kenya

* Corresponding author Email Address: benmwendwa97@yahoo.com

Abstract:

Substantial decline in the abundance and diversity of pollinators have been reported worldwide. Loss of pollinators has serious consequences for both biodiversity and crop productivity. Pollinators are essential or beneficial for the production of many crop species and also important for reproduction of more than 65% of the world's wild plants. The drivers implicated in honeybee colony losses in Europe and North America have been reported in Kenya, including pathogens, parasites and pesticides. The recent declines in honeybee populations and demand for sustainable pollination to ensure food security have resulted in increased awareness of the need to protect honeybee populations especially in Africa. In many areas of the world where it is managed, the honeybee (*Apis mellifera*) has been plagued by diseases, pests and parasites. The presence of Large Hive Beetle (LHB) in Kenya honeybee colonies has raised concern as affecting honeybee colony performance and productivity. On-going research is aimed at determining their seasonal occurrence; effect on colony performance (comb, brood, pollen and nectar area and colony weights); colony productivity and effectiveness of low-tech control strategies such as reduction of hive entrance sizes. This will be the first report of heavy large hive beetle infestation in *Apis mellifera scutellata* in Chawia Taita Hills, Kenya and the potential to affect colony productivity through interaction with other factors such as pathogens, pesticides, varroa mites and nutritional stress.

Key words: Honeybee, performance, colony, Large hive beetle

Background:

Pollinators are essential contributors to global nutrition and food security. An estimated three quarter of major global food crops benefit from pollination (Klein *et al.,* 2007). Fruits, vegetables and nuts, which provide key vitamins, minerals, fats and other micro-nutrients are particularly dependent on pollination (Eilers *et al.*,2011), and thus pollinators form a crucial line of defense against micro-nutrients deficiencies in developing countries. Furthermore, the productivity of many high value crops grown in coffee, and cashew nuts is strongly tied to pollination services (Gallai *et al.,* 2009). Indeed, the amount of animal pollinated crops grown globally has increased significantly in the last fifty years (Roubbik and Harder, 2009), making both developed and developing world countries increasingly depend on pollinator populations for food security and production of economically important crops.

Through pollination of cultivated and wild flowering crops, honeybee *Apis mellifera* L., provide essential ecosystem services (Kremlin *et al.,*2007) that ensure sustained food production, ecosystem stability and opportunities for income generation and habitat conservation for rural poor communities through sale of bee products such as honey, propolis and wax (Sande *et al.,*2009; Raina *et al.,* 2011). The value of

pollination of food production is estimated at €153 Billion globally and €11.9 Billion in Africa (Gallai *et al.,* 2009). These values are based on the services rendered by managed honeybee colonies (responsible for 80-85% of pollination in commercial farm plots), and as a result underestimates the real value of honeybees (Allsopp *et al.,* 2008).

Valuation of honeybee pollination to crop yields reveal: $US 238.9 Billion worldwide (Gallai *et al.,* 2009). Earlier valuation had revealed $US 312 Million in the United Kingdom, 1998, $US 0.78 Billion in Canada, in 1998, $US 14.6 Billion in USA, in the year 2000 and $US 2.4 Billion in Australia. Globally, pollination services amount to £212 Billion, corresponding to 9.5% of the total value of the world agriculture production for human consumption in 2005 (Gallai *et al.,* 2009). Table: (Economic impact of insect pollination of the world agricultural production) Honeybees, *Apis mellifera,* are one of the most important pollinators worldwide, contributing to $14,6 Billion in pollination services to the US in 2000 (Morse and Caldrone, 2000) and $ 3.2 Billion to the South African economy in 1998 (Allsopp, 2004). However, honeybee population has been in decline in North America and Europe over the last 30 years, with beekeepers routinely losing 30% of their managed colonies every winter during the last seven years (vanEngelsdorp and Meixner, 2010).

Recently honeybee populations have been reported to be on decline in most parts of the world (Granberg *et al.,* 2013; Ellis *et al.,* 2010; Potts *et al.,* 2010). The decline has been characterized by sudden loss of worker bees from colonies without sign of dead or diseased bees, despite presence of abundant breeding cells, pollen and honey (Le Conte *et al.,* 2010). The decline has been attributed to interaction of multiple factors (Anderson and East, 2008), including both environmental and human induced (Moritz *et al.,* 2010). Among the factors are pests and diseases, poor nutrition, hive management and incidental pesticides exposure (Vanbergen, 2013; Potts *et al.,* 2010; Johnson *et al.,* 2009).

The known bee parasites and bee diseases include Varroa mites (*Varroa spp),* Tropilaelaps mite (*Tropilaelaps spp),* tracheal mite (*Acarapi woodi)*, and bee louse (*Braula spp). Aspergillus spp,* American foulbrood (*Bacillus larvae*), European foulbrood (*Melissoccocus plutonius*) and protozoan *Nosema spp.* Bee mites play a major role in the spread of bee pathogens exacerbated by human movement of bees for pollination and trade (Sammataro *et al.,* 2000). A number of viruses have been associated with varroa mites (*V. destructor*) at varying degrees. The mite weakens bee's immune system triggering viral multiplication leading to death (Le Conte *et al.*, 2010; Rosenkranz *et al.*, 2010). Varroa mites have also been shown to transmit bee bacteria through feeding bites.

Although presumed free of sudden honeybee losses, pests and diseases associated with Colony Collapse Disorder (CCD) have been reported on the African continent over the last decade (Hussein, 2000; Frazier *et al.,*2010; Kijobe *et al.,* 2010; Strauss *et al.,* 2013), suggesting that a closer examination of possible existence of CCD in Africa is warranted. Despite claims of a decline in honeybee populations on the continent (Neumann &Carreck, 2010; Kluser *et al.,* 2011), these changes appear inconspicuous compared to those in Europe and North America (Neumann & Carreck, 2010). This scenario has been attributed to greater resilience of Africa honeybee towards pests and diseases compared to their European counterparts (Tarpy,2003) and paucity of information through insufficient surveys (Dietemann *et al.,*2009). The observation of colony decimation and death due to Varroa mites and diseases on the Island of Madagascar (OIE, 2010; Rasolofoarivao *et al.,* 2013) points to the probable existence of isolated and undocumented cases of CCD on the continent. More so, the presence of Varroa has been confirmed in many countries in

Africa (Dietemann *et al.,* 2009; Frazier *et al.,* 2010; Rasolofoarivao *et al.,* 2013), clearly suggests that the health status of the continent's main pollination resources is under threat and therefore urgent and extensive health surveys are needed. Furthermore, a recent study on presence of the large hive beetle (LHB) found in various parts of Kenya and their damage on honeybee combs under laboratory observations indicated the need for further study on its long term effect in the performance and productivity of honeybee colonies in the country.

In East Africa, honeybees provide critical pollination services, nutrition and income for small holder farmers and rural families. There is considerable genetic diversity in *Apis mellifera* populations in this region: indeed, five distinct *Apis mellifera* subspecies, each adapted to a specific ecological niche, have been identified in Kenya and in the surrounding region (Meixner *et al.,* 2011; Whitfield *et al.,* 2006). These bee populations are unmanaged: typically beekeepers set out empty receptacles (traditionally, hollowed-out logs) and bee's swarms will occupy them as they migrate into the area (Crane E, 1999; Mbae R. M, 1999). In western Kenya, pollinators provide $US 3.2 Million in ecosystems services to eight crops (beans, cowpeas, butternuts, sunflower, monkey nut, tomatoes, capsicum and passion fruits (Mbae, 1999). Furthermore, the honey collected from these colonies serve as an important source of nutrition and income for families.

Table: Economic impacts of insect pollination of the world agricultural production used directly for human food and listed by the main categories ranked by their rate of vulnerability to pollinator loss.

Crop category	Average value of a production unit	Total production Economic Value(EV)	Insect pollination Economic value(IPE)	Rate of Vulnerability (IPEV/EV)
	€ per MT	10^9€	10^9€	%
Stimulant crops	1225	19	7.0	39.0
Nuts	1269	13	4.2	31.0
Fruits	452	219	50.6	23.1
Edible oil crops	385	240	39.0	16.3
Vegetables	468	418	50.9	12.2
Pulse	515	24	1.0	4.3
Spices	1003	7	0.2	2.7
Cereals	139	312	0.0	0.0
Sugar crops	177	268	0.0	0.0
Roots & tubers	137	98	0.0	0.0
All categories		1618	152.8	9.5

Source: Gallai *et al.,* 2009.

Large hive beetle: Surveys in Kenya have established the main arthropod pests associated with honey bees to be small hive beetles, *Aethina tumida* (Coleoptera: Nitidulidae); *Oplostomus haroldi* and *Oplostomus fuligineus* (Coleoptera: Scarabaeidae) and the ecto-parasitic mite, *Varroa destructor* (Frazier *et al.* 2010; Torto *et al.* 2010). The occurrence, genetic diversity and damage caused by scarab beetles under laboratory conditions in Kenya have been reported (Ayuka *et al.* 2012). Two large hive beetle species, *O. haroldi* and *O. fuligineus* have been found in specific non-overlapping areas; *O. fuligineus* occurred

mainly in the semi-arid eastern areas while *O. haroldi* occurred predominantly within the coastal and highland areas of Kenya (Torto *et al.* 2010; Ayuka *et al.* 2012). Large hive beetle feeding resulted in a characteristic damage pattern consisting of either small (1 – 3 cells) and large (> 5 cells) clusters of damaged cells. Small cells damage was derived from feeding on a fourth or fifth instar larva or pupa across neighbouring cells, while large clusters resulted from either burrowing into single cell containing second or third instar larva or capped pupal cell. Large hive beetles consumed more brood compared to honey and pollen (Ayuka *et al.* 2012). More recently, December 2017, beekeepers have reported an unexpected surge in the number of large hive beetles in honey bee colonies in Taita Hills, a range of coastal highlands in Kenya.

A follow up rapid survey established that colonies where harboring high numbers of large hive beetles. We sampled four apiary sites in Chawia Forest, Taita Hills (GPS coordinates 3.48° S 38.35° E, 0328′38″ S38°21′351° E, Elev.1347 m.a.s.l) and randomly inspected one colony in each apiary site. Large hive beetles numbers were 460; 112; 65 and 72 in each of the colonies inspected in the four apiaries respectively. The two beekeepers owning the apiaries reported to have lost 48 colonies due to absconding presumably caused by the high numbers of beetles. A Sugar roll test established that the colonies did not have detectable varroa mite infestations (zero count).

Beekeepers are managing the beetles by physically removing the beetles during periodical colony inspections and crashing the beetles to death. Collected beetle specimens were confirmed to be *O. haroldi* and *O. fuligineus* by comparing with specimens at the International Center for Insect Physiology and Ecology (Icipe) museum.

On-going research is aimed at determining their seasonal occurrence; effect on colony performance (comb, brood, pollen and nectar area and colony weights); colony productivity and effectiveness of low-tech control strategies such as reduction of hive entrance sizes.

We provide the first report of heavy large hive beetle infestation in *A. m. scutelatta* in Taita Hills, Kenya. Of importance is the potential to affect colony productivity through interaction with other factors such as varroa mites, pesticides, pathogens and nutritional stress.



Figure 1. Honeybee comb (*A. scutellata colony)* with open and capped brood heavily infested with *O. haroldi* and *O. fuligineus* in Chawia, Taita Hills.



Figure 2. Pattern of damage for *Oplostomus species* showing frame section of capped cells

destroyed by infestation of the beetle. The Large Hive Beetles feed on the brood leaving comb partly damaged.



Figure 3. Adult large hive beetle (*Oplostomus fuligineus)* forcing its way to the modified beehive entrance. (Photo: B. Wambua 2018).

References Cited

Allsopp, M. 2004. Cape honeybee (*Apis mellifera capensis* Eshscholtz) and Varroa mite (*Varroa destructor* Anderson & Trueman) threats to honeybee and beekeeping in Africa. International Journal of Tropical Insect Sciences 24:87-94.

Allsopp, M. H., Lange, W. J. D. & Veldtman, R. 2008. Valuing insect pollination services with cost of replacement. PLOS ONE 3; e3128. DOI: 10. 1371 / journal pone.

Anderson, D., East, I. J., 2008. The latest buzz about colony collapse disorder. Science 319; 724-725.

Ayuka T. Fombong, Fiona M. Mumoki, Eliud M. Muli, Daniel K. Masiga, Richard T. Arbogast, Peter E. A. Teal and Baldwyn Torto. 2012. Occurrence, Diversity and pattern of damage of Oplostomus species (Coleoptera:Scarabaeidae) honeybee pests in Kenya. *Apidologie.*

Baldwyn Torto, Ayuka T. Fombong, Daniel M. Mutyambai, Eliud Muli, Richard T. Arbogast, and Peter E. A. Teal. 2010. *Aethina tumida* (Coleoptera: Nitidulidae) and *Oplostomus haroldi* (Coleoptera: (carabaeidae): Occurrence in Kenya, Distribution within Honey Bee Colonies, and Responses to Host Odors. *Ann. Entomol. Soc. Am. 103(3): 389- 396.*

Crane, E. 1999. The world history of beekeeping and honey hunting. Duckworth, London, United Kingdom.

Dietmann, V., Pirk, C. W.W., Crewe, R. M. 2009. Is there a need for conservation of honeybees in Africa? Apidologie 40, 285-295.

Eilers, E. J., Kremen, C., Greenleaf S.S., Garber A. K., Klein A. M. 2011. Contribution of pollinator-Mediated Crops to Nutrients in Humaan Food Supply. Plos One 6.

Ellis, J. D., Pettis, J. S., 2010. Colony losses, managed colony population decline and Colony Collapse Disorder in the United States. Journal of Apicultural research 49(1): 134. DOI: 1. 3895 / IBRA. I.49.30.

Frazier, M., E. Muli., T. Coklin., D. Schmel., B. Torto., J. Frazier., J.H. Tumlinson, and S. Raina. 2010. A scientific note on *Varroa destructor* found in East African: threat or opportunity? Apidologie. (www.apidologie.org and DOI: 10. 1051 / APIDO / 2009073).

Gallai, N., Salles, J.M., Settele, J. & Vaissiere, B. E. 2009. Economic valuation of the vulnerability of world agriculture confronted with pollinator decline. Ecological Economics 68: 810-821.

Granberg, F., Vicent- Rubiano., Rubio- Guerri., C, Karlosson., O. E., Kukielka., D, Belak., S, *et al.*, 2013. Metagenomic detection of viral pathogen in Spanish honeybee: conifection of aphid lethal paralysis, Israel acute paralysis and Lake Sinai viruses. Plos ONE 8:e57459. DOI: 10. 3711 Journal. Pone. 0057 / 459.

Hussein, M.F. (Eds) 2000. Beekeeping in South African. Plant Protection Research Institute, Pretoria, South Africa.

Johnson, R.M., Evans, J. B., Pobinson, G. E., Berenbaum, M.R., 2009. Changes in transcript abundance relating to colony collapse disorder in honeybees (*Apis mellifera)*. Proceeding of National Academic science USA 106: 14790-14795.

Kajobe, R., Marris, G., Budge, G., Laurenson, L., Cardoni, G., *et al.,* 2010. First molecular detection of a viral pathogen in Ugandan honeybees. Journal of Invertebrates Pathology. 104: 153-156.

Klein, A. M., Vaissiere, B. E., Cane, J. H., Steffan-Dewenter, I., Cunningham, S. A., Kremen, C., Tscharntke, T. 2007. Importance of pollinators in changing landscapes for world crops. Proceeding of Review Society of Biological Sciences Services. B 274, 303-313.

Le Conte, Y., Ellis, M., Ritter, W., 2010. Varroa mites and honeybee health: can Varroa explain part of the colony loss? Apidologie, 41:352-363.

Mbae, R. M. 1999. Overview of beekeeping development in Kenya. IN: Raina S. K., Kioko, E. N., Mwanycky, S. W. editor. The conservation and Utilization of Commercial Insects Nairobi: ICIPE Science Press pp. 103-105.

Meixner, M. D., Leta, M. A., Koeniger, N., Fuchs, S. 2011. The honeybees of Ethiopia represent a new subspecies of *Apis mellifera – Apis mellifera simensis* N. SSP. Apidologie 42, 425-437.

Moritz, R. A., Haddad, N., Bataieneh, A., Shalmon, B., Hefetz, A. 2010. Invasion of dwarf honeybee *Apis florae* into the Near East. Biology of Invasion, 12, 1093-1099.

Morse and Calderone, N. W. 2000. The value of honeybees as pollinators of US crops in 2000. Bees Culture 128: 1-15.

Neumann, P. & Carreck, N. L., 2010. Honeybee colony losses. Journal of Apicultural Research 49: 1-6.

Potts, S. G., Roberts, S. P. M., Dean, R. Marris, G. Brown, M. A., Jones, H. R., Neumann, P., Settle, J. 2010. Decline of managed honeybee and beekeepers in Europe. Journal of Apicultural Research 49 (1): 15-22 doi: 103896 / IBRA. 1.49.1.02.

Raina, S. K., Kioko, E., Zethner, O. & Wren, S. 2011. Forest habitat conservation in Africa using commercially important insects, annual Review of Entomology 56:465-485.

Rasolofoarivao, H., Clemencet, J., Ravaomanarivo, L., Razafindrazaka, D., Rey-naud, & Dellatte, H. 2013. Spread and strain determination of *Varroa destructor* (Acari: Varroidae) in Madagascar since its first report in 2010. Experimental and Applied Acarology 60: 521-530.

Rosenkranz, P., Aumeier, P., Ziegelmann, B. 2010. Biology and control of *Varroa destructor*. Journal of Invertebrate Pathology. 103. S120- S131.

Sammataro, D., Gerson, U., Needham G. 2000. Parasitic mites of honeybees: life history, imlpications and impact. Annual Review of Entomologgy. 45: 519-548.

Sande, S. O., Crewe, R. M., Raina, S.K., Nicolson, S.W & Gordon, I. 2009. Proximity to a forest leads to higher honey yield: another reason to conserve Biological Conservation 142:2703-2709.

Strauss, U., Human, H., Gauthier, L., Crewe, R. m., Dietemann, V. & Pirk, C. W.W. 2013. Seasonal prevalence of pathogens and parasites in the savannah honeybee (*Apis mellifera scutellata)*. Journal of Invertebrates Pathology 114: 45- 52.

Tarpy, D. R. 2003. Genetic diversity within honeybee colonies prevents severe infections and promotes colony growth. Proceedings of the Royal Society of London. Series B: Biological Sciences 270: 99-103.

Vanbergen, A. J., Initiative, L. P. 2013. Threats to an ecosystem service: Pressure on pollinators. Front Ecology and Environment. 11. 251-259 doi: 10. 1890 / 20126.

Whitfield, C, W., Behura, S. K., Berlocher, S. H., Clark, A. G., Johnston, J. S., Heppard, W. S., Smith, D. R., Suarez, A. V., Weaver, D. & Tsutsi, N. D. 2006. Thrice out of Africa: ancient and recent expansions of honeybee, *Apis mellifera.* Science 314: 642-645.

Human and Physical Variables in The Adoption of Cash Crop Farming in Gem Sub County, Siaya County, Kenya

By

Daniel Oduor Onyango,

Department of Education Foundations, St. Augustine University. Po Box 307, Mwanza, Tanzania. Email. d.juma@yahoo.com

Abstract

Poverty level in Gem sub-county is high yet the area has a high agricultural potential. However, there is low engagement in cash crop farming especially, growing of sugarcane. Involvement in sugarcane farming would assure the farmers of extra income from the sale of the crop. This would empower them economically, reduce poverty rates, spur industrialization and provide employment. Hence there is need to establish why a large number of farmers are not engaging in sugarcane farming in Gem-sub County. The objectives of the study were to: establish whether operations costs, marketing costs, land fragmentation and rainfall variability have influenced adoption of sugarcane as a cash crop. The study was conducted using descriptive survey design. It employed both quantitative and qualitative methods. A Conceptual Framework guided the study. The questionnaire was administered to 300 heads of households. Six Agricultural Extension workers were interviewed. Stratified Random Sampling was used to select the sample from the population. The unit of analysis was the farmers. Descriptive statistics was used to analyze the data. The study established that operations costs, marketing, land fragmentation and rainfall variability contributed to decline in sugarcane farming in Gem Sub County, Siaya County.

Key terms: Smallholder agriculture, sugarcane farming, land fragmentation and agriculture, climate change, operations costs.

Introduction

Participation of households in cash crop farming is very important to a developing country like Kenya. Smallholder cash crop farming can be used as means of developing the rural areas and as means of improving livelihoods. Majority of Kenya's population, 70% still live in the rural areas. Majority of this population depends on agriculture as a source of food and a source of income. According to Musambayi (2013), smallholder agriculture can contribute immensely to agricultural production of a country if it is well supported. This is possible if the smallholder farmers are assisted to overcome many obstacles in their way in cash crop farming. Musambayi further indicates that smallholder cash crop farming has the advantage of creating employment and reducing poverty.

Yayne and Muyanga (2012) Observes that there is poor investment in agriculture in some areas by farmers due to lack of physical infrastructure such as roads, electricity, irrigation, water, schools and health facilities. They also observe that in areas where land is under customary land tenure the households are facing emerging land constraints resulting from increased population growth since independence.

Literature Review

Kamruzzaman and Hassanuzzaman (2007) observe that profitability of cash crops grown by small holders such as sugarcane is decreasing because of poor utilisation of scientific knowledge. They also observe that many farmers were opting out of cash crop farming due to financial constraints and bureaucracy.

Despite its huge benefits to the economy of countries where it is grown such as Brazil, India Nigeria and Kenya, farmers who grow sugarcane face a lot of problems such as poor yields, diseases poor prices and shrinking land (Giro and Girei, 2010). According to Rice (2011), sugarcane farmers in U.S.A are giving up sugarcane farming due to erosion for money they are paid by sugar companies. Babatunde, Omotesho & Sholatah (2007) indicates that sugarcane farmers in Nigeria whose farms are irrigated often complain of not receiving adequate water and other inputs such as fertilizers, which are necessary in sugarcane farming.

Chandakar (2012) explains that in 2005 sugar cane contracted farmers in Western Maharashtra, India, boycotted supplying the sugar companies with raw cane due to poor payments. The sugar mills had to increase their prices by 25% before farmers accepted to resume supplying the companies with sugarcane.

Kweyu (2013) conducted a study in Mumias Sugar Belt, he observed that the contracted sugarcane farmers were giving up sugar cane farming due to delayed payments, needed more land to grow food crops, low payments they were getting for their sugarcane and delayed payments by Mumias Sugar Company, the major sugar miller in Kenya. He found out that the contracted farmers were reducing cane acreage by 5% every year.

Statement of the Problem

Smallholder farmers' participation in cash crop farming is important towards rural development, poverty alleviation and enhancing food security in Kenya. Smallholder engagement in sugarcane farming can contribute towards improving livelihoods in rural communities. To enable small holders' farmers to take up sugarcane farming, obstacles which cash crop farmers face should be addressed. There is conspicuous absence of literature on influence of geographical variables such as: operations cost, marketing cost, land fragmentation and rainfall variability on adoption of sugarcane as a cash crop in Gem Sub County hence this study. Hence, there was an urgent need to conduct this study.

The objectives of the study were to:

Find out whether operations costs have influenced adoption of sugarcane as a cash crop in Gem sub county Investigate whether marketing costs affect the adoption of sugarcane as a cash crop in Gem Sub County Establish whether land fragmentation has influenced adoption of sugarcane as a cash crop in Gem Sub County Determine whether rainfall variability has had an impact on adoption of sugarcane as a cash crop in Gem Sub County

Research Design and Methodology

The study was conducted in Kenya, Gem Sub County, and Siaya County. The main economic activity practiced in the area is subsistence farming. Subsistence farmers grow crops such as; maize, beans, cassava and millet. The main urban centres are Yala, Wagai and Nyangweso. The following communities; Luo, and Luhya inhabit Gem Sub County.

Research Design

Johnson and Onwuegbuze (2004), explains that the Mixed Methods Approach is the third strategy in Social Science Research. It is an approach to research where the researcher combines qualitative and quantitative methods. It draws strengths from qualitative and quantitative method and minimizes weaknesses of both in the study. The mixed methods approach bridges the gap between quantitative and qualitative studies. Many practitioners in geography research are of the view that research in geography has become complex, inter-disciplinary, and dynamic and there is need to compliment the methods (Allsop, et al. 2010). The mixed method approach has the advantages of allowing the researcher to integrate the two designs in the development of instruments and data analysis. This eliminates unnecessary repetitions.

The design of the study was descriptive survey, which allowed large amounts of data to be collected over a short period. It also provided for numeric descriptions of the population. It also enabled the researcher to describe and explain relationships between dependent and independent variables. The researcher used it because it assisted the researcher to discover whether operation costs, marketing costs, land fragmentation and rainfall variability have contributed to adoption of sugarcane as cash crop in Gem Sub County, Siaya County (Johnson & Onwuegbuze, 2004).

The target population was heads of households engaged in farming and Agricultural extension officers in Gem Sub County. Unit of analysis in this study was farmers. Heads of households were selected as respondents because in the Luo and Luhya communities they are the heads of the family and are the ones mandated to provide required information about the household to any visitor such as the researcher.

Sampling Technique

The sampling techniques selected for the study was stratified and purposive sampling. These sampling techniques were used to select the heads of households from the target population. The samples were used in this study because of the issues of cost and need for speed in data collection (Oso & Onen, 2008).

The households in Gem Location were grouped into locations using the existing administrative locations/wards in the Sub County. This was done to ensure equitable and proportionate representation of the population in the sample. It was also used to allocate a sample of heads of households to each location in the Sub County ((Viser & Jones, 2010).

Thereafter purposive sampling technique was used to draw samples from each location. Table 1 shows how the samples as be allocated among the different locations.

Table 1: Sampling Frame of the Study

Location	Households		Extension Workers	
	No	Sample	No	Sample
Gem West	2875	43	1	1
Yala	2894	45	1	1
Gem North	4375	66	1	1
Gem Central	982	47	1	1
Gem North East	2500	40	1	1
Gem South	3802	59	1	1
TOTAL	17428	300	6	6

Source: Census Report 2009

The sample for the study as shown on table 1 was drawn using Krajcie and Morgan (1970).

Development of instruments

The study used a single household questionnaire and interview schedule as the tools for data collection. The instruments were self-made. The instruments were selected because the researcher required detailed

information, which would necessitate the use of multiple instruments to collect data in order to find answers to research questions.

Data Analysis Procedures

The following section presents information on data analysis procedures especially how qualitative and quantitative data analysis was carried out.

Mixed Methods Research

The Mixed Methods Approach was used in data analysis; the researcher combined both qualitative and quantitative approaches in the analysis of data. This improved the accuracy and validity of the research findings (Johnson & Onwugubuzie, 2004).

Findings

Operations costs

The study investigated whether operations costs influenced adoption of sugarcane as a cash crop.

	Variable	Mean	Std deviation
1	Acquisition of inputs	4.18	.490
2	Cost of hiring labour is high	4.18	.626
3	Cost of hiring tractors is high	4.15	.584
	Overall Mean	4.17	.567

Table 2

As shown on table 2, the heads of households rated the variable, acquisition of inputs highly. (Mean= 4.18, SD=.490). Secondly the table 2 shows that the second variable in the sub scale (Operations costs), cost of hiring labour was also rated highly by most of the farmers (Mean= 4.18, SD=.626). Further table 2 indicates that the variable, high cost of hiring tractors was also rated highly by most of the respondents (Mean= 4.15, SD=.584).

The high rating of the variable: acquisition of inputs (4.18) shows that farmers are facing the problem of lack of inputs which are necessary in the production of sugarcane. Agricultural inputs are very important

in the production of sugarcane and without this inputs they may not do much. The standard deviation of .490 which is below one show that the scores were not far spread from the mean, this could be interpreted to mean that most of the farmers were in agreement about the influence of inputs such as fertilizers on sugarcane farming. This is an opinion, which could suggest that the farmers perceive acquisition of inputs as a problem in sugarcane farming. Similarly the high rating of the variable acquisition of inputs, labour, hiring farm machinery by most of the heads of household shows that the heads of households perceived operations costs as impediments to adoption of sugarcane as a cash crop in the region.

Most of the field extension officers interviewed identified lack of inputs by farmers as major problem facing farming in general in the region. They blamed this problem on inability of households to raise sufficient funds for farm operations such buying fertilizers and other inputs. They argued that unless the farmers in the region are assisted to acquire this inputs at a subsidized rate or free, it would be difficult for the them to adopt any cash crop farming let alone sugarcane.

The findings in table 2 in this study agrees with observations made by Herbs and Columba (2010) who indicated that many contracted sugarcane farmers have given up sugarcane farming due to problems with supply of fertilizers and funds to procure herbicides.

Marketing Costs

The study also sought to investigate whether marketing costs influenced adoption of sugarcane as a cash crop. The results were as presented in Table 3

Table 3: Marketing Costs

	Variable	Mean	Std deviation
1	Local roads linking jaggeries/mills are impassable during rainy season.	4.21	.640
2	Local roads are narrow	3.75	1.271
3	Connection between local roads and main roads is poor due to lack of bridge culvert	3.73	1.081
4	Transport charges for lorries are high	4.31	.499
5	Farmers are paid late	4.16	.809
6	Delivery of sugarcane is never paid	4.36	.483
7	Sugarcane payments are	4.27	.642
8	Jaggeries are far from farms	3.87	1.166
	Overall mean	3.97	.823

Table 3 shows that the variables in the marketing sub scale were rated as follows : local roads(mean= 4.21, SD=.640), local narrow roads (mean=3.75, SD=1.271) and connection between local and main roads was rated (mean=3.73, SD=1.081), high transport charges (mean=4.31, SD=.499), late payments (mean=4.16, SD=.809). Lack of payments for sugar deliveries (mean=4.36, SD=.483), payments made are low (mean=4.27, SD= .642), and distance from farms to jaggeries/mills (mean=3.87, SD=1.166)

The result from table 3 further indicates that the eight variables had high and very high mean ratings. The highest rated variable was delivery of sugarcane is unpaid (mean=4.36). It was followed by transport charges (mean=4.31). The third highly rated variable, prices paid are low (mean=4.27). The fourth highly rated variable, linkage between local roads and main roads (mean=4.21). Late payment was rated fifth at (mean=4.16). Three variables: local roads are narrow (mean=3.75), Connection between local roads and main roads, mean=3.73), Distance from farmers homes to jaggeries was rated (mean=3.87). These ratings were high. Table 4.7 further shows that no variable was rated low.

Similarly table 3 indicates that lowest standard deviations were observed in the following variables; high transport charges (SD=.499), delivery of sugarcane is never paid (SD=.483) and prices paid for sugarcane are low (.642).

It can also be observed from table 3 that the highest standard deviation was observed in the following variables: local roads are narrow (1.271), jaggeries are far from farms (1.166) and connection between local roads and main roads (1.081). The overall mean standard deviation was (Mean=.823). This was a high mean.

Very high mean ratings of variables related to payment such as late payment for deliveries, deliveries are never paid and low payment, suggests that farmers could be experiencing a problem where they are not sure of being paid for what they have supplied to the jaggery/mills. In a case where a farmer has an incurred the cost of producing a product and has sold the product to the market and no payments are forthcoming this hurts the farmer. Delayed payments after the crop has been in the field for 16-24 months makes the situation very difficult for the farmers

The low standard deviations in most of the variables suggests that majority of farmers suffers from the problems of; non-payment after the delivery of sugarcane, low payments by millers and juggeries and high transport costs. The ratings were very close to the mean. This could suggest that the scores were almost normal. This could also suggest that the heads of household perceived the variables related to payment as major predictors of adoption of sugarcane as a cash crop in Gem Sub County. The overall mean (4.17) and standard deviation (.567) further attest to above suggestion.

It is difficult for the farmer to meet his/her basic needs if he/she is not getting payments after the sale of a crop. This particular farmer may not have capital to reinvest in the venture again. The farmer can also be discouraged from engaging again in the farming completely. The same scenario is experienced if the

farmer is paid late or the payments are low. It makes it difficult for the farmer to reinvest in the venture. It leads to a farmer abandoning the activity all-together even after the first or the second crops. High rating of the variables, transport costs suggests that charges by the jaggery/mills or private transport providers can have an impact on sugarcane farming in the area. This could imply that the transport service providers charge a lot of money for transporting sugarcane to the jaggeries/mills. High transport costs could leave farmers with low profit margin to reinvest in sugarcane farming.

Variables related to road network were also rated highly in the marketing subscale. This could suggest that the condition of roads in the area could be poor. Poor condition of roads could lead to high transport costs. In an area where roads are very poor, transport providers are likely to hike their rates leading to many farms not able to meet this expense. In a long run, it will discourage the farmers from engaging in cash crop farming, which will require them to bearing this kind of expense. The situation can be made better for the farmers if both national and county governments regularly maintain roads.

Lack of bridges/culverts to link various areas can lead to distances between a market and a producer longer. This makes the transport providers to charge more money per unit of the goods being transported. The cost would be less if the distance between the source of sugarcane and market is shorter. This would be possible, if areas are connected with bridges and culverts.

The high rating of the variable, narrow roads could also suggest that the roads in the region are narrow this makes it difficult for machinery which is used in land preparation, transportation of inputs, such as fertilizers and transportation of harvested sugarcane difficult. This is because the roads/paths cannot allow a vehicle to access the farms. This could lead to the use of additional human labour to move the sugarcane from the farm to the nearest point where the tractors or Lorries can stop. This would cost additional money, which the farmer may not be able to afford.

High rating of the variable, low payments also shows that the amount of money paid by the Jaggeries could be so low to a point where farmers cannot break even. In long run since farming is a sort of business the farmers would not get enough money to re invest in farming. This makes them to abandon cash crop farming altogether. If the returns are high, it makes the farmers to re invest the income from the previous harvest in a new crop.

The findings as observed from table 3 agree with the observations made about impassable roads by Waitathu (2015) who indicated that farmers in Baringo County have urged Baringo County Government to improve roads so as to reduce the escalating cost of doing livestock business. These comments were made after the farmers complained about the high transportation cost they incur when transporting the livestock to the markets within and outside the district. Transportation system is the artery of agricultural development. Areas with good transport network such as all weather roads; it is easier for the farmers to move their farm produce to markets. Transporters will not charge a lot of money for their service in areas where the road network is superb.

The finding about the distance between farms and mills agrees with observations made by Gettis et al. (2008) who indicates that availability of cheap transport systems in high economic areas lowers cost of transporting goods. This allows farmers to break even. He suggested that industries should be located where transportation of materials to the market is low. Kenyatta (1967) further observed that to make sugarcane farming economical in Nyanza, there was need to put up modern roads in Miwani, Chemelil and Muhoroni sugar belt.

The observations about low and late payments for sugar delivery agree with the observations made by Leong and Morgan (1982), they observe that the government should protect farmers so that they can get good prices for their products. Similarly Kibor and Gitonga (2014) observed that farmers need to be helped by the Elgeyo Marakwet County Government to get good prices for their produce most of the time, farmers sell their products at a throw away price to middlemen.

Land Fragmentation

The study investigated whether Land Fragmentation influenced adoption of sugarcane as a cash crop. The results were as presented in Table 4

Table 4: Land Fragmentation

	Variable	Mean	Std deviation
1	Parcel of land not adequate for cash crop farming and homestead.	3.52	1.295
2	Distances between land parcels are huge.	3.16	1.452
3	Land parcels are inaccessible	3.04	1.512
4	Machines such as tractors cannot be used in small pieces of land.	3.09	1.485
5	Small pieces of land are not economical	3.40	1.371
	Overall mean	3.40	1.423

Results from table 4 reveals that the variable parcel of land not adequate, was rated (mean=3.52, SD=1.295,) while the variable distances between land parcels, was rated (mean=3.16, SD=1.452). The variable, land parcels are inaccessible was rated (mean=3.04, SD=1.512) while the variable machines such as tractors cannot be used was rated (mean=3.09, SD=1.485). Finally, variable, small pieces of land are uneconomical was rated (mean=3.40, SD=1.371). The overall mean was 3.40 and mean standard deviation was 1.423.

Table 4 indicates that it is only one variable whose mean was rated high, parcel of land not adequate (mean=3.52, S.D=1.295. The rest of the variables were rated average. The table 4 also shows that the standard deviations were high. This shows that opinions of the respondents on different variables in this particular sub-scale were divergent and widely scattered. This suggests that some households could only

be having a single parcel of land and therefore they rated the variable distances between the parcels low, others could be having more than one parcel and rated the same variable high. This could be the cause of the high standard deviation (SD=1.452). The same scenario could have been experienced in the variable, land parcels are inaccessible. This variable was applicable to farmers who had more than one parcel of land. They were to indicate whether these parcels are accessible or inaccessible, the (Mean=3.09) is an indicator that the rating was average; this could also suggest that there were divergent views about this particular variable.

It could also suggest that in some part of the population, it would be difficult to access some of the parcel of land from a neighbors' land if one has to use machinery in land preparation e.g. tractors, if the farmer is not in good terms with the neighbor then it may not work. The head of households also rated the variable, small pieces of land are not economical averagely (mean=3.40). This indicates that they did not get much yield from their small parcel of land in which they had planted sugarcane. It suggests that the small parcels of land were not productive.

These findings show that there are areas within the region where population growth is very high and land subdivision has been extensive leading to small, near uneconomical land pieces. It also suggests that there could also be areas where there is still huge chunks of land where farmers could still put huge chunks of land under cash crop farming. Many parts of western Kenya have experienced high population growth rate. The cultural norms require the head of household to distribute his land among his children. This has decreased land available for cash crop farming. Much of the land is set aside for homesteads and food crop farming (Kweyu, 2013; 2013; Smokin, 2010). Kodowo (2012) suggests that land consolidation should be pursued aggressively in Siaya County. This would provide adequate land for cash crop farming.

These findings show the ways in which land fragmentation has influenced the adoption of sugarcane as a cash crop. This is through inadequate land and subdivided parcels of land, which are not economical. Inaccessibility of some parcels of land due to physical features such as rivers, hills and hostile neighbors' are also variables, which could have affected adoption of sugarcane as a cash crop.

Rainfall Variability

The study investigated whether rainfall variability influenced adoption of sugarcane as a cash crop. The results were as presented in Table 5 below. The respondents rated the variables as indicated below. The variable, dry season has been prolonged was rated (mean=4.19, SD=9.41), the beginning and the variable, end of the short rains were unpredictable was rated (mean=4.27, SD=.539), while mean and standard deviation of the variable, unusual strong winds was rated (mean=4.27, SD=.617). The rating for the remaining two variables were, the beginning and the end of long rains unpredictable (mean=4.15, SD=.821). and unusual changes in temperature during the rainy season was (mean=4.22, SD=.623). The overall mean and the standard deviation of rainfall variability sub-scales was (mean=4.22, SD=.586).

Table 5: Rainfall Variability

	Variable	Mean	Std deviation
1	The dry season is prolonged	4.19	.941
2	The beginning and end of the short rains are unpredictable	4.27	.539
3	The unusual strong winds during the rainy season destroy mature crops	4.27	.617
4	The beginning and end of the long rains is unpredictable	4.15	.821
5	There are unusual changes in temperature during rainy season	4.22	.623
	Overall mean	4.22	.586

The results on table 5 shows that the highly rated variable was, the unpredictability of the onset and end of the strong rains and unusual strong winds destroys the crops (mean= 4.27). Secondly table 5 reveals that three variables were highly rated by the respondents with the means of above 4.2. The other two variables, dry season is prolonged (mean = 4.19) and the beginning –and the end of long rains is unpredictable, were highly rated but with means below 4.20. The standard deviation of all the five variables was below 1.0. This is an indication that views of the respondents were not divergent on the issue under investigation. The highest standard deviation was observed in the variable, dry season is prolonged (SD=0.941), followed by the variable, beginning and the end of long rain are unpredictable (mean=.821)

These findings reveal that the heads of the households were in agreement that the variables in the rainfall variability scale have affected the adoption of sugarcane as a cash crop in Gem Sub-County. The findings further suggest that the respondents quite understand the phenomena of climate change and they can show how it had affected adoption sugarcane farming. This is evident from high mean ratings (4.00 and above and a standard deviation below 1.0).

The findings in this study shows how global climate changes can interfere with geographical conditions, which favor production of sugar. Sugarcane in its growth cycle requires high temperature, which should be in the range of between 21° to 27°, this allows for high sucrose accumulation. However, if the temperatures are raised or lowered abruptly the crop is affected. Sugarcane also requires a dry season to allow harvesting. Prolonged dry season contributes to withering of the crops, which affects its tonnage. Rainfall beyond the recommended annual amount of 1200mm-1500mm can also lead to destruction as it leads to poor agronomic practices such as cultivating and harvesting. It can also contribute to situations of water logging which interferes with sugar plant growth. It can also lead to pests and diseases such as leaf spot, smut, white crabs and pests. This can easily attack the crop leading to low yields.

Conclusions

Basing on the findings, the study concluded that operation costs such as; acquisition of inputs such as fertilizers, labour costs, cost of land preparation hinders farmers from fully participating in sugarcane farming. Marketing costs such as: poor condition of roads, narrow roads, and poor connection between local and main roads has contributed to low farmers inputting land fragmentation under sugarcane in Gem Sub-County. This is because transport providers/jaggery owners are forced to charge highly for transporting the cane to the jiggery due to poor road network. Land fragmemtation has also contributed to inadequate land which can be put under cash crop farming. Rainfall variability in form of unpredictable rainfall distribution has contributed to low adoption of sugarcane as a cash drop in Gem sub-county, Siaya County. The farmers perceive the rainfall patterns to be unclear. This could have affected activities within sugarcane crop cycle e.g. planting, weeding and harvesting.

Recommendations

It was recommended that farmers in Gem sub-county, Siaya County should be assisted to acquire inputs such as fertilizers, herbicides so as to put more land under sugarcane crop. The road network in Gem sub-county needs to be improved to allow smallholder farmers to easily transport the produce to the markets and to lower the cost of transportation. Roads should be widened enough to allow access to farms by the tractors/lorries. Subdivision of ancestral land according to culture should be discouraged. The subdivided land becomes uneconomical for cash crop farming such as sugarcane. Furthermore, some subdivided parcels of land cannot be accessed. There is need to introduce rainfall adaptation strategies in Gem sub-county to help farmers to make adjustments. This will enhance resilience instead of farmers decreasing land under cash crops (sugarcane).

REFERENCES

Allsop, D., Allen, H., Clare, H., Cook, I., Raxter., Upton, C. and Williams, A. (2010). Ethnography and Participant Observation. In, Research Methods in geography: A critical Introduction. Eds. Gomez, B. & Jones, J. P. Blackwell: Sussex.

Babatunde, R.O, Omotesho, O. A. & Sholatan, O.S. (2007). Socio_ economic and food security of farming households in Kwara State, Nigeria. Retrieved from www.iosrjournals.org, on 15th April 2015.

Chandavakar, R. (2012). Sugar mills to raise sugarcane price by almost 25% signals losing influenceof Sharad pawar, Retrieved from www.articles.economictimes on 11th march, 2015.

Getis, A. Getis, J. & Felimann, J. (2008). *Introduction to Geography.* Boston: Mc Graw Hill.

Girei, A. A. & Giroh, D. Y. (2012). Analysis of the Factors Affecting Sugarcane Production under the Out growers Scheme in Numan local government area Adamawa State, Nigeria. *Journal of Science Education*. 2(5), 158-164.

Harb, J. C. and Columba, C.H. (2010). Financial and Economic Feasibility of Sugarcane Production in Northern Lapaz. Retrieved from http; //Wikipedia.Org. Retrieved on 13/3/15.

Johnson, R. B. & Onwuegbuzie, A. J. (2004). Mixed Methods Research: A Research Paradigm whose time has come. *Educational Researcher*, 33(7). 14-26. Retrieved from www.edr.sagepub.com on 14th October, 2014.

Kamruzzaman, M. & Hassanuzzaman, M. (2007). Factors Affecting Profitability of Sugarcane Production As Monoculture And As Intercrop In Selected Areas of Bangladesh. *Bangladesh Journal of Agriculture Research,* 32(3),67-79.

Kelinger, T. N. (1983). *Foundations of Behavioral Research (5th ed.).* London: Pitman.

Kenyatta, J. (1967). *Suffering Without Bitterness*. Nairobi: East African Publishing.

Kodiwo, M. (2012). Social Economic Factors Influencing Agricultural Land use Intensity in Siaya *District,* Kenya. Retrieved from http;//library.ku.ack. Retrieved on April 15, 2015.

Krajcie, R. V. Morgan, D.W. (1970). Determining sample size for Research activities. Educational and psychological measurement. Retrieved from www.kenpro.org on 10th March, 2015.

Kweyu, W. W. (2013). Factors Influencing Withdrawal of Farmers from Sugarcane Farming, a case of Mumias District, Kakamega County. Unpublished Thesis University of Nairobi.

Leong, G. C. & Morgan, G. (1982). *Human and Economic Geography*. Oxford: Oxford.

Musambayi, N. J (2013). *The Impact of Land Fragmentation, Segmentation and Production and Food Security.* Elixir Agriculture 56(2013) 13493-13495.

Onen, D. & Oso, W. Y. (2005). *Writing Research Proposal*. Kisumu: Options.

Rice, R. W. (2011). Sugarcane plant Diagnosis. Retrieved from. www. edis.ifes.ufl.edu. on 10th October, 2014

Smokin, W. (2010). *Essays on Land Law* Nairobi; University of Nairobi.

Viser, S., & Jones, J.P. (2010). Descriptive Statistics. In, *Research Methods in geography: A Critical Introduction.* Eds. Gomez, B. & Jones, J. P. Blackwell: Sussex.

Waswa, F. (2012). Enhancing Household Food and Income Security through Crop Diversification in the Nzoia and Mumias Sugar Belts in Kenya.

Determinants of Participation of Young Farmers with And Without Disability in Capacity-Building Programs Designed for The Public in Uganda

David Agole, Ph.D. (Corresponding Author) agoledavid@yahoo.com Tel: +256776555119

William Faustine Epeju, Ph.D. wepju@yahoo.co.uk Tel: +256774160118

Department of Agriculture, Kyambogo University P.O Box 1 Kyambogo-Uganda

Abstract

Participation of young farmers with disabilities in agricultural capacity-building programs in their communities is important as poverty reduction strategy in people with disabilities in Uganda. This research study comparatively examined participation of young farmers with and without disabilities in capacity-building programs designed for the public in Northern and Eastern Uganda. The study employed a comparative, mixed methodology, cross-sectional research designs involving 774 young farmers composed of 388 with disabilities and 386 who had no disabilities. The sample selection strategies involved the use of a stratified, and random sampling techniques. This research utilized an interviewer-administered paper survey in collecting data. Descriptive statistics and regression analyses were used in analysing quantitative data. The findings indicate that young farmers with a disability and being contacted face-to-face were less likely to participate in community capacity-building programs. In contrast, Northern Uganda, those contacted in a group setting, application of sign language interpretation, being female, and having supportive training staff increased the chances of their participation in community capacity-building programs.

KEY WORDS: Agriculture, capacity-building programs, disability, participation, youth with and without disability.

Introduction

Participation refers to the process of attendance and active involvement of people in situations and decisions that affect themselves and their community (Checkoway & Gutierrez, 2008). In this study, participation refers to shared influence and the responsibility of participants to become actively involved in program activities such as decision making and feeling of belonging to those programs and communities (Head, 2008; Wagner III, 1994). Thus, participation entails informing, consultation, involvement, collaboration, and empowerment of the target participants so as to build their capacity for improved well-being (Wagner III, 1994).

In addition, participation takes three dimensions: as contribution, as organization, and as empowerment. Participation as contribution refers to participation of community members through labor, cash, and land, among others. Participation as organization refers to creation of appropriate structures to facilitate participation by targeted people. While participation as empowering refers to involving marginalized and underserved groups and communities to develop power and influence to make decisions and have control over programs meant to benefit them (World Health Organization, 1991). Critical, therefore, to the definition of participation is that it targets vulnerable, underserved, and excluded people to build their capacity to make decisions and have control over all programs intended to benefit them.

Participation takes a number of forms including: informing people with balanced and objective information, consulting people and providing feedback, involving and working directly with communities, collaborating and partnering with groups or communities in decision making, and empowering and ensuring that the participants retain control over decisions that affect them (World Health Organization, 2008). It is, therefore, important create spaces that enable and encourage participation by vulnerable and excluded groups such as people with disabilities. However, a critical gap exists in factors that influence participation by people with disabilities in capacity-building programs in communities.

Topology of Participation

Participation involves eight levels: 1) manipulation, 2) therapy, 3) informing, 4) consultation, 5) placation, 6) partnership, 7) delegated power, and 8) citizen control (Sherry, 1969). While the presence of eight levels seems oversimplified, they help to illustrate something that is often omitted by development programmers to the disadvantage of targeted program participants (Sherry, 1969).

Unfortunately, community power holders tend to disadvantage poorly resourced people. Most often, development practitioners misconstrue manipulation as if people have been involved in planning, yet the resource-poor have not been engaged/have not participated in either planning or decision-making (Sherry, 1969). Information and consultation allow the targeted poor to hear and to have a voice in program planning and decision-making. Participation by vulnerable and excluded groups from capacity-building programs in communities tends to be facilitated by less stratified communities, a supportive environment, and conducive policy framework (Anaby, Hand, Bradley, DiRezze, Forhan, DiGiacomo, Law, 2013; World Health Organization, 1991).

As with all people, when people with disabilities participate in capacity-building program activities, they develop skills, competencies, and social networks (Deutsche Gesellschaft fur Technische Zusammenarbeit [GTZ] 2005; World Health Organization, 2008). In addition, people with disabilities achieve mental and physical health, and develop a feeling of belonging to the community, and meaning and purpose in life. Meaningful, active, and rewarding community participation is the main goal of capacity-building programs. Participation is important to the well-being of people with disabilities (World Health Organization, 2008). People with disabilities are not meaningfully included in community development activities due to the demands required to be effective in making fundamental changes in organizational policies, and capacity building of personnel, among others. In 2005, a report of a meeting between USAID, the National Union of Persons with Disabilities in Uganda (NUDIPU), the Kampala Disabled Persons Business Association, and Action on Disability and Development (ADD) showed that organizations for the

disabled had difficulty accessing funding because their program interests did not align with the donor community's priorities (Albert, Dube, & Riis-Hansen, 2005).

In the above scenario, these organizations were not funded because the funding interests of USAID were perceived to be different from those of people with disabilities. The question is this: how many other organizations for people with disabilities in the world may have and may be continuing to experience such funding dilemmas? Failure to obtain funding or support constrains people with disabilities from pursuing their interests and needs. Capacity building for the disabled requires hands-on learning and observation of innovative agricultural practices in the case of farmers/farm workers. Access to these resources can promote skill development in problem solving through participatory learning and group activities designed to empower farmers as well as to promote social cohesion through increased cooperation (Phillips et al., 2014).

A few organizations are involved in and have championed research and capacity building for people with disabilities and their support organizations in developing countries. The best example, so far, is the United Kingdom's Department for International Development (DFID) as the first agency to issue a paper on the status of people with disabilities, and the United States Agency for International Development (USAID), which has continuously mainstreamed disability issues in programs and organizations and supported those agencies. Such mainstream activities that address the plight of people with disabilities include opportunities to support more-focused activities, direct support of organizations for the disabled, and support of all initiatives aimed at building capacity people with disabilities. The reason for this support is that people with disabilities lack human development and capacity building opportunities, such as educational and vocational training opportunities (DFID, 2000; Siddiqua et al., 2012). People with disabilities must be involved in all aspects of capacity-building programs such as planning, advocacy of training programs, and delivery of the capacity-building programs at individual, group and systemic levels. Lewis (2010) added that capacity-building programs could elicit successful outcomes when people with disabilities constitute part of the consultative and delivery process as agents for socioeconomic change.

In developed countries, however, policy makers promote and subsidize adaptive capacity-building courses for people with disabilities to cover their educational deficits and skill inadequacies (Pagan-Rodriguez, 2015). Disability is both a cause and a consequence of poverty and eliminating world poverty is unlikely unless the rights and needs of people with disabilities are considered in development programs (Yeo, 2005).

In practice, community development programs are meant to address equity criteria by targeting people with disabilities among others. Unfortunately, however, community programs tend to prioritize effectiveness criteria to maximize the impact of the program as opposed to equity criteria, which is all-inclusive. The effectiveness criteria mostly address participation of more resourced, educated and socially networked individuals. Most programs, however, tend to adequately meet effectiveness criteria as opposed to equity inclusion. This stems from either conflicting target criteria or participant-selection mechanisms that favor the elite or capture the need for a minimum level of social and economic capital (Vornholt et al., 2013). The poor tend to benefit more when they participate directly in programs than when those programs are only knowledge-based (Phillips et al., 2014).

Capacity building for people with disabilities in relevant areas also serves to increase their knowledge and skills through informal learning, learning by doing, and lifelong learning while building the capacity of organizations supporting people with disabilities (Wolbring et al., 2013). A study carried out in Zimbabwe pointed to the exclusion of people with disabilities from access to community entrepreneurial programs, despite the fact that those with disabilities were aware of the program's existence in the community (Mpofu & Shumba, 2013). People with disabilities have lower expectations because they are more disadvantaged in the labor market (Pan-Rodriguez, 2015). The presence of a disability has been found to contribute to lower job satisfaction. Sometimes further participation by people with disabilities capacity-building programs does not translate into increased rewards because of the already existing stigma employers and other workers portray against people with disabilities

Even when people with disabilities supposedly participate in capacity building through community development programs, their attendance or non-attendance, or dropout rate is influenced by factors such as accessibility and relevance of the program to their needs (Phillips et al., 2014; Vornholt et al., 2013). Ineffective program implementation or economic constraints, and perceived returns and opportunity costs of attendance also influence the participation of people with disabilities in community capacity-building programs. However, sometimes participants drop out due to a failure to achieve individually anticipated expectations such as loans, cash or payment in kind for their attendance (Phillips et al., 2014). Participant expectations tend to be guided by those occasions in which development programs with incentives attract participation or require inputs for individuals to implement the program. Therefore, the absence of payment or incentives elicits a negative reaction that discourages participation. In addition, if participants feel that the program is going to encroach on their time for other socio-economic activities and the distance to attend the program is long, they are most likely to drop out or irregularly attend (Phillips et al., 2014).

Many challenges characterize Uganda's extension service delivery. There is very high farmer to extension educator 3000 to one ratio, hard to reach remote and rural communities with poor communication, poorly facilitated extension educators with very low morale, thus most young farmers remain unreached by agricultural extension services (Barungi, Guloba, & Adong, 2016). Barungi et al. add that since 1960, Uganda's extension system has experienced several reforms, whose effect further alienated vulnerable and underserved groups of farmers such as those with disabilities. The ultimate blow on the Uganda's extension system was a decree by the executive arm of the Government of Uganda in 2014, summarily phasing out frontline extension educators and replacing them with military personnel (Rwakakamba & Lukwago, 2014).

Theoretical and Conceptual Framework

This study is based on the social model of disability (Burton, 1993) and knowledge-inclusion-participation- access-fulfilling obligation (KIPAF) framework on disability (Ortiz, 2004). In addition, this study used the *interactional theory* to gain insights into the influence of interactions among individuals on participation in capacity-building programs of young farmers with disabilities (Wilkinson, 1991).

KIPAF Framework on Disability, which is based on the social model of disability, informs this study's focus on participation in capacity-building programs of young farmers with and without disabilities in Uganda. According to KIPAF framework, social exclusion and poverty among people with disabilities can be overcome through the provision of knowledge, inclusion, participation, access and fulfillment of obligations (DFID, 2000; Ortiz, 2004). Alleviation of the antecedents of social exclusion and chronic poverty levels in people with disabilities can result in a rewarding and fulfilling life.

Disaggregating the KIPAF framework, people with disabilities deserve a quality life, but lack the capacity-building opportunities to develop their knowledge, skill, and competencies in their livelihoods (DFID, 2000). For example, farmers with disabilities lack improved seed and animals, agricultural information, and value addition and processing, and markets for their produce. Further, the social exclusion of people with disabilities from social and economic benefits constitutes one of the most curtailing factors in the participation of people with disabilities in the social, economic, and political civic activities in their communities. Often, from the outset, people with disabilities tend to be denied access to public social and economic activities; and are not consulted on issues affecting them, leaving them without input and a voice in decision-making processes. Lack of supportive and enforced legislation hinders access by people with disabilities to the social, economic, and political activities that would enable them to establish the social, economic, political, and physical capital crucially essential for fulfilling and flourishing life (Ortiz, 2004).

The interactional theory postulates that a community is comprised of social fields, which allow people to connect and interact to form community fields (Pigg, 1999; Wilkinson, 1991). Community members interact through social fields that allow them to access community resources such as information on available capacity-building programs. Therefore, the strength or weakness of the social fields formed among young farmers with arm, leg, hearing, speaking, mental or other disabilities, little people, and albino is critical to access of resources dispensed by capacity-building programs targeting young farmers with disabilities. Community fields link community members and, if strong, can influence inclusion; if weak, they can promote marginalization.

The factors this study conceptualizes to influence participation broadly include contact with extension educators, use of accommodation facilities, disability status, region, and supportive program personnel. In addition, this study considered participation in capacity-building programs as shared influence and responsibility of participants in active involvement in program activities such as decision making and feeling of belonging to those programs and communities.

Therefore, a full understanding of factors influencing participation of people with disabilities in capacity-building programs in communities begins by analyzing young farmers with disabilities: socioeconomics, disability status, capacity-building needs, provision of disability-accommodation facilities, disability region of Uganda, responsive capacity-building program personnel. A combination of a young farmer's demographics and socioeconomic situation, disability status, region of residence in Uganda, use of disability accommodation facilities, and supportive program personnel have an effect on participation in capacity-building programs and well-being of young farmers. However, external to this conceptual framework is environmental contexts such as societal culture, political conditions, and geographic settings that influence participation of young farmers with and without disabilities (Laverack et al., 2007). For

example, the geographic setting can influence livelihood strategies and coping mechanisms (Birner et al., 2009).

Findings

The findings of young farmers' participation in capacity building programs are summarized in Table 1.

Table 1

Participation in community capacity building programs by Disability Status or Region

Participation in training activities in community	N	With Disability *Mean (SD)*	N	Without Disability *Mean (SD)*
Level of attending training activities	170	4.15 (0.77)	95	3.83 (0.930)
I actively participated in training	131	3.53 (1.01)	87	3.89 (0.882)
I am involved in decision making	131	3.73 (0.88)	87	3.82 (0.971)
I am part of the community	131	4.18 (1.040)	87	4.18 (0.995)
My production capacity improved by training organizations	168	4.21 (0.720)	103	3.67 (9.330)
Level of benefiting by being a member of community groups	197	3.50 (1.19)	189	3.37 (1.233)
Participating in training activities in community	N	*Eastern Uganda*	N	*Northern Uganda*
Level of attending training activities	57	3.82 (0.690)	208	4.10 (.874)
I actively participated in training	63	3.35 (0.950)	155	3.81 (.954)
I am involved in decision making	63	3.48 (0.840)	155	3.88 (.918)
I am part of the community	63	4.03 (1.050)	155	4.25 (1.00)
My production capacity improved by training organizations	49	3.86 (0.470)	130	4.20 (0.800)
Level of benefiting by being a member of groups	53	3.64 (0.857)	107	3.86 (1.224)

Rating at a five-point Likert scale: 5-very high, 4-high, 3-neither high nor low, 2-low, and 1-very low.

Young farmers with disabilities have a high level (mean = 4.15) while young farmers without disabilities have neither high nor low (mean = 3.83) level of attending training activities delivered by capacity building programs in their communities. However, both young farmers with and without disabilities experience medium high level (mean = 3.53 and mean = 3.89 respectively) of actively participating in training activities in their communities. In addition, capacity building programs have a high (mean = 4.21) potential to improve production capacity of young farmers with disabilities, and consider themselves being part of their local communities (mean = 4.18).

On the other hand, young farmers without disabilities experience lower level (mean = 3.73) of involvement in decision-making, and capacity building program activities are perceived to have high

potential (mean = 4.21) for improving their production capacities. As much as young farmers with and without disabilities subscribe as members to community groups, young farmers with and without disabilities experience low level (mean = 3.50 and mean = 3.37 respectively) of benefit from community groups. Both young farmers with and without disabilities experience a high level (mean = 4.18 and mean = 4.18 respectively) of belonging to their local communities.

Furthermore, the findings in table 1corroborate World Health Organization (1991) information that participation reflects three dimensions: as contribution, as organization, and as empowerment. The contribution dimension refers to participation of people through the giving labour, cash, and land among others. The organizational dimension involves creation of appropriate structures to facilitate participation of targeted people. The empowerment dimension entails integrating involving marginalized and underserved groups and communities to develop power and influence to make decisions and have control over programs meant to benefit them. It is, thus, important to note that participation in capacity building should target the vulnerable, underserved and excluded people such as those with disabilities to build their capacity to make decisions and have control over all programs.

Asked to Participate in Community Training Programs in Last Five Years. Binary logistic regression was used to simultaneously examine the collective influence of disability status, region and mode of contact on whether the young farmer was or was not asked to participate in community capacity building programs. Thus, the investigator examined the determinants of participation of young farmers in capacity building programs. Table 4.17 summarizes the descriptive statistics for each of the variables included in the analysis for the first logistic regression. Approximately 31% (N = 88/128) indicated they had been contacted via a face-to-face conversation and 35% (N=45/128) indicated they had been contacted in a group setting.

Table 2

Summary Descriptive Statistics for Variables used in Logistic Regression Analysis

Variable	Dummy Coding	frequency	Percentage
Disability	0 = No Without Disability	386	68.7
	1 = Yes With Disability	176	31.3
		562	100.0
Region	0 = Eastern	183	32.6
	1 = Northern	379	67.4
		562	100.0
Contact by Face-to-Face	0 = No	88	68.8
	1 = Yes	40	31.2
		128	100.0
Contact in Group Setting	0 = No	83	64.8
	1 = Yes	45	35.2
		128	100.0
Asked to Participate in Community Programs	O = Yes	316	56.2
	1 = No	246	43.8

The logistic regression results (Table 2) indicated there was an acceptable model fit (discrimination among the two groups of the dependent variable) on the basis of the four independent variables ($X^2 = 48.00$, $p<0.001$). Of the four predictor variables two were found to be statistically significant (disability status $p = 0.001$; face-to-face contact $p = 0.013$). This indicate odd that those with a disability were 94.4% less likely compared to those without disability ($p<0.001$) to participate in community capacity building programs. An odd of .046 indicates that the outcome labelled a 1 (not asked to participate in community programs) is 0.046 times as likely with a one-unit increase in the predictor variable when controlling for the influence of the other three predictor variables. Being contacted via face-to-face conversation had an Exp(B) value of 0.178.

The four variables collectively were somewhat acceptable regarding the discrimination between the two groups of the dependent variable. The variables correctly classified 89% of those individuals that have been contacted in the last 5 years to attend any community training programs; whereas, the model correctly classified 71.4% who were not contacted to attend community training programs.

It must be emphasized that this analysis is conducted using listwise deletion of missing cases, and thus only 128 young farmers were used in the logistic regression analysis in Table 4.18.

Table 3

Participation Regressed on Disability, Region, and Selected Modes of Contact

Model	B	SE B	Wald	Exp(B)	*p*
Constant	-2.369	1.450	2.667	0.470	0.102
Disability status (0 = Without 1 = With)	-3.085	0.912	11.433	0.046	0.001
Region (0 = Eastern 1 = Northern)	1.294	0.688	3.539	3.646	0.060
I was contacted by face to face conversation (0 =No 1=Yes)	-1.726	0.694	6.195	0.178	0.013
I was contacted in a group meeting (0 = No 1 =Yes)	0.550	0.630	0.762	1.733	0.383
Model Summary					
N - 128					
df = 4					
Chi Square = 48.004					
p = <.001					
-2 Log likelihood = 86.478					
Cox & Snell R Square = .313					
Nagelkerke R Square = .481					

Dependent variable: In the last five years have you been asked to participate in community training programs is coded 0 = Yes, asked to participate and 1 = No, not asked to participate.

Table 3, indicates having a disability reduced the odds of a young farmer's participation in capacity-building programs by 95.4% ($p<0.001$). This implies that young farmers with disabilities are less likely to

participate in capacity building programs meant to benefit all community members. In addition, Northern Uganda increased the odds of a young farmer to participate in capacity-building programs in their communities by a factor of 3.646 compared to young farmers in Eastern Uganda (p=0.060). Thus, young farmers in Northern Uganda experience more opportunities of participating in capacity-building programs compared to their counterparts in Eastern Uganda. Furthermore, face-to-face contact decreased odds of young farmer participation in capacity-building programs in their communities by 82.2% (p = 0.013), while contact in a group setting increased the odds by 73.3% (p = 0.383). According to focus group discussions in Northern Uganda, young farmers have formed groups to access capacity-building services and increase their ability to advocate for service delivery.

Log (odds of participation) = -2.369 – 3.085 (disability) + 1.294 (Northern Uganda) - 1.727 (face-to-face) + 0.550 (group meeting)

Further, the investigator analysed the determinants of effective participation in capacity-building programs by young farmers with and without disability, findings summarized in Table 4.

Table 4

Active Participation Regressed on Disability Accommodations and Gender

Model	B	SE	Wald	Exp(B)	p
Constant	-4.210	0.767	30.104	0.015	<0.001
Sign language interpretation (0 = No)	0.387	0.093	17.403	1.472	<0.001
Supportive training staff (0 = No)	0.462	0.142	10.601	1.587	<0.001
Gender (0 = Female)	1.290	0.362	12.691	3.633	<0.001

Dependent variable: In the last five years, have you worked with any extension educator on issues related to your agricultural enterprises

Table 4, indicates that sign language interpretation increased the odds of young farmers with disabilities to work with extension educators on issues related to their agricultural enterprises by 47% (p <0.001). This implies that young farmers with disabilities are more likely to participate in capacity-building programs when the training implementers provide sign language interpretation. Thus, application of sign language interpretation in capacity-building programs promotes inclusion, which enhances young farmers' feeling of belonging to and participation in capacity-building programs. In addition, disability-supportive training staff increased the odds of participation of young farmers with disabilities in capacity-building programs by 58% (p <0.001).

Furthermore, Table 4.19 shows that being female increased the odds of a young farmer to participate to participate in capacity-building programs by a factor of 3.633 compared to males. In Uganda, most development agencies target women participation in capacity-building programs due to their pivotal role in household nutrition and performing over 80% of agricultural activities.

Reduced Regression Equation:

Log (odds of participation) = -4.210 + 0.387 (sign language interpretation) + 0.462 (supportive training staff) + 1.290 (female)

Conclusions and Implications

Having a disability reduces a young farmer's opportunity to participate in capacity-building programs. Young farmers with disabilities are more likely to be contacted in group settings rather than via face-to-face—an indication of social exclusion and discrimination that restricts them from participation in capacity-building programs compared to young farmers without disabilities. Thus, unless they are in a group setting, young farmers with a disability are less likely to be asked by extension or community educators to participate in capacity-building programs. However, access to sign language interpretation and supportive-training personnel and being in Northern Uganda improves or enhances participation among young farmers with disabilities in capacity-building programs.

Agencies that fund community development should demand evidence of disability-inclusive programming as one criterion for funding capacity-building programs to enhance inclusive participation of young farmers with disabilities in community capacity-building programs. Moreover, concerted effort of community leaders and programmers should support and enforce disability policies to promote equity in farmer participation in capacity-building programs. Education of extension, community workers, and community members on disability issues and incorporate disability sensitive programs in extension training curricula.

References

Anaby, D., Hand, C., Bradley, L., DiRezze, B., Forhan, M., DiGiacomo, A., Law, M. (2013). The effect of the environment on participation of children and youth with disabilities: A Scoping review. *Journal of Disability and Rehabilitation, 35*(19), 1589–1598. DOI/abs/10.3109/09638288.2012.748840.

Barungi, M., Guloba, M., & Adong, A. (2016). Uganda's agricultural extension systems: How appropriate is the single spine structure. *Economic Policy Research Center*, *16*, 1–34.

Burton, L. (1993). The struggle for citizenship: The case of disabled people. *Disability & Society*, *8*, 235–248. DOI: 10.1080/02674649366780251.

Checkoway, B. N., & Gutierrez, L. M. (2008). Youth participation and community change. *Journal of Community Practice, 14*(1), 1–9. DOI: org/10.1300/J125v14n01_01.

Department for International Development. (2000). *Realizing human rights for poor people: Target strategy paper*. Retrieved from http://www2.ohchr.org/english/issues/development/docs/human_rights_tsp.pdf.

Deutsche Gesellschaft fur Technische Zusammenarbeit (GTZ). (2005). *Guidelines on capacity building in the regions module B: Methods and instruments for the capacity building cycle. Version 2.0 February 2005 GTZ- SfDM support for decentralization measures*. Retrieved from http://www.bvsde.paho.org/bvsacd/cd32/poppe.pdf.

Head, B. W. (2008). Community engagement: Participation on whose terms? *Australian Journal of Political Science, 42*(3), 441–454. DOI: 10.1080/10361140701513570.

Lewis, L. (2010). Geographies of disabilities, resilience and social justice. *Political Crossroads, 17*(1), 75–87.

Mpofu, J., & Shumba, A. (2013). Disabilities and entrepreneurship in Makonde rural community in Zimbabwe. *Studies of Tribes and Tribals, 11*(2), 135–144.

Ortiz, I. (2004). *Disability KaR: Assessing connections to DFID's poverty agenda.* Retrieved from https://assets.publishing.service.gov.uk/media/57a08cad40f0b652dd001498/PolicyProject_IsabelOrtizReportFinal1.pdf.

Pagan-Rodriguez, R. (2015). Disability, training and job satisfaction. *Social Indicators Research, 122*, 865–885. DOI: 10.1007/s11205-014-0719-2.

Phillips, D., Waddington, H & White, H. (2014). Better targeting of farmers as a channel for poverty reduction: a systematic review of farmer field schools targeting, *Development Studies Research, 1*(1), 113–136., DOI: 10.1080/21665095.2014.924841.

Pigg, K. (1999). Community leadership and community theory: A practical synthesis. *Community Development Society Journal, 30*(2), 196–212.

Rwakakamba, M., & Lukwago, D. (2014). *The changing face of NAADS and what the entry of Uganda People's Defence Forces will mean for Uganda's agriculture*. Public policy issue paper, 004, 1-14. Retrieved from http://www.agencyft.org/.

Sherry, R. A. (1969). A ladder of citizen participation. *Journal of the American Institute of Planners, 35*(4), 216–224. DOI: 10.1080/01944366908977225.

Siddiqua, K. A., Islam, R., & Afrin, S. (2012). Disability, employment and poverty: A Study of the physically handicapped people in Dhaka City. *ME-JAA Middle East Journal of Age and Ageing*. ISSN 1449-8677.

Vornholt, K., Uitdewilligen, S., & Nijhuis, F. J. N. (2013). Factors affecting the acceptance of people with disabilities at work: A literature review. *Journal of Occupational Rehabilitation, 23*, 463–475. DOI 10.1007/s10926-013-9426-0.

Wagner III, J. A. (1994). Participation's effects on performance and satisfaction A Reconsideration of research evidence. *Academy of Management Review, 19*(2), 312–330.

Wilkinson, K. (1991). *The community in rural America*. New York, NY: Greenwood Press.

Wolbring, G., Mackay, R., Rybchinskin, T., & Noga, J. (2013). Disabled people and the post-2015 development goal agenda through a disability studies lens. *Sustainability, 5*, 4142–4182. DOI: 10.3390/su5104152.

World Health Organization. (2008). *Social determinants of health: Social participation*. Retrieved from http://www.who.int/gender-equity-rights/understanding/participation-definition/en/.

World Health Organization. (1991). *Community involvement in health development Challenging health services*. WHO Technical Report Series, 809, 1–56. Retrieved from http://apps.who.int/iris/bitstream/10665/40624/1/WHO_TRS_809.pdf.

Yeo, R. (2005). Disability, poverty and the new development agenda. Disability K*a*R Knowledge and Research. Retrieved from http://hpod.org/pdf/Developmentagenda.pdf.

Integrating Information and Communication Technology (ICT) In the Farming System for Livelihood Improvement, "A Case of Kieni East Constituency, Nyeri County, Kenya"

Paul Mwari Maina,

St Paul's University

P.0 BOX 62886 -00200

NAIROBI

+254722651297, mainapaul72@gmail.com

Abstract

In many developing countries, the agriculture sector is dominant in raising incomes among the poor by as much as four times than other sectors. According to the World Bank, 2013, annual report, agriculture reduce poverty, raise incomes and has improved food security for 80% of the world's poor who depend on farming. The sector realized about 17% of the GDP and 40% of exports. This achievement is attributed to improve agricultural productivity through integration of ICT in the farming system to address SDG number two on zero to hunger. Questionnaires, focus group discussions and interviews were the methods used to collect data. The data was collected from 90 respondents sampled across Kieni East Constituency. The research targeted producer organizations, change teams, extension agents and key stakeholders. The overall objective of the research was to investigate the role of ICT to small holder farmers to harness the benefit of information and communication technologies to maximize returns on agriculture production system. The research examined the role of ICT mainly using market price information through short message service or web portal, open data kit, internet and use of geographical information system in enhancing growth and efficiency in agri-business transactions. The research findings indicated that there is a correlation between increase in information and communication technology and increase in returns on agricultural production system. It also indicated that use of ICT enhanced growth and efficiency in agri-business transactions by empowering the farmer and producer organizations with real time marketing information. The research demonstrated the role of ICT in the systematic dissemination of agricultural information to provide comprehensive, up-to-date and detailed knowledge and information. The research witnessed tremendous advancement in information dissemination among smallholder farmers. Use of ICT in Agricultural extension and education provided an efficient and effective way to reach out to small holder farmers.

Key Words: ICT, Agricultural extension, Agricultural information, market, mobile technology

Introduction

The use of ICT in Agriculture plays a vital role in the social and economic development of most African countries and is the main contributor to economic growth and stability, Hilda Munyua, et al (2008). According to Chukwunonso et al (2013), the main impediments to ICT adoption is the sophistication of the technology which requires human capital investment to synchronize efficiently challenges faced by small holder farmers that includes production and marketing. ICTs have a positive impact on the development of any nation especially in the food security sector (Kuhlmann, 2005). There is a strong link between integrating ICT in farming systems and achievement of sustainable development goal number two which targets to end hunger, achieve food security, improve nutrition and promote sustainable agriculture.

The farmers, especially the youth seem inclined towards going online on computers to access market and production information while the older generation respond better to audio and visual ICTs. Most of the stakeholders have also taken a keen interest in some of our technical solutions like Frontline SMS used for mobilizing farmers and use of the technology to answer farmers' queries via phone as well as accessing agronomic information. Agriculture involves the conceptualization, design, development, evaluation and application of innovative ways to use information and technologies in rural domain with a primary focus of livelihood improvement (Manish Mahant et al, (2012). According to Alexander B. Sideridis (2010), poverty and hunger in developing countries can be addressed through increasing farm productivity and ICT in particular can contribute in the achievement of the goal.

The application of ICT in agriculture is an important pillar of agricultural extension (B. L. Dhaka and K. Chayal (2010). The desire to strengthen farmer's access to market has seen the emergence of a number of interventions that employ ICT tools in the provision of agricultural marketing information, Julius J. Okello (2012). Market access is one of the most important factors influencing the performance of small holder agricultural farmers (Barret, 2008; Kirsten, 2010). Ezeh Ann Nnenna (2013), stated that its imperative to provide adequate training on the use of ICTs to all stakeholders strengthening more the use of phones and internet and this needs collaboration with research institutions on information dissemination and training,(Spyros Fountas ,2014).

The ICT technologies accessed include use of using market price information through frontline short message service or web portal, open data kit, internet and use of geographical information system, (H.A.C.K Jayathilake et al 2015). This enhances growth and efficiency in agri-business transactions through timely marketing and technical information to both individual farmers and producer organizations. This is a data base for disseminating market and agronomic information to farmers. Other technologies included creating awareness through the radio and various foras and use of farmers/buyers interactive platform. Others included use of a mobile platform to provide location based information to farmers on topography, rainfall, temperature, farm management practices, crops range and soil types. This was supported by Anthony G. (2013) in the journal on information technology and rural development in Africa, experiences in Kenya.

Objectives of the research

To find out if there is a correlation between increase in information and communication technology and increase in returns on agricultural production system.

To investigate whether use of ICT enhanced growth and efficiency in business transactions through dissemination of timely marketing and agronomic technical information to both farmers and producer organizations

To examine the role of ICT as a driver of economic agribusiness indicators in the agricultural value chain, climate change and resilience intervention and to assess the views of farmers regarding use of ICT in Agriculture.

Research Methodology

The study was carried out through a desk review of secondary sources of information covering small scale agriculture and a wide range of ICT related experiences and initiatives. The primary data was collected in Gakawa, Kiamathaga and Thegu ward in Kieni East Constituency. The research wanted to investigate if there is a correlation between increase in information and communication technology and increase in returns on agricultural production system. The paper accessed the role of ICT to enhance growth and efficiency in business transactions through dissemination of timely marketing and technical information to both farmers and producer organizations. The research was based on key indicators which included the number of farmers trained, numbers actively using the SMS service, numbers of producer organization using ICT in their programing, marketing and income generated at various levels as a result of integrating ICT.

The researcher used regression and correlation analysis to explore the nature of the relationship that exists among dependent and independent variables. The researcher did hypotheses tests and conducted analysis of variance in accordance to the research objectives. The study followed exploratory research design. Quantitative and qualitative research methods were adopted to collect data from the study respondents. Survey research approach was implemented to collect data from the study participants. Quantitative data included open ended and closed-ended information. Data collection methods included use of questionnaires, focus group discussions and interviews. The data was collected from 90 respondents sampled across Gakawa, Kiamathaga and Thegu ward in Kieni East Constituency. The research targeted producer organizations, change teams, extension agents and key stakeholders.

Research Instrument

The survey instrument comprised demographic data items, Likert-scale survey items, dichotomous questions and checklists which were designed to collect data on the issues under investigation.

Reliability of the instrument;

Reliability is the degree to which an assessment tool produces stable and consistent results when administered at different time intervals to the same respondents. For an instrument to be considered reliable to making statistical inference, the Cronbach's alpha of at least 0.7 is required.

Reliability Statistics

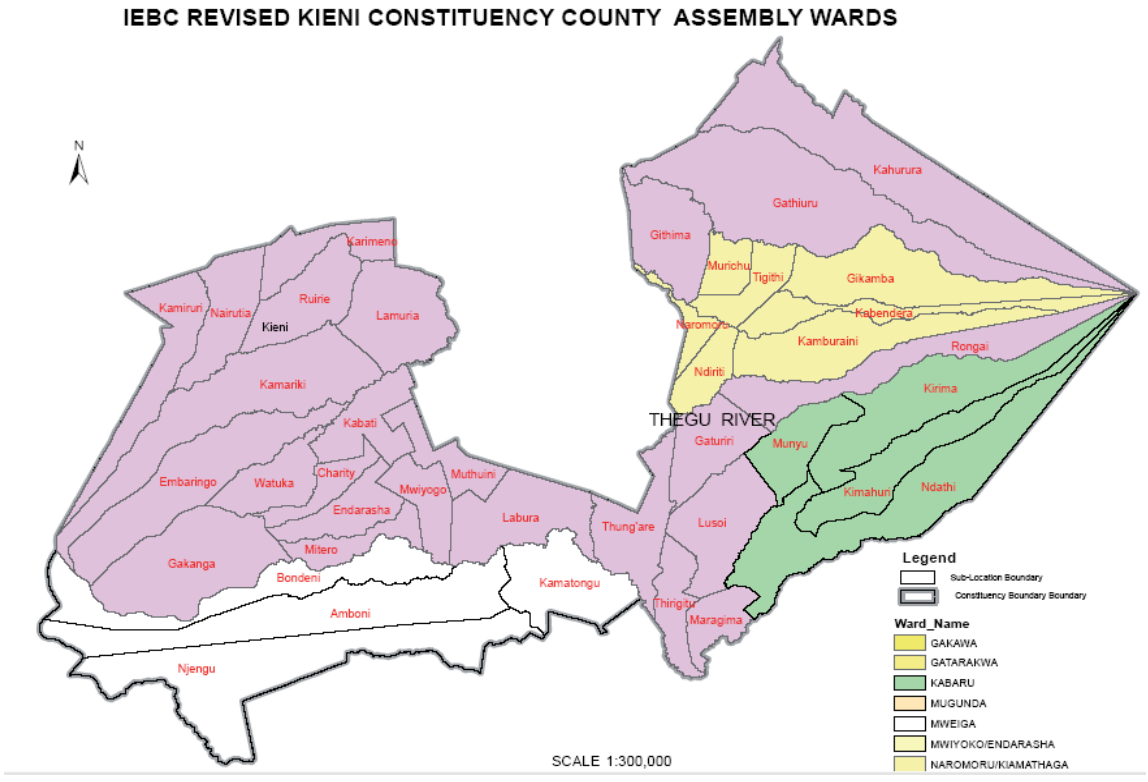
Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.722	.579	23

From Table the alpha of 0.722. The alpha obtained is above the minimum threshold of 0.7 which imply the questionnaire tool used was reliable to make inference and generalize the results.

Scope of the Study

The study was conducted through case study targeting 90 participants. The farmers were identified through stratified random sampling. This included farmers that were using mobile technology.



Map indicating the research area – Kieni East constituency

Target population and sampling method

The data was collected from 90 respondents sampled across Gakawa, Kiamathaga and Thegu ward in Kieni East Constituency who had high concentration of farmers using ICT. The sampling process yielded a sample of 90 farmers out of the 300 population size.

Table 001: Stratified random sampling technique employed to select study participants

Sub Location	Farmers involved	Sample Size
Kabaru	70	21
Kiamathaga	100	30
Narumoru	50	15
Lusoi	30	9
Gakawa	50	15
TOTAL	**300**	**90**

The research used stratified random sampling since it's a method of sampling that involves the division of a population into smaller groups known as strata. The population in this case is the five sub locations. The proportionate sample size method that was used to justify the sample size

(70/300 x90 - 21) (100/300 x 90 – 30) (50/ 300 x 90 – 15)

(30/ 300 x 90 – 9) (50/300 x 90 -15)

Total selection: 90 respondents from the population of 300 farmers. The researcher used the systematic or the nth method where every nth farmer was selected from the randomized list.

Data collection tools used

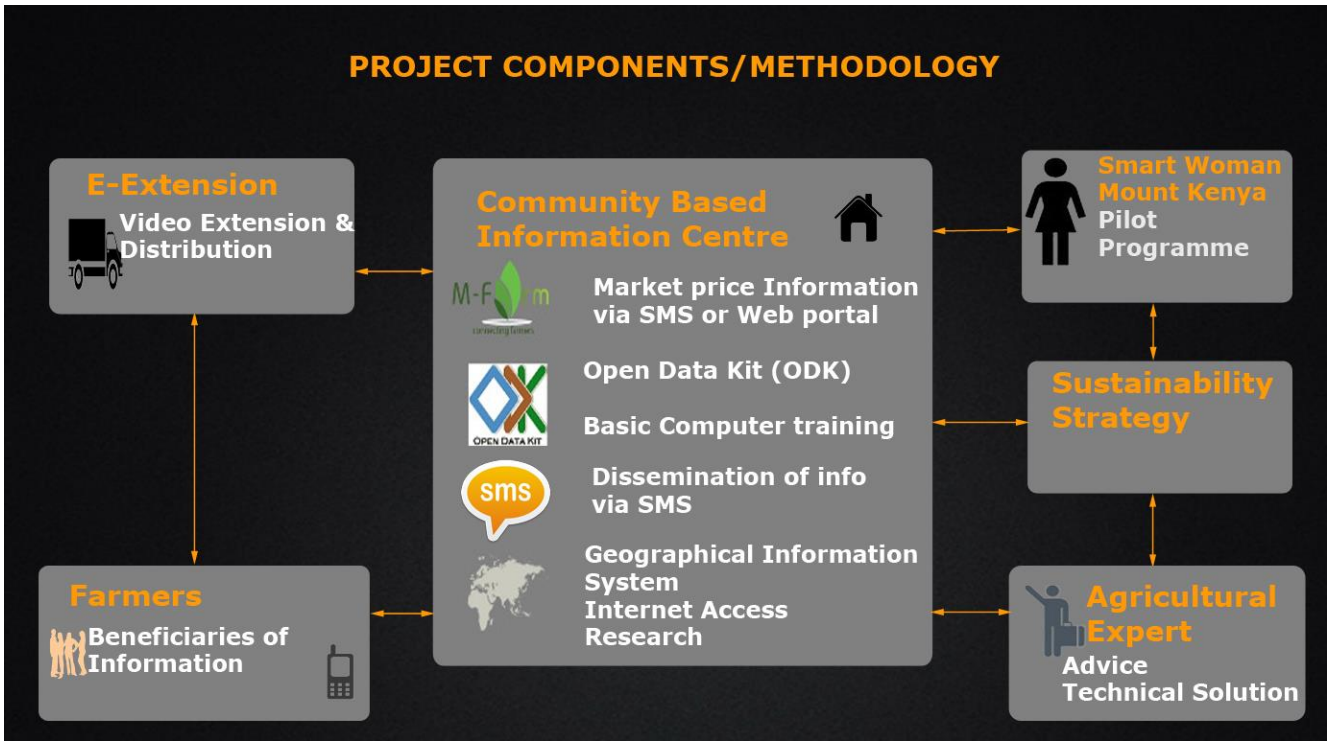
Questionnaires

Interviews

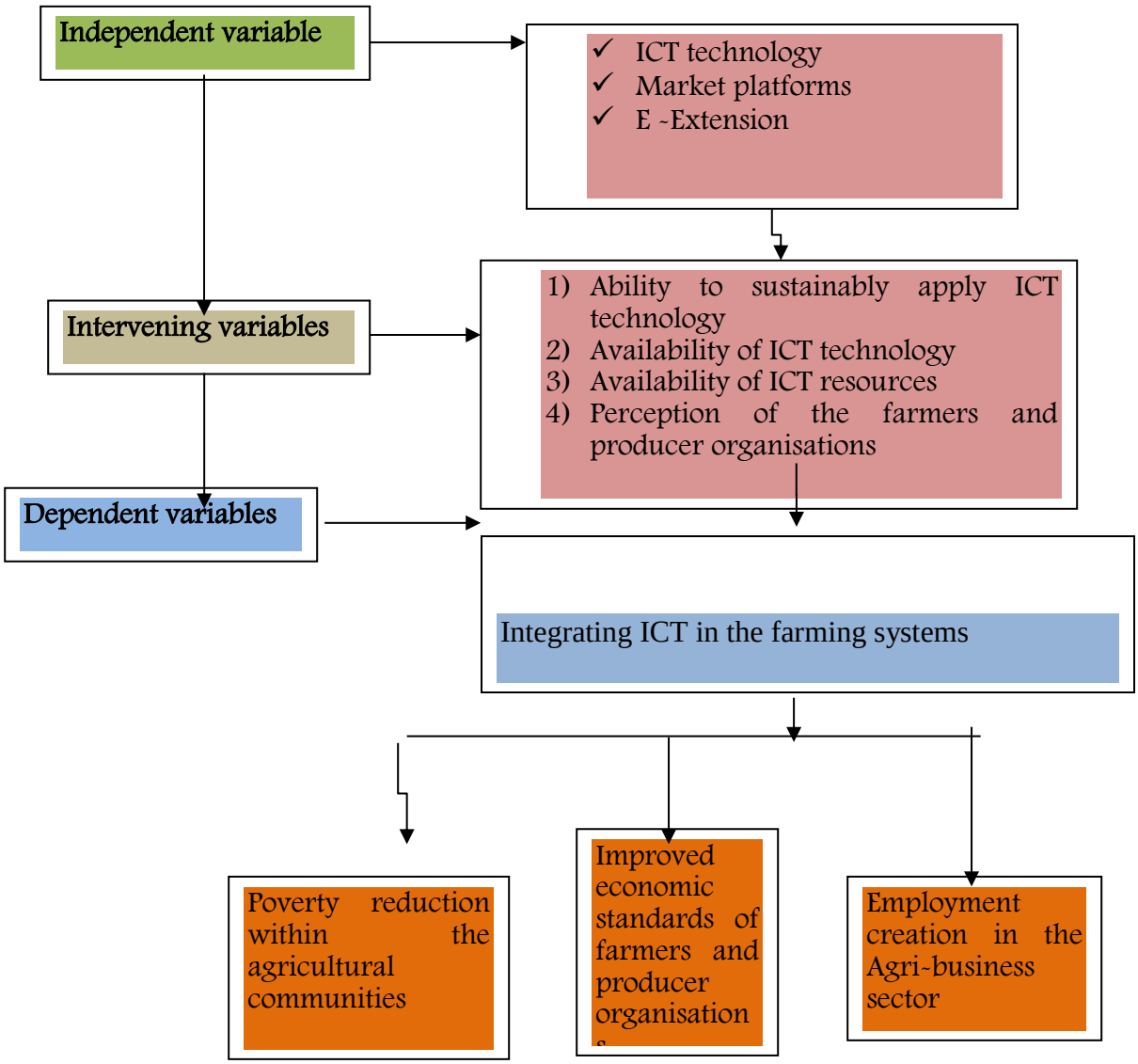
Focus groups discussion.

Observations

Research Component/ Methodology



Conceptual Framework



The Regression Model

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$

Y= Integrating ICT in the farming system

β_0= Y intercept

β_1 to β_3 = regression coefficients

X_1 = ICT technology

X_2 = Market platforms

X_3 = E-Extension

ε = error term.

Whereby Y represent the Integrating ICT in the farming system, X_1 is ICT technology, X_2 , Market platforms and X_3 .E- Extension. B_0 is the model's constant, and $\beta_1 - \beta_3$ are the regression coefficients while ε is the error term form the model's significance. Holding other factors (Integrating ICT in the farming system) constant, a unit increase in use of ICT technology would lead to an increase in marketing hence encouraging farm productivity and improve on livelihoods.

Key outcomes: Use of ICT in agricultural productivity

	Use of ICT in agricultural productivity	
Rating	Checking market rates	Obtaining agronomic information
To a very little extent	0.0%	8.7%
To a little extent	0.0%	11.1%
To some extent	55.6%	32.1%
To a great extent	44.4%	48.1%
TOTAL	100%	100%

The table shows that almost half of the farmers use mobile phones to a great extent (48.1%) to access agronomic information to boost productivity. Over 50% use the mobile phones to some extent to check market rates using short message service or internet. All the farmers interviewed used the mobile phone to check the market rates

Satisfaction with use of mobile technology to boost production

Satisfaction level	**Level of information reliability**	**Level of application of information obtained**
Very dissatisfied	24.0%	0.4%
Somewhat dissatisfied	11.1%	3.7%
Neither satisfied or dissatisfied	0.0%	9.7%
Somewhat satisfied	28.9%	29.6%
Very satisfied	36.0%	56.6%
TOTAL	100%	100%

Over 50% of the farmers interviewed applied the information obtained through the ICT technology. However 3% did not trust the information and were dissatisfied.

Conclusion and Recommendations

The research findings indicated majority of farmers had positive attitude towards use of ICT and there was a correlation between increase in information and communication technology and increase in returns on agricultural production system. The research concluded that use of ICT calls for good infrastructure, adequate ICT skills, good and affordable connectivity and appropriate ICT policies. Use of ICT enhanced growth and efficiency in business transactions through dissemination of timely marketing and technical information to both farmers and producer organizations. Use of ICT in Agricultural extension and education provided an efficient and effective way to reach out to small holder farmers. The research concluded that without the enabling environment and infrastructure, no much can be achieved.

There must be right policy formulation and capacity building of farmers and extension workers on ICT usage in agriculture related software and provision of market information platforms. The researcher recommended the need to strengthen Agriculture ICT curriculums in the formal and informal educational and training programs. The governments should invest more on the acquisition of advanced ICT skills targeting agriculture extension staff in the rural areas. There is need to establish community based village knowledge centers to act as clinic for farmer's needs. There is also need to design phones that can be solar powered to reduce dependency on electricity which is less available in some remote areas. The research recommended that promotion of high technology such as ICTs for communication with farmers should be targeted to youth in agriculture because they are already familiar with the communication tools and require little additional training for their use and the fact that older farmers have less understanding of the benefits of ICT adoption.

Reference

Alexander B. Sideridis (2010) ICT and farmers: lessons learned and future developments

Aderbigbe (2014) - ICT in Agricultural Sustainability And Food Security Bello

Asingwire, N. (2003). Electronic delivery of agricultural information to rural communities in Uganda

Adejo, P.E and U. Haruna, (2009) - Access of farmers to ICTs for agricultural development in Bauchi local government area

Aker, C.J. (2008). 'Does Digital Divide or Provide?' The Impact of Cell Phones on Grain Markets in Niger; Center for Global Development Economics Department, Fletcher School of Law and Diplomacy, Tufts University

Anthony G. (2009); Information Technology for Agriculture and Rural Development in Africa: Experiences from Kenya

Bracha Gal Et Al (2003); Adoption of Information Technology for Farm Management,

A Case Study.

B. L. Dhaka and K. Chayal (2010); Farmers' Experience with ICTs on Transfer of Technology in Changing Agri-rural Environment

Batchelor, S and Norrish, P. (2005). Framework for the assessment of ICT pilot projects

Baryamureeba, V. (2007). ICT as an Engine for Uganda"s Economic Growth: The Role of and Opportunities for Makerere University

Barret, (2008) – Market Access for small holder farmers

Ezeh Ann Nnenna (2013); Access and application of information and communication technology (ICT) among farming households of south east Nigeria

Market access is one of the most important factors influencing the performance of small holder agricultural farmers

Chukwunonso et al (2013) The adoption of information and communication technology in Agriculture, Nigeria state

Gelb E, Parker C, (2006). Is ICT adoption for agriculture: a summary of the EFITA ICT adoption

Hilda Munyua, Edith Adera, and Mike Jensen(2008); Emerging ICTs and Their Potential in Revitalizing Small-Scale Agriculture in Africa

H.A.C.K Jayathilake et al (2015); ICT Adoption and Its' Implications for Agriculture in Sri Lanka

Jones, M. (2006) An agricultural research perspective on poverty, innovation policies and agricultural development in Sub-Saharan Africa.

Julius J. Okello (2012); Drivers of Use of Information and Communication Technologies by Farm Households: The Case of Smallholder Farmers in Kenya

Kirsten, (2010) Famers market access in developing countries

Kuhlmann, F (2005). IT Applications in Agriculture: Some Developments and Perspectives.

Kidane, W., M. Maetz, and P Dardel (2006); Food security and agricultural development in Sub-Saharan Africa

Kweku, A.K. (2006). Demystifying ICT diffusion and use among rural women in Kenya.

Manish Mahant, Abhishek Shukla, Sunil Dixit, Dileshwer Patel (2012) Uses of ICT in Agriculture.

Nicole Taragola and Ehud Gelb (2013): Information and Communication Technology (ICT) Adoption in Horticulture: A Comparison to the EFITA Baseline

Oladipo, A. (2013). Investment Opportunities in Nigerian Economy: The Fastest Growing Economy in Sub-Saharan Africa

Padraig Wims (2011); ICTs in Irish Agriculture: Can ICTs Improve Communication Between Agribusiness and Farmers?

Richardson, (2006) ICTs policies and infrastructure in developing countries

Ramatu M. Al-Hassan, Irene S. Egyir and James Abakah (2013); Farm household level impacts of information communication technology (ICT)-based agricultural market information in Ghana

Sideridis (2009) -Education, training and e-services

Spyros Fountas (2014); ICT in Precision Agriculture – diffusion of technology

Tomato Leaf Miner (*Tuta Absoluta*) Incidence and Severity in Kirinyaga County, Kenya

Nderitu Wangari Peris [1]Geoffrey O. Wafula[2] Otieno Mark[1] John Jamleck Muturi[3] and Arunga Esther[1]

[1] University of Embu, Department of Agricultural Resource Management, PO Box 6-60100, Embu, Kenya.

[2]Koppert Biological Systems (K) Ltd P.O Box 41852-00100, Nairobi, Kenya

[3] University of Embu, Department of Biological Sciences, PO Box 6-60100, Embu, Kenya

Abstract

The tomato leaf miner (*Tuta absoluta*) is a new insect pest of tomato in Kirinyaga County. *Tuta absoluta* can reduce yield and quality of tomato by 80-100% both in field and greenhouse conditions. Farmers have been using synthetic insecticides to combat the insect pest. However, the aggressive nature of the pest, multivoltine character, short generation time, high biotic potential and increased resistance to insecticide use has led to difficulty in its control. This study was aimed to determine the incidence of *Tuta absoluta* through monitoring using pheromone traps and determine its severity in tomato fields' despite chemical insecticides applications for effective designing of ecologically-sound management strategies of *Tuta absoluta* in Kirinyaga County. Field survey was carried out during 2016-2017 growing seasons on a set of 15 tomato fields located in three sites (Kimbimbi, Defathers, and Kariithi). A survey was conducted every three weeks from transplanting to harvest on 30 randomly selected plants in each focal field. Three leaves per plant (lower, intermediate and upper) were carefully inspected for the presence/absence of mines. Sex pheromone traps were used in every focal field to monitor population dynamics of *Tuta absoluta*. *Tuta absoluta* trap catches were found in all sampled sites, captured moths ranged from 120-240, there was a linear increment in the number of captured moths during the surveyed time. *Tuta absoluta* mining damage on the leaves was observed in all the 15 focal fields. High infestation was recorded on the lower part of the leaf (73%) at 100 days after transplant. Upper part of the leaf recorded the lowest damage of *Tuta absoluta* among the three sites sampled. Kariithi showed the highest (37%) infestation compared to other sites. Infestation damage increased as the crop advanced in growth and was heaviest at the end of the cropping cycle. Synthetic insecticides have been found to reduce populations of naturally occurring predators and parasitoids of *Tuta absoluta* and increased development of resistant populations of the insect pest. It is therefore imperative to develop alternative nonchemical integrated control programs for a sustainable management of *T. absoluta*.

Key words: *Tuta absoluta*, synthetic chemicals, sustainable management, pheromone traps

Introduction

Tomato (*Lycopersicon esculentum mill*) is one of the most promising commodities for horticultural expansion and development in Kenya. Kenya is among Africa's leading producer of tomato (ranked 6th in Africa) with a total production of 397,000tones (FAO, 2012). Tomatoes contribute significantly to food security and nutrient balance but also are a source of income, foreign exchange earnings and creation of employment (FAO 2012). They are nutritious vegetables that provide high quantities of vitamins A and C; they play an important role in meeting nutritional food requirements for both rural and urban populations in Kenya.

Tomato leaf miner is a major insect pest infesting tomato crops. It has been reported as the most devastating pest of tomato in Argentina, Chile, Colombia, Brazil, Paraguay, Peru, Uruguay and Venezuela (Barrientos *et al.,* 1998; Estay, 2000; Botto, 2011b). In Kenya, *T. absoluta* was first found in early 2014 to infest open field tomatoes. The insect has spread rapidly and is now considered as the most challenging insect pest of Tomato in Kirinyaga County (Nderitu *et al.,* 2018). Under inadequate control, *T.* absoluta has been reported to cause 90-100% yield losses (Estay, 2000). Infestation of tomato plants occurs throughout the entire crop cycle, with females ovipositing preferentially on leaves (73%), and to a lesser extent on leaf veins and stem margins (21%) sepals and green fruits account for 5% and 1% respectively (Estay, 2000).

Chemical control using insecticides is considered as an effective management option of the pest (Silverio *et al.,* 2009). *Tuta absoluta* management in Kirinyaga County is based on chemical insecticides application that range between 9 and 16 applications per growing season (Nderitu *et al.,* 2018). Chemical insecticides are routinely applied as control strategies of the pest however, Farmers are not always aware of the harmful effect that come along with chemical use both to humans and the environment (Picanco *et al.* 1998). Therefore this study aims to determine the incidence of *Tuta absoluta* through monitoring using pheromone traps and determine its severity in tomato fields' despites chemical insecticides applications for the development of ecologically sound, integrated control programs for a sustainable management of *T. absoluta*.

Materials and Methods

Experimental Site

An extensive field sampling was carried out during the 2016-2017 growing season on a set of 15 tomato fields located in three locations, including Defathers, Kariithi and Kimbimbi in Mwea East Sub-county, Kirinyaga County, Kenya. Mwea East sub-county was chosen since it's involved in tomato production throughout the year and tomato farmers rely on irrigation for production. This was aimed at assessing the incidence and extent of damage caused by *T. absoluta* across the tomato fields.

Data collection procedures

A Delta trap containing pheromone lure specific to attract *T. absoluta* male adults (Pherodis, *Tuta absoluta*, Koppert, Kenya) was set up in every focal field to monitor *T. absoluta* incidence and abundance. The pheromone traps were positioned in the middle of the field at a height of 40 cm above ground. The exposed traps were collected from the field after every 6weeks and replaced with new ones. Trap catches were counted and further taken to the Museum of Kenya for identification.

A field survey was conducted every three weeks from transplanting to harvest on 30 randomly selected plants in each focal field. Three leaves per plant (from lower, intermediate and upper canopy) were carefully inspected for presence/absence of mines using the scoring scale where 1- no infestation, 2- up to 25% leaf infestation, 3- 25-50% leaf infestation, 4- 50-75% leaf infestation 5≥75% leaf infestation (Ayalew, 2011). Pest management strategies were applied by farmers and they were based largely on chemical applications which targeted control of *T. absoluta* and other lepidopteron insect pests.

Data analysis

Specimens caught in the pheromone traps were carefully removed and preserved in 96% ethanol and taken to Museum of Kenya for identification.The variability of damage across the different sites and the sampled plant parts was in percentages. The percentage data was subjected to arcsin square root transformation and analysis of variance performed using one way ANOVA in R software. Mean separation was done using turkey's test.

Results

Field sampling for *Tuta absoluta* incidence

Delta traps that were placed in every focal field were collected and replaced every 6 weeks, to monitor the abundance of *Tuta absoluta* in the tomato fields. Across the 15 tomato fields evaluated each had over 120-240 specimens of *Tuta absoluta* (Figure 1). Adult samples were identified at the Museum of Kenya and confirmed as *T. absoluta* species. Based on the Delta trap counts, *Tuta absoluta* catches increased as the crop matured (Figure 1)

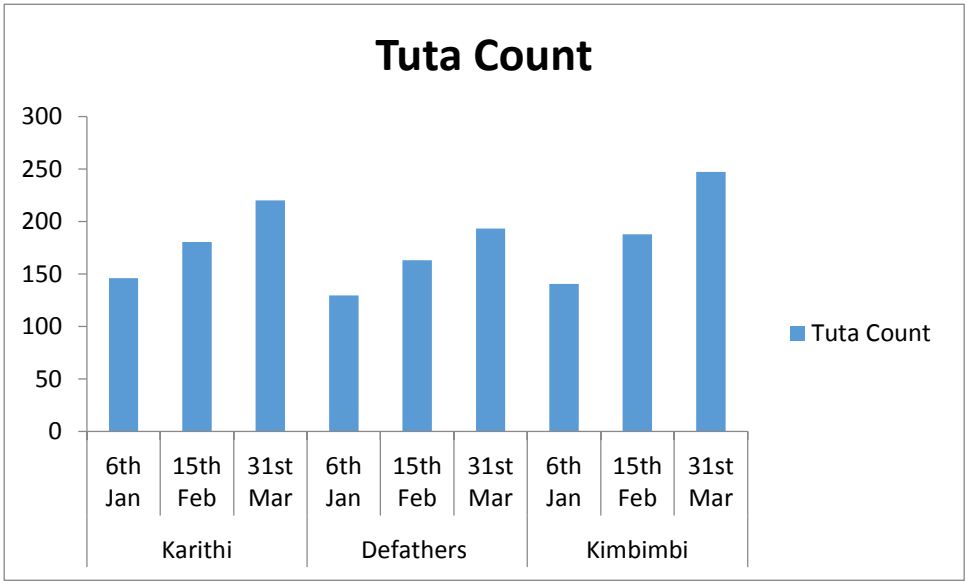


Figure 1: Means of *Tuta absoluta* catches across the three sites during tomato growing season from transplanting to harvest

Field sampling for *Tuta absoluta* Damage

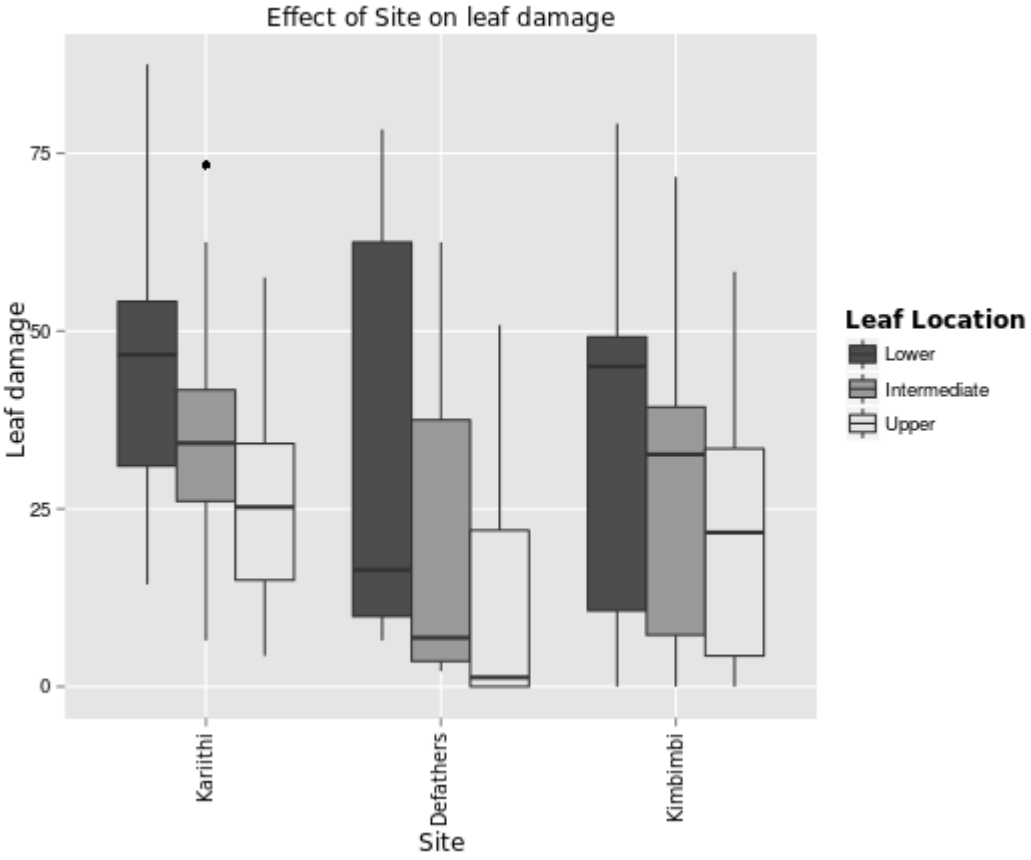
Tuta absoluta mining damage on the leaves was observed in all the 15 focal fields (Figure 2). *T. absoluta* larvae were found between the upper and lower leaf epidermis, feeding on the mesophyll tissues and causing mines. The excreta could also be seen inside galleries.



Figure 2: *Tuta absoluta* mining damage

SEVERITY OF *Tuta absoluta* ACROSS THE THREE SITES AND ON SAMPLED PLANT PARTS

In all the sites, the lowest part of the leaf was highly infested and damaged with the highest range of damage appearing at Karithii site while the lowest range was at Kimbimbi (Fig. 3). The trend was different for the intermediate and upper part of the leaf where the highest range value of damage was observed at defathers and Kimbimbi, respectively and the lowest was observed at Kimbimbi and defathers, respectively. Generally, the upper part of the leaf recorded the lowest damage of *T. absoluta* among the three location of the leaf sampled. The box plots also depicts the infestation data at Defathers and Kimbimbi to be highly negatively and positively skewed, respectively. On the other hand, Karithii showed a mild skewness.


Effect of Site on leaf damage
Leaf damage
75
50
25
0
Kariithi
Defathers
Kimbimbi
Site
Leaf Location
Lower
Intermediate
Upper

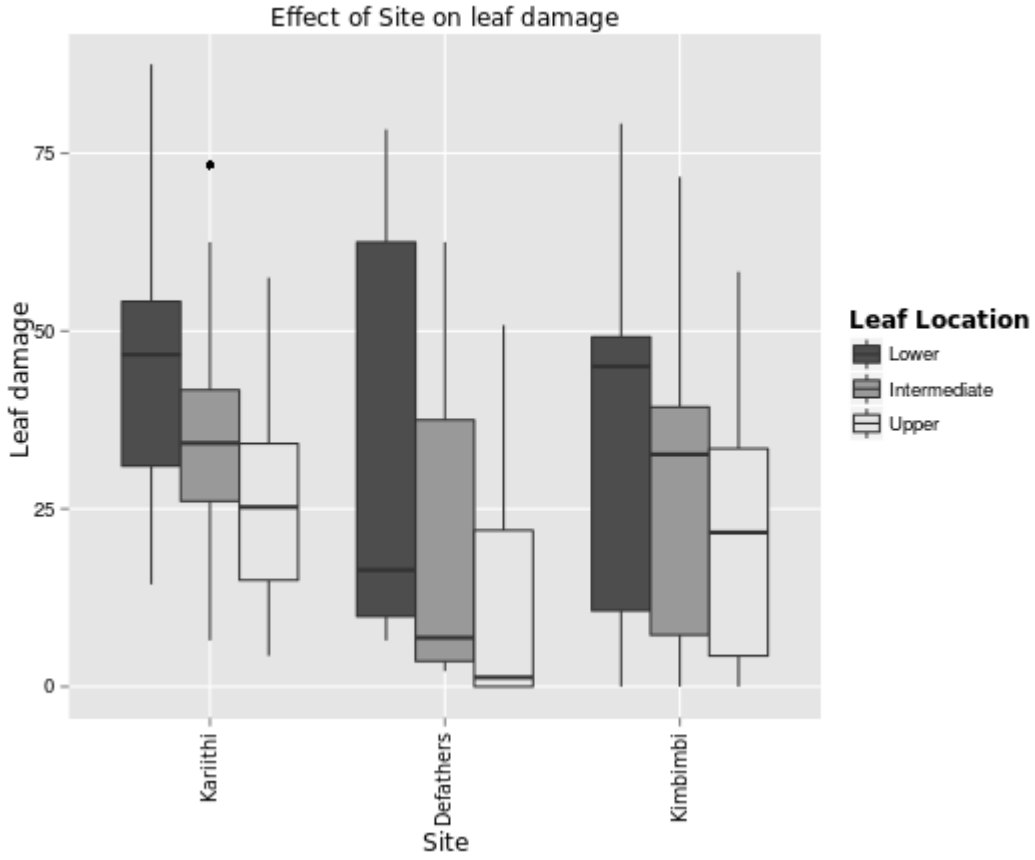


Figure 3: Percentage leaf damage by *Tuta absoluta* across the three sites.

Among the three sites where tomatoes were planted and percentage leaf damage by *Tuta absoluta* measured, Kariithi showed the highest (37%) infestation of the pest compared to the other sites (Table 1). The damage at Kariithi was greatly significant to the two sites which recorded the lowest damage. There was no significant differences between the two sites, defathers (22%) and Kimbimbi (28%), in terms of percentage damage by the pest.

Table 1: Severity of *Tuta absoluta* damage (in percentage) on tomato leaves in three different sites. Means marked with the same lowercase letters are not significantly different (mean ± standard deviation, $p > 0.05$, tukey test)

Location (site)	Damage Percentage (%)

Kariithi	37 ± 19 a
Defathers	22 ± 23 b
Kimbimbi	28 ± 23 b

Comparing the time period from transplanting to maturity of the tomatoes, *Tuta absoluta* damages to the lower, intermediate and upper part of the leaf were least observed at 20 and 40 days after transplant (Fig. 4). The percentage damage increased after 60 days which were signigicantly higher to 20 and 40 days, across the plant parts. The trend was the same at 80 and 100 days after transplant, where at 100 days the damages was significantly higher than all other counting periods across the leaf parts. Overall, the highest leaf damaged (73%) by *Tuta absoluta* was observed on the lower leaf part at the 100 days after transplant whereas the lowest damage (5%) was observed on the upper leaf part after 40 days of transplanting.

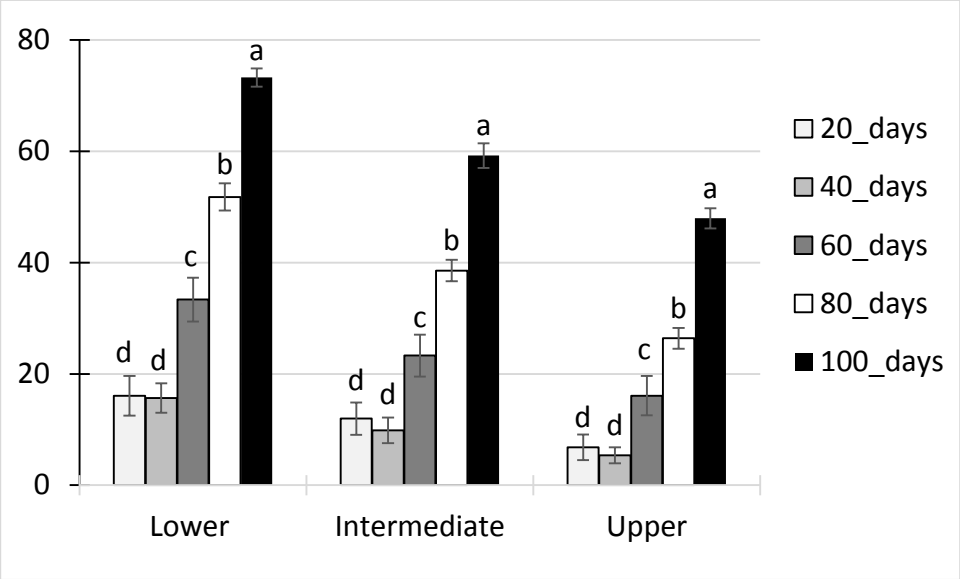


Fig 4: Severity of *Tuta absoluta* damage (in percentage) on tomato leaves based on time of plant growth and the location of the leaves on the plant. Means marked with the same lowercase letters are not significantly different (standard error bars, $p > 0.05$, tukey test)

Discussion

The presence of *T. absoluta* was evident in this study, pheromone trap catches of adult *T. absoluta* were collected across the 15 focal fields distributed in 3 sites. Our results show an already established population of *T. absoluta* in Kirinyaga County. Pheromone traps have been widely used to monitor, forecast and sometimes control insect pest populations (Prasad and Prabhakar, 2012). Further, pheromone traps can be used to efficiently monitor pest population for correct timing of pesticide application. Despite chemical control of the insect pest, Results revealed an increase in *T. absoluta* population as the crop advanced in growth. This could have been attributed to the availability of the crop and therefore there was enough food supply that promoted reproduction and multiplication. Allache et al. (2015) reported

similar results where adult *T. absoluta* catches were present throughout the tomato crop cycle. Further, Torres et al. (2001) reported that with availability of host plants, the adult moth continues to oviposite.

Tuta absoluta catches were found as early as 2weeks after transplanting this could be attributed to the cultural practices of the farmers. Most of the farmers practice monocropping and after harvest of the crop they left the crop residues at the periphery of their fields; this provides a favourable environment for *T. absoluta* to survive before the crop residues are completely decomposed. Further, *Tuta absoluta* is associated with other solanaceous plants including weeds which are cultivated in Kirinyaga County as indigenous vegetables. Establishment of the insect pest could also have been accelerated by short distance dispersal of the insect pest since most of the farmers in the county are small scale farmers. Ajaya et al. 2016 found that short distance spread of *Tuta absoluta* could occur by flight since the insect pest can fly several kilometers.

Tuta absoluta mining damage was found in all the 15 focal fields throughout the crop growth stages. Larval mining was found in the leaves causing irregular mines; fully grown larvae could be seen inside galleries (Fig. 2). Arno and Gabarra (2011) noted that tomato plants can be infested by *T. absoluta* from seedling to mature plants. *Tuta absoluta* damage was seen as early as 20 days after transplanting and this was found to increase steadily over time while highest mining damage was at 80 to 100 days after transplanting during flowering and fruiting stage. Brahim et al. (2009) reported similar results while assessing population dynamics of *Tuta absoluta* where there was low level of infestation 11 weeks after transplanting but this increased steadily and was highest at 19 weeks after transplanting. This increase in *Tuta absoluta* infestation can be linked to continuous availability of food and favourable environmental conditions to the insect pest. Nayana et al. (2018) revealed a low *Tuta absoluta* infestation level during the first phenologic cycle but by the end of the cropping cycle there was a significant increase in the insect pest density. Further, Leite et al. (2004); Oliveira et al. (2009) reported severe attacks by *T. absoluta* towards the end of the tomato crop cycle.

Extensive mining was seen on the lower leaves (73%) (Fig. 3) followed by intermediate leaves and then upper leaves. Other studies show that leaves were more attractive to female *T. absoluta* and the lower leaves were more infested than upper leaves (Hussein *et al.,* 2015). *Tuta absoluta* has a high preference to lay its eggs on the apical part of the tomato plant as the third and fourth instar larvae were found on leaves of the middle and lower parts of the plants (Asma*et al.,* 2013). Lower leaves had the highest infestation by *Tuta absoluta* across the three sites; this could be attributed to the fact that fourth instar larvae prefer basal leaves awaiting pupation in the leaves or the ground. As the crop advanced in growth *Tuta absoluta* infestation was seen in the intermediate leaves and upper leaves. Trottin-Caudal et al. (2012) revealed similar results where *Tuta absoluta* mining was observed more on the lower part of the plant but as populations increased mining damage was seen on higher parts of the plant as well as green fruits.

Despite insecticide applications by farmers which were mainly calendar based *Tuta absoluta* damage increased over time across the three sites. Most farmers increased the chemical dosage, frequency of spraying and even mixed more than one insecticide with different modes of action when there was reduced efficacy in the control of the insect pest (Nderitu et al., 2018). However, frequent use of synthetic insecticides have been found to reduce populations of naturally occurring predators and parasitoids of *Tuta absoluta* and increased development of resistant populations of the insect pest (Anastasios *et al.,* 2014;

Ajaya *et al.,* 2016). Garzia et al. (2012) reported a rapid adaptation of T. absoluta to different environments and heavy infestations when unsuitable or untimely control measures are applied.

Conclusion

It is evident from this study that *T. absoluta* is established in Kirinyaga County. Pheromone traps have been found to be effective in monitoring and identifying the presence and abundance of the insect pest early in the season. *Tuta absoluta* was found to cause sizeable damage despite chemical insecticide application. It is therefore imperative to develop ecologically sound integrated pest management strategies for *T. absoluta* sustainable control.

References

Ajaya Shree, R.B., P.M. Ram, B. Binu, B. Sanjaya R.S. Pathour and M.M. Naresh, 2016. The First record of South American tomato leaf miner, Tuta absoluta (Meyrick 1917) (Lepidoptera: Gelechiidae) in Nepal. Journal of Entomology and Zoology Studies; 4(4): 1359-1363

Allache, F., Y. Bouta and F. Demnati, 2015. Population development of the tomato moth *Tuta*

absoluta (Lepidoptera: Gelechiidae) in greenhouse tomato in Biskra, Algeria. – Journal of Crop

Anastasios, N.T. W. Stephen and L. Carlo, 2014. The tomato leaf miner (*Tuta absoluta*): Conventional pest problems, Organic management solutions? Organic Agriculture 4: 43-61.

Arno, J. and R. Gabarra, 2011. Side effects of selected insecticides on the Tuta absoluta (Lepidoptera: Gelechiidae) predators Macrolophus pygmaeus and Nesidiocoris tenuis (Hemiptera: Miridae). J. Pest Sci. 84: 513–520.

Asma, C. and M. Ramzi and G. Kaouthar, 2013. Biological aspects of tomato leaf miner *Tuta absoluta* (Lepidoptera: Gelechiidae) in conditions of Northeastern Tunisia: possible implications for Pest Management. Environmental & Experimental Biology; 11: 179-184.

Barrientos, Z.R., H.J. Apablaza S.A. Norero and P.P. Estay, 1998. Temperatura base y constant termica de desarrollo dela polilla del tomate, Tuta absoluta (Lepidoptera: Gelechiidae), Ciencia e investigacion Agraria, no. 25, pp. 133-137.

Brahim, C., A. Khaled, A. Mariem, B.O. Soukaina, O. Mohamed, G. Wafa and K. Sonia, 2009. First Estimate of the damage of *Tuta absoluta* (Povolny) (Lepidoptera: Gelechiidae) and Evaluation of the efficacy of Sex Pheromone Traps in Greenhouse of Tomato Crops in the Bekalta Region, Tunisia. The African Journal of Plant Science and Biotechnology vol. 3 (1) pp. 49-52.

Estay, P., 2000, 'Polilla del tomate *Tuta absoluta* (Meyrick)', INIA La platina, Instituto de Investegaciones Agropecuarias, Centro Regional de Investigacion La Platina, Santiago, Chile, 4pp.

FAO, 2012, 'Growing Greener Cities in Africa. First Status Report on Urban and Peri-urban Horticulture in Africa', *Food and Agriculture Organization of the United Nations*, Rome, Italy.

Leite, G.L.D., M. Picanço, G.N. Jham, F. Marquini, 2004. Intensity of Tuta absoluta (Meyrick, 1917) (Lepidoptera: Gelechiidae) and Liriomyza spp. (Diptera: Agromyzidae) attacks on Lycopersicum esculentum Mill. leaves. Ciênc. Agrotec. 28: 42–48.

Nayana, B.P., P.R. Shashank and C.M. Kalleshwaraswamy, 2018. Seasonal incidence of invasive tomato leafminer, Tuta absoluta (Meyrick) (Lepidoptera: Gelechiidae) on tomato in Karnataka, India. Journal of Entomology and Zoology Studies; 6 (1): 400-405.

Nderitu, W.P., J.J. Muturi, O. Mark, A. Esther, and M. Jonsson, 2018. Tomato Leaf miner (*Tuta absoluta*) (Meyrick 1917) (Lepidoptera: Gelechiidae) prevalence and farmer management practices in Kirinyanga County, Kenya. – Journal of Entomology and Nematology 10: 43–49.

Oliveira, F.A., D.J.H. Da Silva, G.L.D. Leite, G.N. Jham and M. Picanço, 2009. Resistance of 57 greenhouse-grown accessions of Lycopersicon esculentum and three cultivars to Tuta absoluta (Meyrick) (Lepidoptera: Gelechiidae). Sci. Hort. 119: 182–187.

Picanco, M., G.L.D. Leite, R.N.C. Guedes and E.A. Silva, 1998, 'Yield loss in trellised tomato affected by insecticidal sprays and plant spacing', *Crop protection,* Vol. 17, pp. 447-452. Protection 4: 509–517.

Silvério, F.O., E.S. de Alvarenga, S.C. Moreno and M.C. Picanço, 2009. Synthesis and insecticidal activity of new pyrethroids. Pest Manage. Sci. 65: 900–905.

Torres J.B., C.A. Faria, W.S Evangelista Jr and D. Pratissoli, 2001. Within-plant distribution of the leaf miner Tuta absoluta (Meyrick) immatures in processing tomatoes, with notes on plant phenology. Int. J. Pest Manage. 47: 173–178.

Trottin-Caudal Y., V. Baffert, J.M. Leyre and H. Hulas, 2012. Experimental studies on *Tuta absoluta* (Meyrick) in protected tomato crops in France: biological control and integrated crop protection. EPPO Bull 42:234–240.

Influence of Secondary School Students' Attitude Towards Agriculture on Employment Creation in Vihiga County, Kenya

Seraphine Sherry Aholi[1*] and Dr. Jacob J. J. Ochieng' Konyango.

[1] Egerton University, Department of Agricultural Education and Extension, P.O. Box 536, Egerton, Kenya.

[2,] Machakos University, Department of Agricultural Education and Extension, P.O. Box 136-90100, Machakos, Kenya.

[*]Corresponding Author's Email; aholiseraphine@gmail.com,Tel./Fax +254 728555331

Abstract

Agriculture is believed to be the backbone of the Kenyan economy contributing to over 30% of the Gross Domestic Product and employs about 80% of the rural population. Kenya Vision 2030 positions it as a key driver for delivering the 10% annual economic growth. It is estimated that 64% of unemployed persons in Kenya are youth, indicating a serious employment problem. Emuhaya Constituency being an agricultural potential area, little attention has been taken to identify why there is a high rate of unemployment yet some of the youth who have learnt agriculture in secondary school are idle thus indulging in crime and other social vices. The purpose of this study was to analyze the influence of secondary school students' attitude towards agriculture on employment creation in Vihiga County, Kenya. The study was done in Emuhaya Constituency and adopted qualitative research design using descriptive survey method. The target population was the youth who learnt agriculture in secondary schools. The study purposively sampled 150 youth out of a total population of 2,736 youth who sat for KCSE in Emuhaya Constituency between 2010-2012. Data was collected using structured questionnaire. Academic experts from the Department of Agricultural Education and Extension validated the instrument. The instrument had a Cronbach's Alpha reliability coefficient of 0.814, at 0.05 level of significance. The data was analyzed using the Statistical Package for the Social Sciences, based on the objectives and research questions. The relationship between the secondary school students' attitude towards agriculture and employment creation was tested using Pearson Correlation. Frequency tables and percentages summarized the results. The study established that teaching of agriculture in secondary school based on students' attitude was negatively related to employment creation for out of school youth in Emuhaya Constituency of Vihiga County. The study recommended formulation of policies that promote harmonization between agriculture teaching and employment creation, it recommended youth to take up agricultural activities for employment and also recommended replication of similar studies in other levels of education such as primary and university.

Key Words: Agricultural Policy, Employment Creation, Learning Resources, Students Attitude, Agricultural Education

Introduction

1.1 Background to the Study

Young farmers play an important role in ensuring food security for future generation although they face many challenges. Statistics on rural youth employment are scarce because the country's employment data are usually not disaggregated according to locality (rural/urban) and age group (ILO, 2010). It is estimated that 78.31% of Kenyans are below 35 years and that 64% of unemployed persons in Kenya are youth. Only 1.5% of the unemployed youth have formal education beyond secondary school level and the remaining over 92% have no vocational or professional training with majorities in rural Kenya (KNBS 2010).

KNBS (2010) reveals that Emuhaya Constituency has, 155,065 youth comprising of 70,012 males and 80,053 females where only 34,242 males and 37,793 females are employed but the remaining 83,030 youths, comprising 37,770 males and 45,260 females are unemployed, thus showing a serious employment problem. Most of these secondary school leavers don't get formal employment hence proper agricultural education offered in schools should provide the school leavers with core skills in agriculture which will enable them to be self reliant through self employment.

Secondary school agriculture is one of the subjects that aim at meeting the employment needs of the students who terminate their education after secondary school. Self-reliance provides the initial importance of teaching agriculture in schools. Studies have been done on enrollment, performance and other aspects of secondary school agriculture but no study has been done to determine the relationship between students attitude towards the subject and employment creation for the out of school youth. Little attention is taken to identify whether the original objectives of making agriculture a dignified and profitable occupation have been diverted or shelved in Emuhaya Constituency.

The rate of youth unemployment in Emuhaya Constituency is high; the youth are idle, which lead to problems of increase in crime and other social related vices among the youth. Food insecurity is also a major concern now, yet agriculture should offer vital skills to school leavers for self-reliance or salaried employment while on the other hand producing sufficient food through improved modern farming techniques and biotechnologies. The critical question was to find out why unemployed youth having studied agricultural principles, have shied away from taking up on agriculture as a source of employment in Emuhaya Constituency.

1.2 Literature

Attitude is learned predispositions to respond either positively or negatively to certain situation, instructions or people (Oppenheim, 2000). The key factors that contribute to students selection of subjects are; interest in the subject, perceived usefulness of the subject, ability or success of the subject, career preference, subject combination for further studies, teachers advice and the teaching strategy (Berry, 2004). A study by Cheplogoi (2011) indicated that students had a negative attitude towards agriculture while teachers had a positive attitude. When teachers have positive attitudes towards an innovation, they will be willing to spend time and efforts in the implementation of the process.

Students have misconceptions of agriculture as a career because they are not only unaware of the type of jobs in the sector but they also have the impression that all jobs in this area have very low pay as well, parents have a negative attitude towards the career (Chee and Leong-Yong, 2011). Students' enrollment in agriculture is driven by certain preference in other agriculture related careers but not associated with farm work and therefore see agriculture as employment provider rather than creation (Hansel, 2009). Schools in the Pacific and in the Sub-Saharan Africa, use agricultural activities as punishment contributing towards students' negative attitude towards agriculture (Dalla, 2010). For example, in Uganda agriculture it is unattractive to the young partly because it is used in schools in the administration of punishment to errant and undisciplined children (Agena, 2011).

Youth are the main source of productive labour in agriculture and if motivated to participate actively in agriculture, then it will promote industrial revolution (Aksoy, 2012). In the rural areas, farming is the most applicable and readily available form of employment for out of school youth, using the available land in the rural areas for either crop and or livestock production. Agriculture is the single most important sector in the economy, contributing approximately 25% of the Gross Domestic Product, and employing 75% of the national labor force (Republic of Kenya, 2005). Functions of agricultural and agribusiness education therefore included; Educating individuals for employment in the fields of agriculture and agribusiness; A vocational agricultural course work and ; Issues having to do with the 'food crisis'. The authors went on to explain that agricultural education is based on decision making through problem solving, and is centered on experience and it addresses both individual and community needs; is related to resource management. Secondary school agriculture hence should lead to increased self-employment opportunities for young people who leave school and do not continue with higher education.

Although Kenya has enjoyed relatively high economic growth rates over the past decade, formal job creation has been lower than the rate at which the labor force is growing. Challenges still remain on bridging the gap between economic growth and jobs creation and in turn address the growing unemployment1 especially among the youth (Page, 2012). Levels of underemployment, vulnerable employment are even higher than the levels of unemployment since only a few youth can afford to remain unemployed – they often engage in part time work even for a few hours just to make ends meet. It is thus not surprising that there are high levels of working poor i.e. those who are employed but they live below the poverty line. Creating decent employment opportunities for this rapidly increasing youthful labor force as MDG 1 target 1B2 stipulates is a challenge that has reached a level of priority for Kenya's development agenda.

Brooks et al., (2012) and Kararach et al., (2011) reveal that creation of non-agricultural jobs may not happen in the short run; as such agriculture is likely to continue being a source of employment and livelihood in the medium to long term especially for countries that heavily depend on agriculture. The 2008 World Bank "Agriculture for development report" further points out the enormous potential of agriculture in offering employment (World Bank 2008). Despite the recognition of employment creation within the sector, youth participation in agriculture especially as farmers is declining not only in Kenya, but in other African countries alike (FAC, 2011).

Apparently, the agriculture sector is not looked at as a viable sector of employment and remains highly unattractive to the youth due to the risks, intensive nature and low profitability (FAO, 2012). Most of the youth engaged in agriculture are vulnerably employed as own account workers and contributing family

workers with little or no income accruing to them. While the exodus of the youth from the agriculture sector might seem to be higher than that of the prime age group, the majority of the youth continue to derive their livelihood from agriculture. Some would argue that this movement away from agriculture is a sign of structural transformation of the economy; but the pattern has not brought with it the required job growth needed to absorb the increasing young labour force and as such high levels of underemployment are being experienced in the services and industrial sectors (FAO, 2010).

The poor state of youth participation in agricultural activities in Kenya has been a matter of great concern among agriculturists, agricultural researchers as well as administrators. This is because the present poor state of decline in agricultural production has dimmed the hope of raising the level of agricultural production to ensure sustainable food security for the ever increasing population of Kenya. One of the major setbacks of agricultural development programmes is attributed to the inability of the federal government to integrate youths into the mainstream of the numerous agricultural development programmes implemented over the years (Bertow & Schultheis. 2007).

Several studies have identified potential entry points for youths in agriculture sector which include provision of unpaid labour at their households or even work as day casual labourers for wages using during the rainy seasons (SACAU, 2013). Agribusiness (Mibey, 2015), Fish farming (Mandania, 2012), poultry farming (Kirui, 2014) and horticulture farming (Gichuki, 2012) have also been identified.

Youth consider secure land access as principle for starting farming (FAO, 2011). Youth access to land contributes to household food security, employment creation and income generation as land is used as collateral and security for one to access credit, signifies their identity, elevates their status, and also improves their participation in decision making within their communities and other organizations (MIJARC et al, 2012). A study in Uganda revealed that the land tenure systems hinder youth from engagement in agriculture as many use it without exclusive rights of ownership (Ahaibwe et al 2013).

According to UN-HABITAT (2011) youth are always never aware of land acquisition, registration and taxation requirements and therefore fall prey to fraudulent and corrupt land dealers. Nonetheless, expecting youth to acquire land through purchasing is unrealistic since most are not employed and those who are have low wages and also the land prices are so high which pose even a bigger challenge for young women in developing countries who usually work as house helps and earns low wages (FAO, 2011b). The policy and legal documents on the other hand do not always include youth land rights and if so there are no defined mechanisms for policy implementation since the youth are never involved in the development of the laws and policies in relation to land and thus they never respond to their needs. (FAO, 2012).

The youth are faced with several challenges as they try to access markets, which at times surpass what generally smallholder farmers in developing countries experience (Giuliani and Valle, 2014). These include: strict supply chain standards for the supermarkets and the international market (FAO, 2014), inadequate knowledge and experience on market systems and structures, lack of skills to manage their entrepreneurial ventures as well as lack of information about prices. Further, demand for highly processed food triggered by globalization affects the market systems and standards and leads to introduction of new safety and quality standards that youth must comply to (Giuliani and Valle, 2014). This limits them from accessing and selling their produce for higher prices to other national, regional and international markets and this scenario leaves the youth with the option of the local (rural) markets (FAO, 2014). In Zambia,

the markets are characterized by instability in demand and prices, disorganization of the markets and delayed payments by dominant buyers which affects youth in farming (SACAU, 2013) This study further points that youths are interested in farming businesses which yield money fast, have minimal labour demands and also the ones with guaranteed such as contractual farming.

A study by Njega, et al (2012) revealed that 71.7% of the youth and women engaged in agriculture were not happy with their agricultural earnings resulting from low return on investment. Lack of market, lack of market information, high competition, inadequate skills of marketing their produce, inaccessibility to potential good markets, high exploitation by the middle men and low prices further affect youth access to market (Gichuki, 2012). Additionally, the rapid changes in the market, rising quality standard, the growing demands for high value products and the emergence of new market types and arrangements also affect the youth (Akpan 2011).

In many rural areas of the developing countries, accessibility to suitable education and training is always limited (Sanginga, 2014) and hence farming knowledge is mostly transferred to children from their parents (PAFPNet, 2010). Supporting education related to agriculture for efficient operation of small scale farms, profitability, market access and engagement process in the various agribusiness will enhance youth engagement in agriculture (Abdul et al., 2013). Agricultural curricula has slowly disappeared, it is outdated and inadequate in most schools in developing countries where agriculture is considered a fall back plan for those who don't perform well in school.

1.3 Conceptual Framework

The independent variable in this study is the youths' attitude towards agriculture measured in terms of the agriculture knowledge is just for purposes of passing exams, lack of practical learning, lack of resources and facilities and low income from agriculture-based employment. The dependent variable is youth employment measured in terms of crop production, livestock production, value addition, transportation and marketing. The intervening variables influence the effects of the independent variable on the dependent variables. These are performance of school agricultural projects and conduciveness of agro-ecological conditions and sources of funds for the agricultural activities.

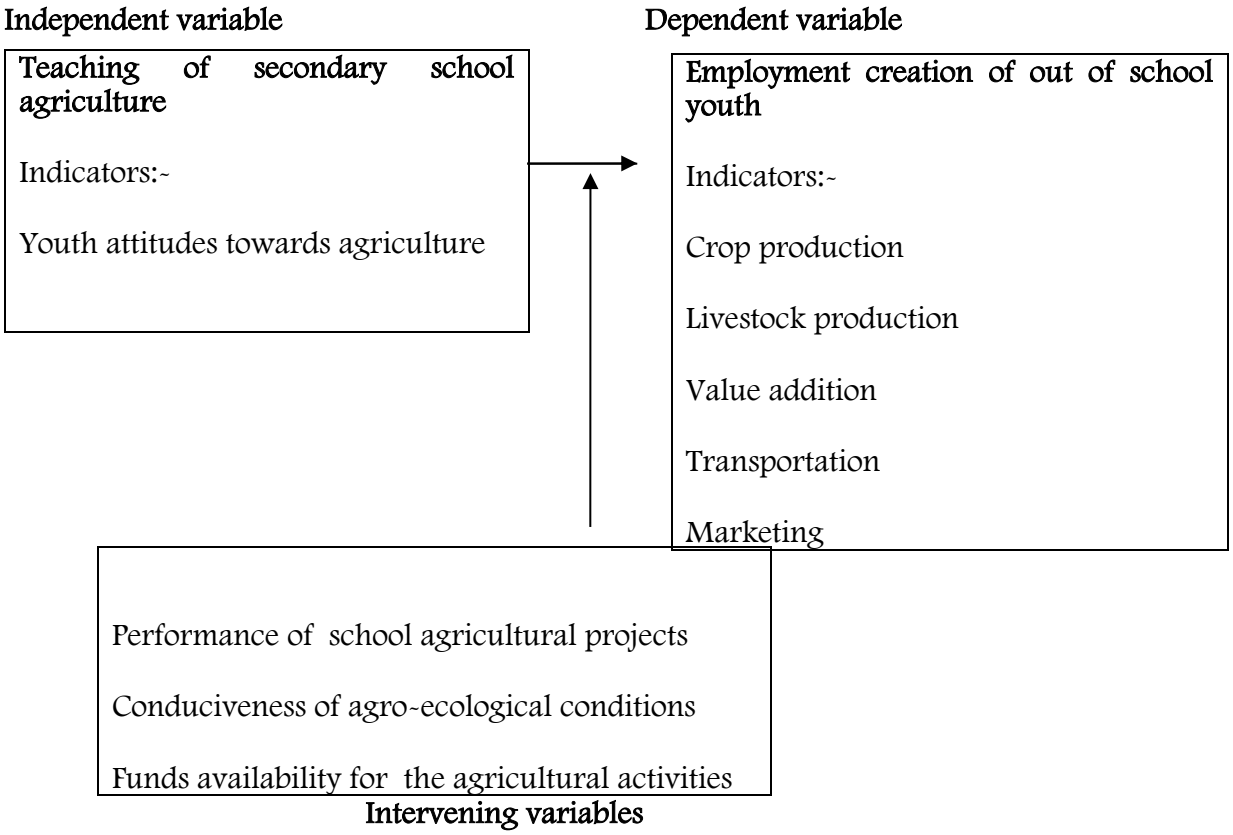


Figure 1: Conceptual framework showing the relationship between secondary school students' attitude towards agriculture and employment of the out of school rural youth.

2.0 Material and Methods

2.1 Research Design

This study adopted qualitative research design using descriptive survey method. The study was conducted between May to July 2015.

2.2 Area of the Study

The study was conducted in Emuhaya Constituency located in the Vihiga County of Kenya, adjacent to Maseno University and bordering Kisumu City. The Constituency covers an area of 94.50km^2 with a population of 95,064 people (KNBS, 2010). The Constituency receives a bimodal type of rainfall. The average annual rainfall range is 1500-2000mm per annum. The long rains starts from March and ends in May while short rains season starts in October and ends in December. The rainfall pattern is convectional with lightning and at times hailstorms. Rainfall is well-distributed and approximately 85% reliable, (GOK, 2009). The average farm holding is about 2ha. Mixed farming is mainly practiced on small

scale. Farmers keep cattle, sheep, goats, poultry, and also plant crops such as maize, beans, sorghum, millet, groundnuts, cowpeas and sweet potatoes, (MOA, 2011). Weaving of baskets, ropes and mats is also done from sisal and papyrus reeds. Agribusiness is mainly done in Luanda Town which is a major market, along the Kisumu-Busia highway.

2.3 Study Population

The target population consisted of 2,736 youth who studied agriculture up to form four in 32 secondary schools in Emuhaya Constituency between 2010 and 2012, according to the Vihiga sub-county KCSE Examination.

2.4 Sample Size and Sampling Procedure

The sample size was 150 respondents of the target population and their employment in agriculture related activities. Three Wards in the Constituency were randomly selected then 50 respondents were picked from every ward represented in the sample. These employment activities included crop production, livestock production, marketing, value addition and transportation of agricultural products.

Snowball method was used to reach the other out of school youth who learned agriculture in secondary school, one hundred and fifty youth were stratified because their population did not constitute a homogeneous group. Thus, the aim was to stratify them into male and female population. They were then sampled by simple random sampling, fifty youth from every ward were sampled and this was the criteria of selection.

2.5 Data Collection Instruments

The study will use structured questionnaire which was administered to the respondents.

2.6 Data Collection Procedure

A letter of approval was obtained from the Board of Graduate Studies of Egerton University and was presented to the National Commission for Science, Technology and Innovation (NACOSTI) to obtain a research permit. Once authority was obtained, arrangement was made to visit the Constituency Agriculture Office, in Emuhaya Constituency for permission and authority to conduct research in the Constituency. With assistance of Constituency Extension Officers, 150 out of school out of school youth were selected and given the questionnaires.

2.5 Data Analysis

Quantitative data was coded and analyzed using Statistical Package for the Social Sciences (SPSS). Frequency tables and percentages were used to summarize and present the quantitative data. The relationship between the teaching of agriculture in secondary school and employment creation was established using Pearson Correlation where the independent variables were elements of agriculture teaching methods and dependent variable was employment creation. In order to establish the elements of

students' attitude towards agriculture teaching methods that contributed more to employment creation, regression analysis model below was used.

$$Y = \beta 0 + \beta 1 X1 + \beta 2 X2 + \beta 3 X3 + \beta 4 X4 + \varepsilon$$

Where;

Y = Employment creation

$\beta 0$ = Constant Term

$X1$ = Independent Variable 1 (agriculture knowledge is for exams)

$X2$ = Independent Variable 2 (lack of practical learning)

$X3$ = Independent Variable 3 (lack of resources)

$X4$ = Independent Variable 4 (low income from agriculture)

$B1 - \beta 4$ = Regression Coefficient for each independent term

ε = Random or Stochastic Term

The model assumes that:

(i). There is little or no multicollinearity in the data. Multicollinearity occurs when the independent variables are not independent from each other.

(ii).The error of the mean will be independent from the independent variables.

3.0 Results and Discussions

3.1.1 Attitude on Secondary School Agriculture

This section presents data related to the objective number three of this study which was stated as; determine the relationship between attitude on secondary school agriculture and employment creation of the out of school youth. The following variables were used to analyze out of school youths attitude on secondary school agriculture and employment creation; knowledge gained from learning agriculture in secondary school was only aimed at passing examinations, lack of practical learning once theoretical principles were learnt in classroom, lack of resources and facilities and agriculture had low income. Attitude in this analysis was based on Oppenheim (2000) who describes attitude as learned predispositions to respond either positively or negatively to certain situation, instructions or people.

Table 1: Attitude on Secondary School Agriculture and Employment Creation

Statement	SD	D	U	A	SA	TOTAL
Agriculture knowledge was for exams	13.9	12.4	7.3	66.4	-	100.0
Lack of practical learning	-	8.8	0.7	16.1	74.4	100.0
Lack of resources	7.3	13.9	-	37.2	41.6	100.0
Low income from agriculture	6.6	7.3	6.6	20.4	59.1	100.0

Source: Field Data (2015).

Majority of respondent 66.4% saw agriculture as a subject only for passing examinations compared to 26.3% who saw it as a subject that gave learners skills for employment creation. Majority of respondents 74.4% agreed that lack of practical learning once theoretical principles were learnt in classroom compared to 8.8% who had a positive attitude on the subject. Majority of respondents 78.8% agreed that there was lack of current resources and facilities on principles of agriculture in secondary schools compared to 21.2% who disagreed. Majority of respondents 71.5% agreed that agriculture was low in income subject in terms of returns in case one created an employment out of the subject compared to 13.9% who disagreed.

This finding revealed that school youth had negative attitude towards the following aspects of agriculture; that they learnt agriculture only for purposes of passing exams, the schools did not give them practical skills rather more theoretical knowledge which could not be applied in job creation, that the schools where they learnt lack resources that could give them vision of pursuing agriculture for job creation, that agriculture was a low income based subject which did not attract them to learn it for purposes of job creation and that there was lack of information on agricultural opportunities and occupations after school for employment. This finding confirmed Cheplogoi (2011) whose study indicated that students had a negative attitude towards agriculture while teachers had a positive attitude. When teachers have positive attitudes towards an innovation, they will be willing to spend time and efforts in the implementation of the process.

This finding further confirmed a report by FAO (1997) that showed that at times students lack interest in agriculture; therefore, will only enroll for it when they do not have options to go for other subjects. The negative attitude of the subject may explain why agriculture subject was introduced to schools in Kenya in 1926 followed by subsequent drop in 1931 though it was later re-introduced in 1960 at Chavakali high school. Mutonga (1995) asserts that there was poor enrollment in Chavakali high school based on argument of parents that their sons would go to hold *jembes* and that agriculture was not among the subjects examined by the Cambridge Examination Syndicate (CES).

3.1.2 Agriculture as Employment Creation

Table 2: Appreciation of Agriculture as Employment Creation by Students

Response	Frequency	Percent
Yes	122	89.1
No	15	10.9
Total	**137**	**100.0**

Majority of respondents 89.1% agreed that agriculture was an important subject for employment creation compared to 10.9% who did not agree. Some of the reasons respondents gave included; students practicing crop farming after finishing school, other students practicing livestock production after school, others observed that some students started agricultural value addition enterprises. This finding supports Schools Mwiria (2002) who found that schools that do well in a given vocational subject in the KCSE tend to show more interest and to set aside more resources for their teaching as argued by. In the rural areas, the most important resource available for most youth at their disposal is the farm. Once the rural youth acquire appropriate knowledge and skills on agriculture, they will be able to utilize the farm adequately; since the capital and recurrent investment required maintaining the economic viability of a farm may be only this land for most youth who are out of school.

Table 1: Area of Agriculture used for Job Creation

Activity	Frequency	Percent
Crop Production	103	75.2
Livestock Production	14	10.2
Processing of agricultural products	7	5.1
Transportation of agricultural products	10	7.3
Marketing of agricultural products	3	2.2
Total	**137**	**100.0**

Majority of respondents 75.2% observed that crop production was mostly used for job creation, followed with 10.2% who used livestock production, 7.3% used transportation of agricultural products in job creation, 5.1% used value addition and 2.2% used marketing of agricultural products to create jobs.

Table 4: Agricultural Skills Applicable for Employment Creation

Activity	Frequency	Percent
Crop Production	80	58.4
Livestock Production	38	27.7
Processing of agricultural products	13	9.5
Transportation of agricultural products	3	2.2
Marketing of agricultural products	3	2.2
Total	**137**	**100.0**

Majority of respondents 58.4% observed that crop production was most used for job creation, followed with 27.7% who used livestock production, 2.2% used transportation of agricultural products in job creation, 9.5% used value addition and 2.2% used marketing of agricultural products to create jobs.

Table 5: Agricultural Activity Mostly Practiced for Income Generating Activity

Activity	Frequency	Percent
Crop Production	67	48.9
Livestock Production	47	34.3
Processing of agricultural products	13	9.5
Transportation of agricultural products	3	2.2
Marketing of agricultural products	7	5.1
Total	**137**	**100.0**

Majority of respondents 48.9% observed that crop production was most used for job creation, followed with 34.3% who used livestock production, 2.2% used transportation of agricultural products in job creation, 9.5% used value addition and 5.1% used marketing of agricultural products to create jobs.

Table 6: Agricultural Activity Out of School Students were willing to Continue Practicing for Future Employment.

Activity	Frequency	Percent
Crop Production	94	68.6
Livestock Production	13	9.5
Transportation of agricultural products	4	2.9
Marketing of agricultural products	26	19.0
Total	**137**	**100.0**

Majority of respondents 68.6% observed that crop production was most used for job creation, 9.5% who used livestock production, 2.9% used transportation of agricultural products in job creation and 19.0% used marketing of agricultural products to create jobs. This finding reveals that out of school students were willing to apply knowledge, apply skills, apply agricultural principles and continue with crop farming activity for purposes of employment creation. Activities like livestock production; agricultural products value addition, transportation of agricultural products and marketing of agricultural products, as activities were not favorably used by out of school youths in employment creation.

3.1.3 Attitude on Secondary School Agriculture and Employment Creation

This section presents data related to the objective number three of this study which was stated as; determine the relationship between attitude on secondary school agriculture and employment creation of the out of school youth. The following variables were used to analyze out of school youths attitude on secondary school agriculture and employment creation; knowledge gained from learning agriculture in secondary school was only aimed at passing examinations, lack of practical learning once theoretical principles were learnt in classroom, lack of resources and facilities, agriculture subject was those who were not bright, agriculture had low income and lack of information on agricultural activities. Attitude in this analysis was based on Oppenheim (2000) who describes attitude as learned predispositions to respond either positively or negatively to certain situation, instructions or people.

Table 6: Attitude on Secondary School Agriculture and Employment Creation

Correlations	employment Creation	passing examinations	Lack of modern resources	Lack of practical learning	Low income
employment Creation	1	0.166	0.059	-0.038	-0.014
		0.053	0.495	0.662	0.871
passing examinations	0.166	1	0.144	0.265	0.042
	0.053		0.093	0.002	0.625
Lack of modern resources	0.059	0.144	1	0.544	0.210
	0.495	0.093		0.000	0.014
Lack of practical learning	-0.038	0.265	0.544	1	0.362
	0.662	0.002	0.000		0.000
Low income	-0.014	0.042	0.210	0.362	1
	0.871	0.625	0.014	0.000	

Source: Field Data (2015)

The study established a weak negative correlation of 0.116 (p= 0.053>0.05) between agriculture as a subject for passing exams and employment creation. This finding reveals that alignment between employment creations by agriculture as a subject was inverse to students seeing the subject for passing exams. This finding does not support of the expectation of EAEC (1976), agriculture was taught in schools mainly to impart knowledge to students and inculcate in them a positive attitude towards agriculture as a dignified and profitable occupation. More than this, the intention was to prepare them for life in the rural areas. The success of effective school agriculture can be measured by those who actually go to the land, live there and earn their living through agriculture (Ray & John 1996). After all, the fundamental purpose of the agricultural education should ensure a better agriculture and make a country life, as nearly perfect as possible for practical activities and subsequent potential for self-employment of youth after school.

The study established a weak positive correlation of 0.059 (p=0.495>0.05) between lack of modern resources and facilities and employment creation. This finding reveals that alignment between employment creations by agriculture and learning resources and facilities was week. This finding did support the PWPSU (1981) which emphasized the need to make learners self reliant by the time they leave school, by offering them a broad based and practical oriented curriculum. These can be achieved when the skills needed in carrying out agricultural practices are enhanced.

The study established a weak positive correlation of -0.038 (p=0.662>0.05) between lack of practical learning and employment creation. This finding reveals that alignment between employment creation by practical learning used by agricultural teachers to prepare out of school youth was weak. This finding did support Boehrer and Linsky (1990) teaching with practical reality based cases is a good example of how teachers can exchange methods to meet student's needs and those of the larger society; hence, agriculture becomes a very important subject in secondary school for agricultural employment after school.

The study established a weak negative correlation of -0.014 (p=0.871>0.05) between agricultural based low employment contributing to youth negative attitude towards agriculture and employment creation. This finding reveals that alignment between employment creation by agriculture as a subject was inverse to agricultural based low employment contributing. This finding supports Cheplogoi (2011) indicated that students had a negative attitude towards agriculture while teachers had a positive attitude. When teachers have positive attitudes towards an innovation, they will be willing to spend time and efforts in the implementation of the process. A report by Pacific Agricultural and Forestry Policy Network (PAFPNET) (2011) confirmed that the teachers could instill a more positive image towards agriculture explaining to their students the many aspects of agriculture, its importance to everyday life and its career opportunities. The finding further supports FAO (1997) showed that at times students lack interest in agriculture; therefore will only enroll for it when they do not have options to go for other subjects. The negative attitude of the subject may explain why agriculture subject was introduced to schools in Kenya in 1926 followed by subsequent drop in 1931 though it was later re-introduced in 1960 at Chavakali high school. Mutonga (1995) asserts that there was poor enrollment in Chavakali high school based on argument that their sons would go to hold *jembes* and that agriculture was not among the subjects examined by the Cambridge Examination Syndicate (CES). African parents still had a negative attitude towards agriculture based on the myth that agricultural qualifications would not lead their sons into descent careers but end up being farmers.

Table 7: Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.209	0.44	0.15	0.311

The R^2 value indicates how much of the dependent variable, "employment creation", was explained by the independent variables, "use of agriculture to pass exams, lack of modern resources and facilities, lack of practical and agricultural employment having low returns". In this case, the R Squared is 0.44 indicating that 44% of the variation in employment creation was explained by the independent variables. The difference, that is, 56% of the variation in employment creation was explained by factors that are not included in this study.

Table 8: Full Regression Model

	Unstandardized Coefficients		Standardized Coefficients	T	Sig (p).
	B	Std. Error	Beta		
Knowledge gained is for passing examinations	1.0839	0.151		7.191	0.000
Lack of practical learning	0.038	0.018	0.189	2.143	0.034
Lack of modern resources and facilities	-0.054	0.038	-0.153	-1.396	0.165
Low income from agricultural employment	0.028	0.025	0.113	1.110	0.269
Knowledge gained is for passing examinations	0.002	0.023	0.010	0.104	0.916

a. Dependent Variable: employment creation

As indicated in Table 8, from the unstandardized coefficients, the following equation was developed:

$y = 1.0839+0.038x_1-0.054x_2-0.028x_3+0.002x_4+\varepsilon$

From the full regression model, the standardized coefficients indicate that all elements of students' negative attitude had negative effect on agriculture as a source of employment creation. In conclusion, therefore, the research question that what is the relationship between the attitude of the out of school youth on secondary school agriculture teaching and employment creation? Was established that the students' negative attitude towards agriculture teaching had negative effect on agriculture as source of employment creation.

4.2 Summary and Conclusion

The study established that the students' negative attitude towards agriculture teaching had negative effect on agriculture as source of employment creation. This was because the students viewed agriculture as a subject for passing exams; they observed that there were lack of resources and facilities for learning agriculture and also carrying out practical lessons. They also attributed agricultural employment to be a low income based employment they did not want to associate with.

Recommendation

Formulation of policies that promote harmonization between the teaching of agriculture in secondary school and employment creation. The process should be participatory involving stakeholders and other interested parties in agriculture entire food chain. Key area that should be looked at during this process include; Secondary School Agriculture Syllabus, Promotion of agriculture in all sectors of economy,

change management process in teaching, examination of agriculture, promotion of self employment in agriculture through tax regimes and international trade of Kenya agricultural products.

Take up on agricultural activities for employment after school using the knowledge and skills acquired in schools; utilize available resources for income generation; encourage other youth to develop positive mindset on farming as an occupation to reduce rural –urban migration for white-collar jobs and utilize the available land using advanced technologies for more food production.

References

Agena, M (2011). *Increasing Rural Agricultural Productivity through Technology*: A story of a young Modern Fruit Grower in Apac, Northern Uganda in 'CTA ARDYIS Essay content; 2011.

Ahaibwe, G, Mbowa, S & Lwanga M.M (2013). *Youth Engagement in Agriculture in Uganda: Challenges and Prospects*

Akpan, S.B (2012). *Encouraging Youth's Involvement in Agriculture Production and Processing.* Nigeria strategy Support Program Policy Note No. 29 synthesis report.

Aksoy, M (2012). The Evolution of Agricultural Trade Flows in Global Agricultural Trade and Developing Countries. Washington D. C: The World Bank.

Bertow, K. & Schultheis, A. (2007). *Impact of EU's agricultural trade policy on smallholders in Africa.*

Bery, D. (2004). *Career undecidedness of high school students.* Retrived from http: // www. Site resources. World Bank .org.html.

Brooks, K. Zorya, S. & Gautam, A. (2012*). Employment in agriculture; Jobs for Africa's youth, 2012 Global Food Policy Report,* International Food Policy Research Institute (IFPRI)

Chee, S., & Leong-Yong, P. (2011). Factors that Influence Brunean Students' not to Enroll in Secondary School Agriculture Subject. Darussalam: Brunei.

Cheplogois, S. (2011). *Attitudes towards Agriculture in secondary schools: the case of Teachers and Students of Baringo North District, Kenya.* (Unpublished Msc Thesis) Moi University Kenya.

Dalla, F (2010). *Promoting employment and entrepreneurship for vulnerable youth in west bank and the Gaza strip,* FAO, 2010; Youth and Farming. We take the lead, vol 27.1. and Gender in agriculture source book, 2009.

FAC (2011). *Future framers: Exploring youth aspirations of African agriculture*. Future Agriculture Consortium Policy brief 037.

FAO, (2010). *Global strategy to improve agricultural and rural statistics*.

FAO. (2011). *The State of Food and Agriculture 2010–11: women in agriculture. Closing the gender gap for development*. Rome.

FAO. (2012). *Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries*

Gichuki, I. N (2012). *The challenges facing horticulture farming among the youths in youths groups in Kieni West District Nyeri County, Kenya*.

Giuliani, A & Valle, F.D (2014). *Access to markets, Youth and agriculture: Key challenges and concrete solutions.*

Hansel, S. (2009). *Agriculture enrollment grows across U.S: Job prospects attract students to major in Agriculture.* Retrieved from http://www.theagie.org/article/2009/11/13.

Kararach G., T. H. Kobena & A.L Frannie (2011). *Regional integration policies to support job creation for Africa's burgeoning youth population*, The African Capacity Building Foundation (ACBF) Working Paper #21.

Kirui, K (2014) *Factor influencing performance of poultry farming projects in Bureti Sub County, Kericho, Kenya*

ILO. (2006). Global Employment Trends for Youth 2006. Geneva.

Mandania, J.M (2012). *The role of Aquaculture entrepreneurship in youth economic empowerment in Sagana fisheries, Kirinyaga County*

Mibey, M.C (2015). *Factors influencing youth involvement in agribusiness projects in Bomet central sub-county, Kenya*

MIJARC/IFAD/FAO. 2012. *Summary of the findings of the project implemented by MIJARC in collaboration with FAO and IFAD: 'Facilitating access of rural youth to agricultural activities'.* The Farmers' Forum Youth session, 18 February 2015http://www.ifad.org/farmer/2012/youth/report.pdf)

Njenga, P, Mugo, F, Opiyo, R (2012). *Youth and Women Empowerment through Agriculture in Kenya*

Oppenheim, A.N. (2000). *Questionnaire Design Interviewing and Attitude Measurement,* Iteinemann. London.

Page, J. (2012). *Youth, jobs, and structural change: Confronting Africa's "Employment problem"* Working Paper Series No. 155 African Development Bank, Tunis, Tunisia.

Republic of Kenya (2005). Economic Survey 2005. Government Printer, Nairobi.

SACAU (2013). *Youth in agriculture – Synthesis report for Madagascar, Malawi, South Africa, Zambia and Zimbabwe*

Sanginga, N (2014). *Youth in Agribusiness within an African Agricultural Transformation Agenda*

Agricultural Interventions and & Sustainability of Rural Livelihoods: A Case of Rural Women Potatoes Production Farmers Groups in Njoro Sub-County Kenya.

By

Wambu Charles

Machakos University, P.O BOX 136, Machakos, Kenya

chkamau06@yahoo.com

Abstract

Women play indispensable role in agriculture and in improving the quality of life in rural areas. However, their contribution often remains concealed due to some social barriers and gender bias. This study assessed the adoption of Agricultural Innovations among rural women farmers in Njoro sub-county. To achieve this major objective, the study identified the socio-economic characteristics of the respondents as well as agricultural innovations introduced and their extent of use. Also the study determined the effects of technologies used on agricultural production. The study adopted cross-sectional study survey with concurrent mixed methods approach entailing equal preference to quantitative and qualitative methodologies to generate rich information that helped fully to explore each of the survey objectives. The respondents were sampled using different approaches for quantitative and qualitative aspects of the survey. For quantitative segment, simple random sampling was done to identify beneficiaries' households (HHs) for the household survey. The survey target 240 farmers who were organized into 2 clusters of 12 farmer groups (Each cluster 6 groups) comprising of 20 farmers each working as a production group in Mauche and Mau-Narok divisions in Njoro sub-county, Nakuru County, Kenya. The sample size representative of the farmers in this study was 148. Primary data collected using a combination of quantitative and qualitative methods including group discussion, structured interview, semi-structured interview, Key informant Interviews (KII) and some PRA tools such as Venn diagram, Gender Analysis Matrix, and Time Trends. Secondary sources comprised of relevant project documents and State and Non-state partner reports. The data collected was analyzed using qualitative and quantitative methods with the help of Statistical Package for Social Science (SPSS). The study findings revealed their was positive and significant relationship between the constraints encountered and adoption level of Agricultural Innovation. It was also revealed that late adoption of innovations was due to irregular visits of extension agent. The major constraint revealed in the study was unstable market price, which has seriously affected the women's activities. Therefore the study recommends that the government should enforce price stabilization policies which will control market prices so as to reduce shortage and losses.

Key words: Agricultural Interventions Sustainability& Rural Livelihoods

1.0 Introduction

1.1 Background of the Study

Women being an integral part of farming household provide 60 and 80 percent of all agricultural labour (Action Aid International, 2011). According to Adi, (2013) women form the backbone of rural development and represent a major force that could boost rural economy, higher growth rate and increased food production. Over the years, reports across different societies of the world including those of Kenya clearly gave evidence to the productive capability of women in National development in relation to their men folks (Bogale, 2012). Women actually constitute the bulk of the world's food producers by pre-dominating the agricultural sector in terms of numbers and tasks performed. According to Adi (2013) is of the view that despite women's major responsibility in household, health and nutrition, their role in agriculture covers all facets of agro-business, including food production, livestock production, fishing as well as farm management. The importance of improved technology to agricultural development especially in less developed countries is widely recognized. This is predicated on the observed impact of these innovations and its potentials and actual contributions to the development of agriculture. In developing countries like Nigeria where a greater proportion of the population lives in rural areas, agricultural technologies could also provide a potential means of increasing production and subsequently raising incomes of farmers as well as their standard of living.

Consequently, there are some constraints facing the rural women's adoption of agricultural innovation which include failure of extension workers to reach them, lack of incentive for adoption of innovation, limited access to credit inputs and lack of access to membership in cooperatives and other rural organizations. Empirical study have shown that some women because of their habit and apathy are resistant to change, that is, they cannot agree to accept any agricultural innovation which may definitely change or affect their agricultural system (Beyan, 2014). Introducing improved agricultural practices to rural women is not easy and adoption of innovation is very essential. It is based on this background that this study has investigated the constraints encountered by women in adoption of agricultural innovations in the study area. To achieve this main objective, the study identified the socio-economic characteristics of the women farmers. Examined the different agricultural innovations introduced to the area and their extent of use.

Literature Review

2.1 Diffusion of Agricultural Innovations in History

Agricultural development is essentially about the study of changes or improvements in agriculture. These changes date back to the hunter/gatherer society when people lived in balance with nature. In good years harvest was plentiful; however, in bad years, they starved. People in hunter/gatherer society also lacked the tools to exploit the land. However, the agricultural revolution changed all that. With the invention of the plough sedentary agriculture was began and farmers in Western societies no longer depended on the vagaries of the weather. According to Greve (2011) The Study of Man, showed that progress in agriculture, the world over, was made possible by the adoption of innovations, across nations.

In modern times, Diffusion of Innovation research was rendered more popular by Rogers with the first edition of his book, Diffusion of Innovations(1962), which has gone through several editions because of its success (Boushey, 2010). Rogers (2003) defined diffusion as a process of communication through which an innovation is spread via communication channels to members of a community over time. The main elements of diffusion process are: a) an innovation, b) communicated through channels, c) over time, and d) to members of a given community or system. Although the diffusion of innovation theory was founded in the communication of agricultural innovations, it has since been applied in other disciplines, such as, pharmacy and marketing.

2.2 The S-M-C-R-E Model in adoption of innovations

Berwick (2003) may have developed the S-M-C-R-E communication model; however, it is Rogers (2003) who gained fame for promoting it. Rogers is generally credited with the S-M-C-R-E or "Source-Message-Channel-Receiver- Effect" model of communication for spreading new innovations. In their book, Communication of Innovations: A Cross Cultural Approach Buchanan, Cole and Keohane (2011) adapted the model as a communication process for extension practice in developing countries. In that context, a sender (S) or "Source" can be the Ministry of Agriculture and Food Cooperatives of Tanzania, with a message (M), such as use of fertilizer, which is sent through a channel C, such as radio or an extension agent, to a receiver R, which can be farmers, for the purpose of adoption or rejection (E) or effect. Although rejection is possible, it is always hoped that farmers will adopt the innovations promoted.

2.3 Elements of Diffusion of Innovations

Again, the four main elements of diffusion process are: the innovation, communication channels, time, and the social system (Rogers, 2003).

a. An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption (Rogers, 2003). An innovation may take the form of ideas, objects, practices (Rogers, 2003), creation, learning, events, trajectories, processes, or contexts (Bhatti , Olsen , & Pederson, 2011). The perceived newness of the idea for the individual determines his or her reaction to it. If the idea is new to the individual, it is an innovation. The newness of an innovation does not only involve new knowledge; someone may have known about an innovation for some time but not yet developed a favorable or unfavorable attitude towards it, nor have adopted or rejected it.

b. Next is the channel that can be either a mass medium or an interpersonal channel.

A communication channel is the means through which messages get from one individual to another (Rogers, 2003). The nature of the information-exchange relationship between a pair of individuals determines the conditions under which a source will or will not transmit the innovation to the receiver, and the effect of the transfer. For example, mass media channels are often the most rapid means to inform an audience of potential adopters about the existence of an innovation, that is, to create awareness-knowledge (Rogers, 2003).

Mass media channels are all means of transmitting messages that involve a mass medium, such as radio, television, newspapers, etc., which enable a source of one or a few individuals to reach an audience of many. On the other hand, interpersonal channels are more effective in persuading an individual to adopt a new idea, especially if the interpersonal channel links two or more individuals who are near peers (Rogers, 2003). For example, through farm visit an extension worker is likely to convince a farmer to adopt a new farming method rather than a farmer having got the news via the radio or television. Interpersonal channels involve a face-to-face exchange between two or more individuals such as when an extension agent visits a farmer or farmer to farmer communication is a form of interpersonal communication.

c. Time is the third element in the diffusion process. According to Rogers (2003), the time variable is involved in diffusion in the innovation-decision process; innovativeness; and an innovation's rate of adoption. The innovation-decision process is the process through which an individual passes from first knowledge of an innovation to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision (Rogers, 2003). Based on time, there are five main steps in the diffusion process: knowledge, persuasion, decision, implementation, and confirmation.

Innovativeness is "the degree to which an individual is relatively earlier in adopting new ideas than the other members of his social system" (Boushey, 2016). Based on innovativeness, adopters are grouped into five categories: innovators, early adopters, early majority, late majority and laggards Rogers, (2003) that consecutively adopted an innovation.

Innovators are active information seekers about new ideas. The adoption process begins with a small number of visionary, imaginative innovators. They often spend a great time, energy and creativity on developing new ideas. And they love to talk about them.

Early adopters are the socially respectable members of a social system. They are always on the lookout for a strategic leap forward in their lives or businesses. Early adopters tend to be more economically successful, well connected and well informed. They are an easy audience. They don't need much persuading because they are on the lookout for anything that could give them a social or economic edge. The early majority is individuals, comfortable with moderately progressive ideas, but won't act without solid proof of benefits. The late majority are conservative individuals who hate risk and are uncomfortable with new idea. Lastly, laggards are persons who perceive a high risk in adopting a particular product or behavior.

d. The names of the adopter categories reflect the rate of adoption, which is the relative speed of adopting an innovation by individuals in a social system. A social system is defined as a set of interrelated units that are engaged in joint problem solving to accomplish a common goal. The members or units of a social system may be individuals, informal groups, organizations, and/or subsystems. The adopter categories begin with the most progressive, followed by the least progressive ones when adopting the innovation. The most rapid adopter group is known as an innovator (as much as 2.5% of the community). The next adopter category is the early adopters (13.5%), early majority (13.5%), and late majority (34%). Laggard (16%) is the last group to receive the innovation (Rogers, 2003). It can be seen from the percentages that initially there are only a small number of individuals who adopt the innovation. Over time, this number

increases up to a certain point in time, and then decreases, forming a normal bell curve. There are five basic attributes of an innovation which affect its diffusion and adoption in society. These are relative advantage, compatibility, complexity, tri-ability and observability of the innovation.

Relative advantage is the degree to which an innovation is perceived as being better than the existing idea measured in economic terms, social prestige, convenience, and satisfaction. The study sought to establish that although a number of modern agricultural information sources exist, do the respondents have knowledge of the sources to meet their agricultural information need; implying that there is much benefit derived due to utilization.

Compatibility refers to the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters. An idea that is incompatible with the culture of a social system will not be immediately adopted. It is necessary to establish if the available information sources are relevant to the needs of the respondents against competition from indigenous practices and cultural beliefs.

Complexity implies the degree to which an innovation is perceived as difficult to understand and use. Simple ideas are adopted more rapidly than innovations that require the adopter to develop new skills and understandings. A major challenge of information sources especially written materials is the assumption that the consumer has an ability to read. These skills lack among the farmers in most parts of the developing world including Tanzania. This makes access, application and adoption of some sources a challenge. Triability is the degree to which an innovation may be experimented with. An innovation that is testable represents less uncertainty to the individual who is considering it for adoption. It is easier to learn by doing because it gives opportunity to test the new innovation which influences decisions for adoption.

Observability relates to the degree to which the adopter has had the opportunity to see the results of the implemented innovation. The researcher will find out whether farmers who receive training in agriculture are often role models for those who do not and are often consulted based on their observable successes. The easier it is for individuals to see the results of an innovation, the more likely they are to adopt it because such visibility stimulates peer discussion of the advantages and disadvantages hence informed decision making.

3.0 Methodology

3.1 Research Design

This study adopted cross-sectional study survey with concurrent mixed methods approach entailing equal preference to quantitative and qualitative methodologies to generate rich information that helped fully to explore each of the survey objectives. This design was appropriate as it provided a better opportunity for participation of the beneficiaries as well as key partners and stakeholders in potato production project in Mauche and Mau-Narok division Njoro sub-county. It also ensured dependence on more than one source of information so that data was carefully triangulated through integrated analysis approach. Qualitative data was collected to triangulate individual quantitative household survey data for the purpose of

validating the results. This, together with secondary data enhanced the process by assuring internal and external validly of the results.

3.2 Study Population and Sampling procedure

The study population was farmers who were registered in groups to produce potatoes in Mauche and Mau-Narok divisions in Njoro sub-county. The respondents were sampled using different approaches for quantitative and qualitative aspects of the survey. For quantitative segment, simple random sampling was done to identify beneficiaries' households (HHs) for the household survey. The survey target 240 farmers who were organized into 2 clusters of 12 farmer groups (Each cluster 6 groups) comprising of 20 farmers each working as a production group in Mauche and Mau-Narok divisions in Njoro sub-county Nakuru County, Kenya. Therefore, the population of this study was assumed to have approximately 240 individual farmer's household beneficiaries. The sample size representative of the farmers in this study was 148. It was determine based on the Krejcie and Morgan's (1970) sample size calculation which is the same as using the Krejcie and Morgan's sample size determination table. The sample size determination Table 1.0 is derivative from the sample size calculation which is expressed as below in equation (1) (Krejcie and Morgan, 1970). The Krejcie and Morgan's sample size calculation was based on p = 0.05 where the probability of committing type I error is less than 5 % or p <0.05.

$$s=x^2NP\ (1-P) \div d^2\ (N-1) +x^2P\ (1—P) \qquad (1)$$

Where,

s= required sample size.

x^2 =The table value of chi-square for 1 degree of freedom at the desired confidence level (0.05 = 3.841).

N =the population size.(240)

P =the population proportion (assumed to be 0.50 since this would provide the maximum sample size.

d =the degree of accuracy expressed as proportion (0.05).

$$148=x0.05^2240*0.50\ (1-0.50) \div 0.05^2\ (240-1) +0.05^2 *0.50\ (1—0.50)$$

Table 1: Table for Determining Sample Size

N(POPULATION SIZE)	S (SAMPLE SIZE
200	132
210	136
220	140
230	144
240	148
250	152
260	155
270	159
280	162
290	165
300	169

3.3 Data Collection Methods and Tools

Various data collection methods, tools and processes were employed during the study exercise to gather rich and high quality primary data and information. These tools endeavored to capture all the core survey indicators and objectives in accordance with the TOR and project logical framework. Primary data collected integrated a combination of quantitative and qualitative methods including group discussion, structured interview, semi-structured interview, Key informant Interviews (KII) and some PRA tools such as Venn diagram, Gender Analysis Matrix, and Time Trends. The study was based on data and information gathered from both primary and secondary sources. Secondary sources comprised of relevant project documents and State and Non-state partner reports. Primary data was collected from sampled beneficiaries in the project focal areas.

3.4 Training enumerators and FGD facilitators

All the data collectors were trained in a central place for a period of 1day including understanding, translation, review of tools that were used and use of digital phones/mobile phones in data collection. The purpose of the training was to equip the enumerators and FGD facilitators with basic principles of the survey as well as requisite skills for data collection including interviewing skills, communication skills, and ethics of research involving human subjects, data quality management and Standard Operation Procedures during field work. Once the training was completed, a pretest was done in another 1 day to ensure that the data collection tools were appropriate and the data collectors were competent to carry out the assignment.

3.5 Data Collection Process

The data collection processes will be undertaken by a group of trained and competent enumerators and FGD facilitators. The exercise will involve seeking verbal informed consent before administration of questionnaires as well as explaining the purpose of the survey beforehand. FGD facilitators on the other hand will conduct sessions with selected community representatives in the selected project sites. The

sessions will be voice recorded using digital recorders after seeking informed oral consent of the participants. Key informants will be interviewed and responses recorded using digital recorders upon receipt of consent. The information generated from the qualitative survey will be used to triangulate quantitative data. Moreover, secondary information will be gathered through document reviews to augment and strength primary data collected using the aforementioned tools.

4.0 Results and Discussion

4.1 Socioeconomic Characteristics of Respondents

The socioeconomic characteristics of the sampled women farmers are shown intable1.Thetable showsthat47.5 percent of the respondents were in their active age (31-40years) while majority(92.5 percent)of the respondents were married, and about66per cent of the respondents had one form of formal education or the other. So also56.3 per cent of the respondent had maximum number of four members in their householdwhile71.3 percent of the respondent practice farming as their primary occupation.Another96.3 percent of the respondent had farm sizes between 1 and 5 hectares while most (52.5 per cent) of the women obtain information from market places. From the findings of the study, the high literacy level might help in faster adoption of farm innovations

Table 1: Distribution of Respondents by Socio-Economic Characteristics

Variable	Frequency	Percentage
Age(Years)		
21-30	35	13.75
31-40	62	47.5
41-50	50	32.5
51-60	26	2.5
61 And Above	27	3.75
Marital Status		
Married	43	3.75
Single	43	3.75
Divorced	114	92.5
Level of Education		
Non-formal	57	33.75
Primary	68	47.50
Secondary	40	12.50
Tertiary Level	35	6.25
Household Size		
0-4	85	56.25
5-9	62	27.5
10-14	53	16.25
Occupation		
Farming	117	71.25
Others	83	28.75
Farm size (HA)		
1-5	137	96.25
6-10	63	3.75
Source of Information		
Mass Media	38	10.0
Extension Agents	50	25.0
market	72	52.5
other farmers	40	12.5

Source: Field Data, 2018

4.2 Extent of Use of Innovations

The agricultural innovations still in use as shown in Table 2 include regular weeding (6.3%), disease control (10.0%), fertilizer application (5.0%) and crop spacing(8.8%). Others are planting techniques (15.0%), adequate disease control (3.8%) hybrid seed (8.8%), tools and equipment(5.0%)and processing/storage facilities (8.8%). It can be observed that the percentages of the respondents still using of these innovations are low. It therefore justifies the need to investigate the constraints to the adoption of the innovations in the study area.

Table 2: Distribution of Respondents According to Extent of Use of the Technologies

Extent of Use	Use &Discontinue	Not All the Time	Some of the Time	All the Time	Still in Use
Regular Weeding	30(7.5)	53(36.3)	35(13.8)	53(36.3)	29(6.3)
Disease Control	31(8.8)	53(36.3)	44(25.0)	40(20.0)	32(10.0)
Fertilizer Application	28(5.0)	59(43.8)	46(27.5)	39(18.8)	28(5.0)
Crop Spacing	34(12.5)	54(37.5)	44(25.0)	37(16.3)	31(8.8)
Planting Techniques	38(17.5)	53(36.3)	40(20.0)	33(11.3)	36(15.0)
Adequate Disease Control	33(11.3)	55(38.8)	42(22.5)	43(23.8)	27(3.8)
Hybrid Disease Control	31(11.3)	53(36.3)	52(35.0)	31(8.8)	31(8.8)
Tools &Equipment's	36(15.0)	52(35.0)	54(37.5)	28(5.0)	28(5.0)
Processing &Storage	38(17.5)	55(38.8)	47(28.8)	31(8.8)	31(8.8)

Source: Field Data, 2018

4.3 Effects of Adoption of Innovation

Table 3 shows the effect of the adoption of innovations such as increased productivity, increased output, increase income, health security, environmental security, food security, improved varieties, adequate control measure and improved seed. The table also ranks the extent to which the respondents accept these effects from the use of the innovations as strongly accepted, accepted, and not accepted. The table reveals that adequate control measure was ranked first (2.13) as the major effect of adoption of the innovation introduced. This was followed by improved varieties (2.11), increased income (1.9), environmental security (1.88), Health security (1.85), increased productivity (1.37), increase output (1.18), food security (1.17) and finally improved seed (1.10) as the least effect that resulted from the use of innovation. This implies that majority of the respondents accepted that the use of the introduced innovations had impacted positively in areas the highlighted.

Table 3: Distribution of Respondents According to Effect of Used Innovations on Agricultural Production

Effect	Not accepted	Accepted	Strong Accepted	WMS	Rank
Adequate disease control	38(17.5)	62(47.5)	51(33.8)	2.13	1
improved varieties	31(11.3)	74(62..5)	44(25.0)	2.11	2
increased income	30(7.5)	83(70.6)	41(21.3)	1.9	3
environmental security	39(18.8)	77(66.3)	34(12.5)	1.88	4
health security	42(22.5)	77(66.3)	32(10.0)	1.85	5
increased productivity	69(56.3)	52(35.0)	27(3.8)	1.37	6
increased output	98(63.8)	67(23.8)	26(2.5)	1.18	7
food security	70(57.5)	45(26.3)	26(2.5)	1.17	8
improved seeds	82(72.5)	34(12.3)	25(1.3)	1.01	9

Source: Field Data, 2018

4.4 Constraints to Adoption

Table 4 reveals the constraints encountered by women in the adoption of innovations. It also ranks the level of constraints encountered by the respondents as serious constraint, mild constraint and not a serious constraint. The table ranks unstable market price as the most serious constraints (2.40), closely followed by insufficient finance (2.30), inadequate supply of innovation (2.20), high cost of innovation (2.20), like of production skills (2.20).Other constraints as their seriousness declines are inadequate agricultural input (2.10), shortage of land for farming and disease attack (2.00) as the least constraint encountered by the women. This implies that shortage of land for farming and disease attack are the least constraints to adoption in the study area.

Table 4: Distribution of Respondents According to Constrains to Adoption

Constraints	Not a constraint	Mild constraint	Serious constraint	WMS	Rank
unstable market price	26(2.5)	68(55.0)	57(41.3)	2.4	1
insufficient finance	28(5.0)	65(51.3)	57(41.3)	2.3	2
high cost of innovations	30(7.5)	64(50.0)	54(37.5)	2.2	3
inadequate supply of innovations	28(5.0)	69(56.3)	52(35.0)	2.2	3
lack of production skills	34(12.5)	59(43.8)	57(41.3)	2.2	3
inadequate agricultural inputs	33(11.3)	67(53.8)	49(31.3)	2.1	6
shortage of land for farming	35(13.8)	75(63.8)	39(18.8)	2.0	7
disease attack	36(15.0)	63(48.8)	40(32.5)	2.0	7

Source: Field Data, 2018

4.5 Innovativeness of Rural Women in Njoro Sub-county

Rural innovation contains components that supersede the components they replace because they embody a new core design concept. Existing components become obsolete because the new components are based on novel design concepts rather than simply being improvements on established design concepts.

Table 5: Rural Women Innovativeness in the Study Area

Innovation	Percentage
Greenhouse construction using local materials	34%
Drip irrigation using bottles	23%
Grafting of fruits	44%
Use of weeds Mexican marigold as pesticides	47%
Covering of potatoes with polythene to initiate chitting	67%
Use of charcoal and saw dust to make local refrigerator for cooling milk	55%
Breeding of local birds with high breeds	68%
M-pesa technology	92%
Organic farming	48%

Source: Field Data, 2018

The social, economic, and political structures of the social context of innovation do not exist in isolation from one another. In any development setting, a contextually informed understanding of agricultural innovation must consider the relationships among these different types of structures (Butler &Mazur, 2007). While it may no longer be as fashionable as it once was, the adoption-diffusion model still has much to offer in such efforts. The model refers implicitly to structural effects of socioeconomic status and communication behavior, though these are conceptualized at an individual level (FAO, 2011). Structural analysis has recently moved more firmly into this interdisciplinary realm, particularly in economics. With the appropriate structural tools, rural sociologists could make notable contributions to our understanding of how the social structures of markets influence innovation.

Technological change in agriculture is still vitally important throughout the world and, correctly applied, diffusion research can assist in its investigation. It is important to consider the consequences of technological change as well as the determinants of adoption of innovation. It is critical to apply the model to environmental practices and other "noncommercial" innovations in agriculture. In-depth case studies over time are needed to further our understanding of how and why individuals and agricultural social collectives adopt technological change. Above all, the social, economic, and political contexts of innovation must be studied with the models and methods of modern structural analysis. All this provides a basis for continuing to build on a wealth of research materials.

4.5 Socio-economic Variables Influencing Access to and Use of Agricultural Information

Variables reviewed under this category include; sex, age, marital status, educational level, household size, farming experience, farm size. The rest are type of farm ownership, labour availability, engagement in off– farm work, and the cultivation of additional crops.

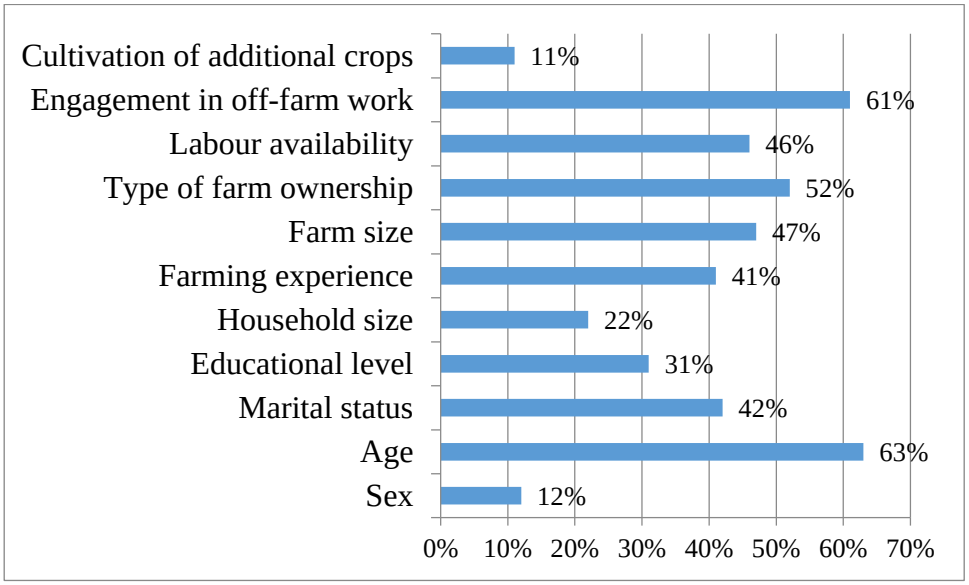


Figure 1: *Socio-economic variables influencing use of agricultural information*

Source: Field Data, 2018

(i) sex

Gender of the household head is a factor that limits access to agricultural information and it use.

Women are traditionally occupied by household chores whiles the man has the liberty of mobility, participate in different meetings and trainings consequently have greater access to extension services. Male- headed households tend to build and maintain larger network ties with relatives and friends than female- headed households (IFAD, 2011). Kimani and Kombo (2010) in assessing access to agricultural extension in SSA found out that sex is an important determinant in the seeking of agricultural information. Male farmers sought for agricultural information than their female counterpart. A positively significant relationship was established between sex of household head and adoption of improved agricultural technologies in the cultivation of Irish potatoes (Buchanan & Keohane, 2011). On the other hand, Maertens and Swinnen, (2009) found out that there was no significant relationship between sex and access to agricultural information

(ii) Age

Age is also one of demographic characteristics which describe how long a person has been in existence. Young farmers are ardent to get knowledge and information than older farmers. It might also be that older farmers want to avoid risk and are not likely to be flexible than younger farmers and thus have a lesser likelihood of information utilization. But several studies report different results; Greve (2011) reports of older farmers being more experience and have accumulated more capital as a result they are more likely to invest in innovation. Similarly, Bhatti, Olsen and Pederson (2011) reported positive relationship

between age and adoption behavior of farmers. However, Rogers (2003) suggest that older people were unwilling to pay for agricultural information delivery technologies such as print, radio, farmer-to-farmer, expert visit, and television. He revealed that, as age increased, the willingness to pay for these agricultural information delivery technologies decreased, meaning that older farmers were less willing to get information than younger ones. Old age also increases with conservativeness and negatively impact on adoption while young farmers tend to be more innovative and risk adverse (Boushey, 2016). A study conducted by Bhatti, Olsen and Pederson (2011) on diary women farmers proved that age has a negative influence on agricultural information network of farm women. The study is that older women do not seek many new ideas, since they try to conform to practices they have followed for a long time in their life. Berwick, (2003) also found out that both younger and old tried new things introduced to them thus there was no significant relationship between age and the use of improved inputs and practices.

(iii) Marital Status

Marriage is considered as an important social institution in the Ghanaian society. Marriage is an institution which can be found in every human culture. Boushey (2010) working on the topic "Decentralization and access to Agricultural Extension services in Kenya" established that the marital status of farmers significantly influenced their access to extension services. Greve, (2011) also noted that there was a positive association between marital status and agricultural information access and use. However, marital status of the farmer was found by Buchanan , Cole and Keohane, (2011) to negatively affects the probability of access to information, signifying that the single farmers had access to agricultural information more than married farmers which could be attributed to the fact that un-married farmers take part in more social activities due to limited responsibilities, while married farmers stay in house to attend to family issues.

(iv) Educational level

Education generally is associated with receiving and absorbing of agricultural information and use of the information. Because education is believed to increase farmers' ability to obtain, process and analyze information disseminated by different sources and helps him/her to make appropriate decision to utilize agricultural information through reading and analyzing in a better way. The ability to read and understand sophisticated information that may be contained in a technological package is an important aspect of access to agricultural information (Rogers, 2005). Ganguli, Souza, McWilliams and Mehrotra (2018) found out that education of respondent had a significant relationship with their access to agricultural information; an increase in the educational level of the respondents increased their access to agricultural information. Better education according to Kimani, and Kombo (2010) would lead to improved access to knowledge and tools that enhance productivity. However, Termine, (2010) established that irrespective of farmers educational level it had no influence on their access to agricultural extension services. With regard to the use of agricultural information, World Bank (2007) posits a positive significant relationship between level of formal education of fish farmers and information use. According to Kakota, Nyariki, Mkwambisi and Kogi-makau (2013), education is expected to create a favorable mental attitude for the acceptance of new practices especially of information- intensive and management intensive practices.

(v). Household Size

The household is the number of individuals eating from the same pot of the family. It is generally agreed that increase in household size comes with extra hands to work on the farm thus more use of agricultural innovations. On the other hand increase in household size also put extra burden on the family as not being able to invest in the farm. Buchanan, Cole and Keohane, (2011) asserts that an increase in size of household increases the probability of access to information. The increases in household size put pressure on the demand for household needs and hence the need to produce more for family and earn more to cater for the household which could lead to agricultural information seeking and use. Rogers (2003) has also found family labour as positively related to adoption and intensity of fertilizer use which is determined by the family size. However, Buchanan, Cole and Keohane, (2011) established no significant between household size and agricultural extension services access.

(vi) Farming experience

Farming experience is the number of years the household has spent with that particular crop.

The number of years spent in farming is a very important household related variable that has relationship with the production process. Longer farming years comes with accumulated farming knowledge and skill which contributes to the use of agricultural information. Several studies support this argument. Longer farming experience implies accumulated farming knowledge and skill which contributes to utilization of agricultural technologies Buchanan, Cole and Keohane, (2011) also argues that experience in a particular activity equips the individual and makes the person more matured to take right decision. Greve, (2011) also asserts that "number of years the farmer has owned his farm is assumed to influence the investment behaviour". However Buchanan, Cole and Keohane, (2011) posit that farming experience has no relationship with access to extension services. Greve, (2011) also establish a non- significant relationship between agricultural information access and farmers years in farming in Pakistan.

(vii) Farm Size

Farm Size is the measure of the total land area under cocoa cultivation and the size in bearing will determines the yield. Ganguli , Souza, McWilliams and ,Mehrotra (2018) in studying effects of farmers' socio– economic characteristics found of a highly significant relationship between respondent size of land holding and their access to agricultural information. Similarly. Greve, (2011) who also found a highly significant relationship between land holdings of the respondents and their access to information. Cocoa farmers with large farm sizes are usually wealthy and there is more likelihood that they would readily adopt any high inputs innovation. Large farm size facilitates easy realization of the benefits due to economy of scale (Rogers 2003). Ganguli , Souza, McWilliams and Mehrotra (2018) found farm size a significant positive relationship farm size and farmers' adoption of modern agricultural production technologies, the bigger the size of a farm, the higher the probability for adoption of current ideas by farmers.

(viii) Off– farm work engagement

Off- farm activities, defined as the participation of individuals in remunerative work away from a "home plot" of land, is seen as an important tool in sustainable development and poverty reduction, especially in rural areas (FAO, 2011). Since farming is a seasonal activity, off-farm occupation comes in with extra income to support the household needs and investment on the farm. IFAD (2011) states that off-farm employment is alternative source of income for farmers thus a way to boost rural economic activity and employment in many developing countries.

Off- farm income was noted to have a positive relationship with access to agricultural information by Owuor et al. (2008) in their study Determinants of Agricultural Information Access by Small Holder Tea Farmers in Bureti District in Kenya. This implies that the more a farmer earned from off- farm work they are likely to look for information to invest in their tea farms. Income from non-farm activities has been found to increase the farmers' probability to invest in new technologies (Owuor, Kovoi & Siele, 2011). However, Owuor et al. (2012) found out that off-farm activities had a negative relationship with adoption of technologies; this is because they are likely to interfere in the other activities that the farmer is carrying out.

(ix) Farm ownership type

Ownership of one's own farm normally comes with an enthusiasm to invest in it since all the benefits would accrue to you than doing a shared cropping. In agreement with this assertion, Kinyili, (2003) states that, farmers naturally do not feel sound emotionally when they are not cultivating on their own land and as such do not invest in land development and will not use inputs efficiently. According to Lagat, Ithinji and Buigut, (2003)they found that land ownership as a major factor influencing investment into land to boost productivity. He states that in Uganda, land owners invest in soil management practices than tenant farmers and other occupants. Mwabu Mwangi and Nyangito (2006) also revealed that land use and ownership affected maize output implying that farmers that owned land are able to adopt technologies that will enhance their yields than sharecroppers.

(x) Labour availability

The use of new agricultural innovations usually is labour intensive so therefore availability of labour in the locality will aid farmers to practice new innovations. Studies such as Agbarevo and Benjamin (2013) states that improved practices require lots of labour and hence the household with relatively high labour force uses the technologies on their farm plots more than those with low labour force. Koskei, Langat, Koskei and Oyugi (2013) inferred from the positively significant relationship between labour availability and adoption of Agricultural innovation and concluded that labour availability is a requirement for technology adoption which increases the yield of farmers. McNamara (2009) also found a positive relationship between labour availability and intensity of use of improved forages as improved practices are labour intensive.

(xi) Additional crops cultivation

Crop diversification is one of the coping mechanisms of food security, production and market risks. Growing of other crops such as maize, cassava, vegetables among others helps farmers feed their families thus the little income from the major crop on the farm. Crop diversification also serves as additional source of income apart from the main crop cocoa. For example, diversification was the single most important source of poverty reduction for small farmers in South and Southeast Asia (FAO, 2011). According to Washington, and Obidike, (2011) mention of diversified maize cultivation into growing other crops to earn additional income apart from cocoa and also ensure food security and income stability.

4.7 Institutional Factors Influencing Access to and Use of Agricultural Information

The factors considered to enhancing access to and use of agricultural information in this study is access to credit, frequency of market visit, distance to the nearest agro-input market and group membership

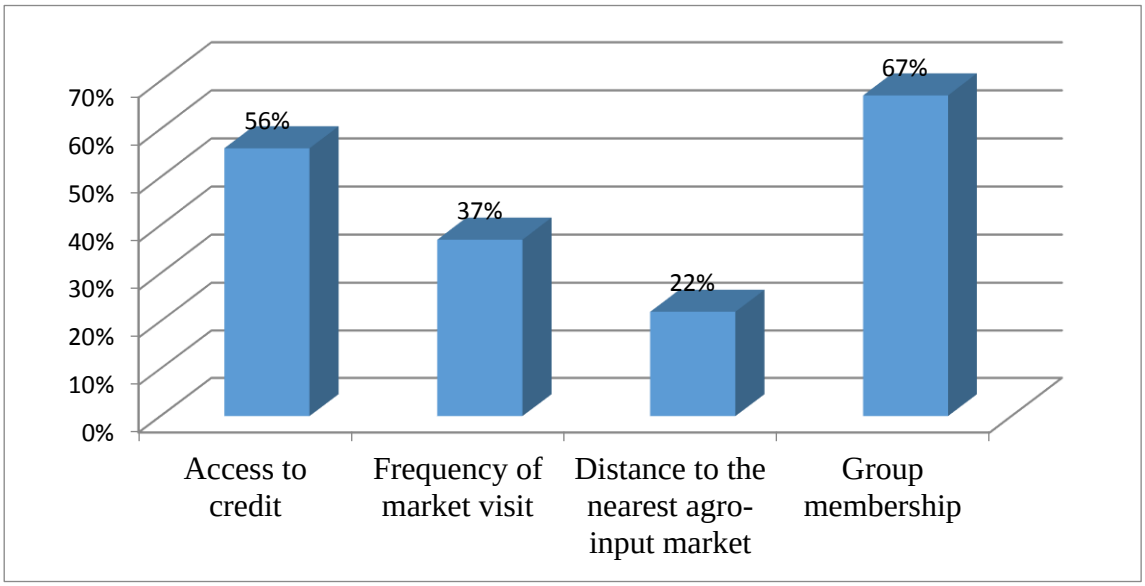


Figure 2: *Institutional factors influencing access to agricultural information*

Source: Field Data, 2018

(i) Group membership

A farmer's association with other farmers is a means of sharing knowledge, information and other resources. Farmers who belong to a group are exposed to their sources of their colleague farmers such as their experience in farming, successful practices on their farms and many more. Belonging to a group

serves as a contact for services provided for groups such as extension services, loans and agro– inputs. Rogers (2005) concludes that: "The heart of the diffusion process consists of interpersonal network exchanges between those individuals who have already adopted an innovation and those who have not are then influenced to do so". In conformity with this view, Okwu and Iorkaa (2011) state that group membership increases the capacity of an individual to access information about current innovation and its benefit from other members. It also increases individual farmer's awareness and as a result increases the likelihood for adoption of new technology.

Group participation was found to stimulate information exchange among members as a result of each other's experience and knowledge (Opara, 2008). Sudath (2008) in their study of determinants of Herbicide Utilization in Striga Hermonthica control among maize farming households identified group membership as a factor influencing use of herbicides in maize farming. Washington and Obidike, (2011) mention of access to credit, inputs and aids from government and extension services as benefits by farmers in groups which aid in the use of agricultural information. Mwabu, Mwangi, and Nyangito (2006) identified group membership as significantly related to information usage because farmers influence each other in a group as a result of experience shared

(ii) Frequency of agro-input market visit and distance

Distance to market and frequency of market visiting is a factor in the access and use of agricultural information and inputs, longer distances to inputs shops tend to make prices high thus constraining poor farmers from purchase. Regular visits to the market make farmers aware of new technologies; it also serves as a platform to share information with other farmers from other localities. The closeness of the market to farmers' is a great catalyst for farmers to receive information (Koskei et al., 2013).Distance to market was found by Washington and Obidike, (2011) to have had a significant effect on the adoption of crossbred dairy. Rogers (2005) also show that market distance is negatively and significantly related to adoption decision which is also confirmed by Maertens and Swinnen (2009) that, distance to nearby markets negatively influenced farmers' access and use of inputs as it adds cost to purchasing inputs implying that longer distances comes with higher prices of inputs hence reducing the use of agricultural information by farmers

(iii) Access to credit

Smallholder farmers are most often financially constrained thus access to credit in the form of money or agro– inputs will go a long way in the search and use of agricultural information by farmers. Availability of credit is important if improved technology in the form of purchased inputs is to be available to farmers, especially small- scale producers. Inputs such as improved seed, agrochemicals and fertilizer require capital in the form of short- term production credit. Access to credit can relax the financial constraints of cocoa farmers'. There are different reports of significant positive influence on the adoption behaviour of farmers regarding improved technologies (Sudath, 2008). Washington and Obidike (2011) found out that access to credit had a positive impact on the use of improved agricultural inputs as it helped farmers' to access seeds, fertilizers and other inputs on credit. Makokha, (2008) established a significant relationship between adoption and credit. They say credit help farmers to purchase most modern technologies which are expensive thus difficult for many rural farmers, who are normally poor to acquire and utilize them without assistance in the form of supply of affordable credit and other financial services

(Washington & Obidike, 2011). For instance, it has been reported that most small scale farmers in the country are unable to afford basic production technologies such as fertilisers and other agrochemicals resulting in low crop yields due to poverty and limited access to credit (Mwabu, Mwangi & Nyangito, 2006).

4.8 Orientation towards Improved Farming and Access to Agricultural Information and It Use.

Access to agricultural information and its use could be highly influenced by farmers' orientation towards improved farming. It included farmers' attitude towards improved farming practices, farmers' innovation proneness, farmers' achievement motivation and their information seeking behaviour.

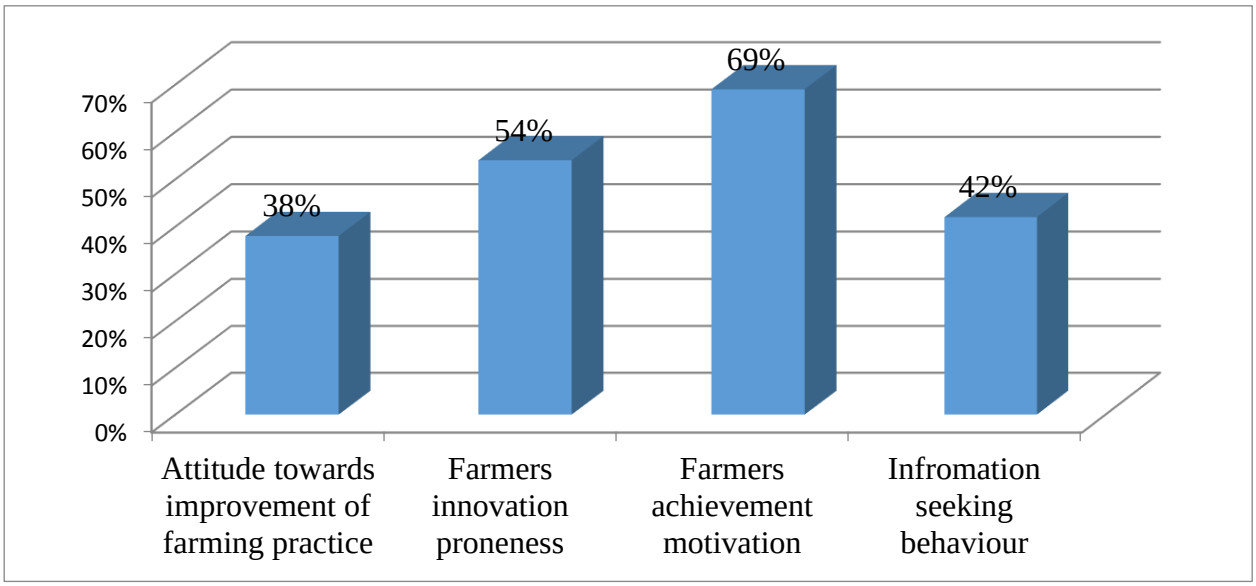


Figure 3: Orientation towards accessing agricultural information

Source: Field Data, 2018

(i). Information seeking behaviour

This variable reflects the degree at which the respondent was eager to get information from various sources on different agricultural activities. Olwande, and Mathenge, (2012) explains information-seeking behavior as the "totality of human behaviour in relation to sources and channels of information sought," Omamo, (2014) advocates for the need for farmers to possess good information search behaviour to enable them to adopt improved production technology. Olwande, and Mathenge, (2012) mentions of vast information available for use by snail farmers who are interested in increasing their productivity, but they exhibit diverse information seeking behaviour, some having a high seeking behaviour whiles others do

not and the difference in their attitude thus affect the information sought after and their productivity. Sharing problems, asking and weighing options exposed people to a variety of hygiene and sanitation information than people with no such behavior (Omiti,et al., 2009). Omamo, (2014) established that as information seeking behaviour of farmers increases, their utilization of accessed information also increases.

(ii) Achievement motivation

Achievement motivation is the value associated with an individual, which drives him to excel or do well in an assignment he undertakes. Achievement motivation helps an individual to decide and complete the tasks in certain direction, which in turn helps in achieving the desired results. According to Njuki et al., (2009), "Achievement motivation is what gets you going, keeps you going and determines where you are trying to go". Achievement motivation among cocoa farmers for the search and use of agricultural information could be increase in yield of cocoa, improvement in their standard of living as a result of increase income, self- recognition etc. Moti, (2007) found out that farmers motivation for engaging in rice training programmes were ambition to make friends, self- recognition, market availability, profitability, loan, personal needs, improve standard of living, increase yield etc. which is in agreement with Olatidoye (2008) who reports improving the standard of living as a motivational factor for participating in a programme. In achieving farmers' motivation for entering into farming, access and use of agricultural would play a pivotal role. Several studies have emphasized the relationship between achievement motivation and access to and use of agricultural information. Morrrison, Raju, and Sinha (2007) asserts a significant relationship between achievement motivation and agricultural information access and use in his studies access and utilization of agricultural information by resettler farming households.

(iii) Attitude towards improved farming practices

Montshwe (2006) defines attitude as a "disposition or tendency to respond positively or negatively towards a certain thing (idea, object, person, and situation). They are closely related to our opinions, beliefs and are based upon our experiences". Attitude simply refers to "a person's evaluation of any psychological object". These evaluations are represented as items of knowledge, which are based on three general classes of information: cognitive information, emotional information, and information about past behaviours (Olwande & Mathenge, 2012). This study looks at attitude towards improved farming as the degree of positive or negative opinion of respondent farmers towards improved farming practices. Attitude is a prerequisite for behavioural change to occur. Positive attitude towards improved farming practice is supposed to enhance the use of such practices and recommendation to other farmers. Attitude towards improved farming was found by Omamo (2014) to have a significant relationship with agricultural information access and use as farmers seek for information exposes them to new information for their activities and influences it use. Olwande and Mathenge, (2012) in his study of adoption of dairy innovations, its income and gender implications in the Adami Tulu District reported that attitude towards change had a statistically significant relationship with dairy adoption. Farmers' had an unfavourable attitude towards the use of fertilizer as they complained of fertilizer promoting weed growth and decreasing the shelf life of produce (Ngqangweni, 2000).

(iv) Innovation proneness

Innovation proneness was operationally defined as the rate of acceptance of an innovation by an individual for his/her agricultural activities. Studies conducted to assess it influence on access to and use of agricultural information include; Termine.(2010) report of a statistically significant relationship between innovation proneness and access to productive role information and utilization of women. Boushey (2010) in studying farmers' adoption behaviour in rice technology found out that innovation proneness of respondents significantly affected adoption of selected rice cultivation practices. Similarly, Greve, (2011) in their study of adoption behaviour of dairy innovations by small farmers under different farming systems established that innovation proneness was very significant in the adoption of dairy farming practices

4.9 Sources of Agricultural Information

Table 4.shows farmers source of agricultural information. From the results obtained, it can be deduced that radio is the most accessible with a percentage of 94.5% followed by Television with 75.0%. Family/Friends(70.8%) was the next followed by extension services (49.2%), input dealers (39.2%), farmer groups (21.9%), NGOs/Private extension providers (20.0%), Newspapers (12.3%) and LBCs (10.4%).This finding is consistent with that of Li, & Baoguo (2011) in their study on information-seeking behaviour and utilization among snail farmers in China. They report of about 65%and 76% of farmers receiving information from radio and television respectively. This could be as a result of radio and TV being the cheapest means of passing information to farmers Farooq, Muhammad, Chauhdary, & Ashraf (2007) and it being the effective medium of reaching farmers with information (Chen & Wu, 2009). A small standard deviation of 0.21 for the access to radio means the responses varied whiles a relatively higher value of 0.50 for access to extension service. A means the responses were varied

Table 6: Rank of Agricultural Information Sources Based on their Access

Source	Freq.	Per	Mean	Std. Dev	Rank
Radio	248	95.4	0.95	0.21	1
TV	105	40.1	0.40	0.50	4
Famers Groups	184	70.8	0.71	0.45	2
Internet	21	9.8	0.098	0.14	11
Newspaper	82	36.7	0.37	0.41	6
Input Dealers	57	21.9	0.22	0.27	7
Family/Family	52	20.0	0.20	0.24	8
Marketing Boards	32	12.3	0.12	0.16	9
NGOs/private extension workers	27	10.4	0.10	0.19	10
County Government Extension Workers	127	49.2	0.49	0.48	3
KARLO extension workers	97	37.7	0.38	0.43	5

Source: Field Data, 2018

4.10 Level of Access to Agricultural Information

Respondents with access to the first seven sources (Table 4.9) indicated their level of access to the information sources with the help of their frequency of access, timeliness of access, clarity of language, clarity of information and relevance of the information. Figure 4.2 displays respondents' level of access to the top seven sources. Figure 4.2 indicates that majority of the respondents (62.3%) had a moderate level of access to agricultural information followed by 25.4% of low level of access. The respondents in the high level of access were 12.3%. With over 70% of respondents above the low level of access, cocoa farmers in the district could be said to have a relatively a high level of access to agricultural information

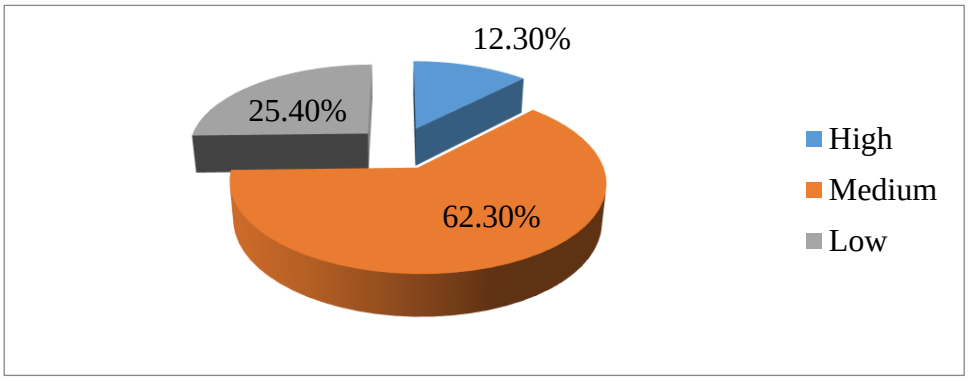


Figure 4: Level of Access to Agricultural Information

Source: Field Data, 2018

4.11 Information Seeking Behaviour of Farmers

Farmers were asked how often they seek information on major practices in cocoa production and other farming activities. The mean values for farmers' information seeking behaviour were calculated. Table 4.4 shows the Mean values of farmers' information seeking behaviour. Table4.4 indicates that information seeking on disease control on cocoa was high. This was attested to by a mean of 3.39 out of a total of5. This was followed by information seeking on pest control on cocoa with a mean value of 3.38; information seeking on recommended agro– chemicals for cocoa followed with a mean value of 3.35. Shade management in cocoa cultivation followed with mean value of 2.28 then information seeking on farm sanitation was next with a value 2.26, information seeking on raising nurseries(2.16),information seeking on cultivation of other crops (2.08) with information seeking on raising of animals being the least with a mean of (1.80). A summary of farmers information seeking behaviour revealed that the number of respondent who were in the moderate level were in the majority (51.2%) and 13.5% of the respondents were in the high level of information seeking. Therefore, the majority (64.7%) of interviewed farmers in the study are aware in the moderate level and above of information seeking behaviour. The plausible reason for the high level of information seeking among cocoa farmers is that cocoa farming has numerous challenges thus the seeking for remedies. Additionally there are a number of sources of information available to farmers as such farmers are able to report any problem they encounter on their farms for restoration

Table 7: Frequency and Type of Information Sought

Activity	Never (1)	Rarely (2)	Sometimes (3)	Very Often (4)	Always (5)	Mean	Rank
Type of crop to be grown	12%	3%	7%	23%	55%	3.86	2
Market Information	14%	16%	8%	18%	44%	3.38	4
Pest and Disease Control	8%	7%	26%	51%	8%	3.12	7
Type of Agro-Chemical to Use	11%	19%	23%	31%	16%	2.87	9
Breed of Animals to Rear	7%	18%	21%	30%	24%	3.91	1
Scale of Production	27%	11%	23%	19%	20%	3.76	3
Type of Fertilizer to Use	18%	6%	27%	22%	27%	3.14	6
Water Harvesting and Utilization	17%	13%	8%	32%	30%	2.14	12
Source of Credit	16%	21%	13%	24%	26%	3.23	5
Soil and Water Conservation Measures	17%	31%	9%	27%	16%	2.89	8
Livestock Management Practices	17%	12%	31%	13%	27%	2.67	10
Nursery Management Practices	8%	23%	25%	37%	7%	2.54	11

Source: Field Data, 2018

5.0 Conclusion and Recommendation

This study revealed that the rural women in the study area were introduced to new technologies such as Hybrid seed, adequate crop spacing, planting techniques, processing and storages facilities. The percentages of the respondents still in use of the innovations are low and the major source of information to the women is market places. Also majority of the respondents strongly accepted that adequate control measure, improved varieties and increased income are the major effects resulting from the use of Agricultural innovations introduced. Most of the respondent agreed that unstable market price, insufficient finance and inadequate supply of innovation were the most serious constraints encountered. Therefore, government should try as much as possible to stabilize market prices to reduce shortage and losses encountered by the farmers

References

Action Aid International (2011).What women farmers need: A blueprint for action. Action Aid International. http://www.actionaid.org/sites/files/actionaid/the blue print for women farmers .pdf. (Accessed on 23 June, 2018).

Adi, B. (2013). Determinants of Agricultural and Non-Agricultural Livelihood Strategies in Rural Communities: Evidence from Eastern Nigeria, University of Tsukuba, Japan, pp 6-16

Agbarevo & Benjamin.(2013). Farmers' perception of effectiveness of agricultural extension delivery in cross-river State, Nigeria. *IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS),* 2, PP01-7

Babatunde RO, Omotesho OA, Olurunsanya EO & Owotoki GM (2008). Determinants of vulnerability to food security : A gender-based analysis of farming in Nigerial. Indian journal of agricultural economics63(1): 116-125.

Bacha D, Namara R, Bogale A & Tesfaye A (2011). Impact of small-scale irrigation on household poverty: empirical evidence from the Ambo district in Ethiopia. Irrigation and Drainage60: 1–10.

Baiphethi MN & Jacobs PJ (2009). The contribution of subsistence farming to food security in South Africa. Agrekon48:459-482.

Bazezew A & Bewket W (2013). Analysis of Vulnerability to Food Insecurity in Drought-Prone Areas of the Amhara Region of Ethiopia: Case Study in Lay Gaint Woreda.

Berwick, D.M. (2003). Disseminating innovations in health care. JAMA Vl. 289(15) pg. 1969–75.

Beyan Z. (2014). Assessment of Women Empowerment through Public Agricultural Extension Services: The Case of Meskan Wereda in the Southern Nations, Nationalities' and Peoples' Region of Ethiopia, MSc thesis submitted to SGS, Haramaya University, Ethiopia. Pp. 67

Bhatti Y, Olsen AL, & Pederson LH. (2011). Administrative professionals and the diffusion of innovations: the case of citizen service centres. Public Adm.;89(2):577–94.

Bogale A (2012).Vulnerability of smallholder rural households to food insecurity in Eastern Kenya. Food Security4:581–591.

Boushey G. (2016) Targeted for diffusion? How the use and acceptance of stereotypes shape the diffusion of criminal justice policy innovations in the American states. Am PolitSciRev.Vl.110(1) pg.198–214.

Boushey GT. (2010). Policy diffusion dynamics in America. New York (NY): Cambridge University Press.

Buchanan A, Cole T, & Keohane, R,O.(2011).Justice in the diffusion of innovation. Vl.9(3) pg. 306–32.

Burney, J.A. & Rosamond, R.L. (2011). Smallholder irrigation as a poverty alleviation tool in Sub-Saharan Africa. World Development, 40: 110-123.

Butler, L.M., and Mazur, R.E. (2007). Principles and processes for enhancing sustainable rural livelihoods: Collaborative learning in Uganda. International Journal of Sustainable Development & World Ecology 14. p. 604–617

Chambers, R., Conway, G.R. (1992). Sustainable Rural Livelihoods: Practical Concepts for the 21stCentury, IDS Discussion Paper296, Brighton, 11-13

Chambers,R.(1997).WhoseRealityCounts:PuttingtheFirstLast.London:Intermediate Technology

Chand, R., Lakshmi, P.A. & Singh, A.(2011). Farm size and productivity: Understanding the strengths of smallholders and improving their livelihoods. Economic & Political Weekly crop–livestock farming systems of sub-Saharan Africa. Agricultural Water Management,

Chen, H.-K. and Wu, Y.-C. (2009) Investigation and Analysis of Farmer's Information Service: Take Yingshan County of Hubei Province as an Example. China Population, Resources and Environment, 19,169-172

CSA (Central Statistical Agency) 2013. Population Projection of Ethiopia for all Regions at Wereda Level from 2014 –2017, Addis Ababa, Ethiopia. PP. 43

Doss, C. 2011. The role of women in agriculture, ESA Working Paper No 11-02, Agricultural Development Economics Division, The Food and Agriculture Organization of the United Nations PP. 20. Website: www.fao.org/economic/esa Eastern Africa Social Science Research Review29 (2): 25-49.

Ellis, F.(2000). Rural livelihoods and diversity in developing countries. UK: Oxford University Press.

FAO 2011. Woman and Agriculture: Closing Gender Gap for Development. Rome, Italy. Available at: http://www.fao.org/catalog/inter-e.htm

Farooq, S., Muhammad, S., Chauhdary, K.M. and Ashraf, I. (2007) Role of Print Media in the Dissemination of Agricultural Information among Farmers. Pak. J. Agri. Sci., 44, 378-380.

Ganguli I, Souza J, McWilliams MJ,Mehrotra A.(2018). Practices caring forunder served less likely to adopt Medicare's annual wellness visit. Health Aff (Millwood).;37(2):283–91.

Greve, H.R. (2011). Fast and expensive: the diffusion of a disappointing innovation. Strategy Manage Vl. 32(9) pg. 949–968.

Günther I & Harttgen K (2009). Estimating households' vulnerability to idiosyncratic and covariate shocks: a novel method applied in Madagascar.

Hoddinott J & Quisumbing A (2003). Methods for micro-econometric risk and vulnerability assessments. Social Protection Discussion Paper Series 0324. Washington, DC: The World Bank, Human Development Network.

IFAD (2011). Women and rural development. International Fund for Agricultural Development, (IFAD) Via Paolo di Dono 44, 00142 Rome, Italy. www.ifad.org, HYPERLINK "http://www.ruralpovertyportal.org"www.ruralpovertyportal.org. (Accessed 23 Nomber 2018).

IFPRI (2012). Women's empowerment in agriculture index. International Food Policy Research Institute.http://www.ifpri.org/sites/default/files/publications/weai_brochure.pdf. (Accessed On 22 August 2013=8).

Kabeer, N. (2005). Gender equality and women's empowerment: a critical analysis of the third Millennium Development Goal. Gender and Development 13(1), pp. 13-24.

Kakota T, Nyariki D, Mkwambisi D & Kogi-makau W (2013). Determinants of household vulnerability to food insecurity: a case study of semi-arid districts in Malawi. Journal of International Development10: 22.56.

Kenya National Bureau of Statistics. (2010). Kenya Population and Housing Census Statistical Abstract. Ministry of Planning and National Development, Nairobi.

Kimani, E.N and Kombo, D.K (2010). Gender and Poverty Reduction: a Kenyan context. Available at: http://www.academicjournals.org/EPR2 /abstract 2010 jan/kimani/20and/20 Kombo.htm.Accessed on 3/11/2018.

Kinyili, J.M., (2003). Diagnostic Study of the Tea Industry in Kenya. Export Promotion Council.

Koskei RC, JK Langat, EC Koskei and MA Oyugi (2013). Determinants of Agricultural Information Access by Small Holder Tea Farmers in Bureti District, Kenya,Asian Journal of Agricultural Sciences 5(5): 102-107

Lagat, J.K., G.K. Ithinji and S.K. Buigut, (2003). Determinants of the adoption of water harvesting technologies in the marginal areas of Nakuru District, Kenya: The case of trench and water pan technologies. Eastern Afr. J. Rural Dev., 19(1): 24-32.

Li, Q. and Baoguo, D. (2011) Study on Agricultural Information Service System—Analysis Based on Farmer's Demand of Guangdong. Guangdong Agricultural Sciences, 38, 229-231

Maertens, M . and Swinnen, J. F. M.(2009). Are modern supply chains bearers of gender inequality? Paper presented at the ILO-FAO workshop on "Gender Dimension of Rural Employment", 30thMarch – 3rdApril, Rome

Makokha, J.N. (2008). Gender Empowerment through Micro-financing: a case study of women group in Fumbini location, Kilifi District, Kenya. Unpublished. M.A Project Paper, Institute of Anthropology, Gender and African Studies, University of Nairobi.

McGuigan, B. (2009). What is Modernization Theory? Accessed June 5, 2010 from http://www.wisegeek.com/what-is-modernization-theory.htm

McNamara K. (2009). Improving Agricultural Productivity and Markets: The Role of Information and Communication Technologies. Agriculture and rural development notes. Issue no. 47, The

Meagher, S. M. and Miller, L. L. (2010). Gender and Development in Theory and Practice. Accessed June 5, 2010 from http://dgroups.org/file2.axd/c2838edd-33d8-491e-aae0-438d5adc0740/Feminist%20Theories%20of%20Development%202003.ppt

Montshwe, B. D. (2006). Factors Affecting Participation in Mainstream Cattle Markets by Small-Scale Cattle Farmers in South Africa. MSc.Thesis, University of Free State, Bloemfontein.

Morrrison, A., Raju, D and Sinha, N. (2007).Gender Equality, Poverty and Economic Growth. The World Bank, Policy Research.WorkingPaper 4349.

Moti, J. (2007). Econometric Analysis of Horticultural Production and Marketing in Central and Eastern Ethiopia.PhDDisssertaion. WageningenUniversity. The Netherlands.

Mugenda, O.M.and Mugenda,A.G.(2003).ResearchMethods:Quantitative and Qualitative Approaches, Acts Press, Nairobi, Kenya.

Mwabu, G., Mwangi, W. & Nyangito, H. (2006). Does adoption of improved maize varieties reduce poverty? Evidence from Kenya. Proceeding of International Association of Agricultural Economists Conference. Gold Coast, Australia.

Namara, R. E., Hanjra, M. A., Castillo, G. E., Ravnborg, H. M., Smith, L. & Koppen, B. V. 2010. Agricultural water management and poverty linkages. Agricultural Water Management97, 520-527.

Ngqangweni, S. (2000). Promoting Income and Employment Growth in the Rural Economy of the Eastern Cape through Smallholder Agriculture. Unpublished PhD Thesis, University of Pretoria, Pretoria.

Njuki, J., Kaaria, S, Sanginga, P, Kaganzi, E.and Magombo, T, (2009). Community Agro Enterprise Development, Experiences from Uganda and Malawi, in Scoones and Thompson

Okwu, O.J. & Iorkaa T.I. (2011). An Assessment of Farmers' Use of New Information and Communication Technologies as Sources of Agricultural Information in Ushongo Local Government Area, Benue State, Nigeria. Journal of Sustainable Development in Africa (Volume 13, No.2, 2011) ISSN: 1520-5509

Olwande, J. and Mathenge, M. (2012).Market Participation among the Poor Rural household in Kenya. Tegemeo Institute, Egerton University, Kenya. Selected Paper Prepared for Presentation at the International Association of Agricultural Economists (IAAE) Triennial Conference, Foz do Iguaçu, Brazil, 18-24 August.

Omamo, S.W. (2014). Transportation Cost and Smallholder Cropping Choices: An Application to Siaya District, Kenya. American Journal of Agricultural Economics, 80:116-123.

Omiti, J.M., Otieno, D.J., Nyanamba, T.O.and McCullough, E.(2009).Factors Influencing the Intensity of Market Participation by Smallholder Farmers; A Case Study of Rural and Peri-Urban Areas of Kenya,African Journal of Agricultural and Resource Economics, 3:7

Opara, N. (2008). Agricultural Information Sources Used by Farmers in Imo State, Nigeria Information Development. Inform. Dev., 24(4): 289-295.

Owuor, P.O., M.M. Kavoi, F.N. Wachira & S.O. Ogola, (2008). Sustainability of smallholder tea growing in Kenya. Country Report, Kenya.

Owuor, P.O., M.M. Kovoi & D.K. Siele, (2011). Assessment of technological and policy factors impending production of green leaf in smallholder tea farms of the Kenya tea industry: An assessment of farmer's awareness and adoption levels of technologies. Report Submitted to Africa Technology Policy Studies Network, Nairobi, Kenya.

Rehman, F., Muhammad, S., Ashraf, I. and Hassan, S. (2011) Factors Affecting the Effectiveness of Print Media in the Dissemination of Agricultural Information. Sarhad J. Agric., 27, 119-124

Rogers, EM.(2003). Diffusion of innovations. 5th ed. New York (NY): Free Press.

Sudath A. (2008). The role of information technology in disseminating innovations in agribusiness: A comparative study of Australia and Sri Lanka. Ph.D. Thesis, Victoria University

Termine, P.(2010). Gender inequalities in rural labour markets. Background paper for The State of Food and Agriculture 2010–11. Rome, FAO

UNDP, (2010). Gender and Poverty Reduction. Available at: http:www.undp.org. Accessed on 3/11/2018. World Development37(7): 1222–1234.

Washington, N., & Obidike, A.(2011). Rural Farmers' Problems Accessing Agricultural Information: A Case Study of Nsukka Local Government Area of Enugu State, Nigeria. Library Philosophy and Practice (e-journal).Paper 660.

World Bank. (2007). Empowerment in Practice: Analysis and Implementation – A World Bank Learning Module. Washington DC: The World Bank.

Women Technological Empowerment in Agriculture: Issues, Challenges and Policy Option: A Case of Rural Women Farmers Groups in Njoro Sub-County Kenya.

BY

Wambu Charles

MACHAKOS UNIVERSITY, P.O BOX 136, MACHAKOS, KENYA.

Abstract

In Kenya women in rural areas are key agents for achieving the transformational economic, social, political and environmental changes required for achieving sustainable development. Women lack empowerment on economic, political, social, educational and psychological affecting most for development such as Sustainable Development Goals, Kenya Vision 2030 among others. Empowering is women key not only to the well-being of individuals, families and rural communities but also to the overall economic productivity, given that women form the largest workforce in agriculture worldwide. The study adopted cross-sectional study survey with concurrent mixed methods approach entailing equal preference to quantitative and qualitative methodologies to generate rich information that helped fully to explore each of the survey objectives. The respondents were sampled using different approaches for quantitative and qualitative aspects of the survey. For quantitative segment, simple random sampling was done to identify beneficiaries' households (HHs) for the household survey. The survey target 240 farmers who were organized into 2 clusters of 12 farmer groups (Each cluster 6 groups) comprising of 20 farmers each working as a production group in Mauche and Mau-Narok divisions in Njoro sub-county, Nakuru County, Kenya. The sample size representative of the farmers in this study was 148. Primary data collected using a combination of quantitative and qualitative methods including group discussion, structured interview, semi-structured interview, Key informant Interviews (KII) and some PRA tools such as Venn diagram, Gender Analysis Matrix, and Time Trends. Secondary sources comprised of relevant project documents and State and Non-state partner reports. The data collected was analyzed using qualitative and quantitative methods with the help of Statistical Package for Social Science (SPSS). From the data results the respondents reported that they lacked power over, power within and power to control major decisions such as marketing, major crops to produce, type of technology to use, and type of information. They reported that they were economically, technologically, socially and politically empowered. The women reported that after introduction of the mobile phone services they were able to open an account, save, access credit, make payments, access extension information, network with other women, men and other organization on modern farming methods.

Key Words: *Women, Technological Empowerment, Agriculture, Issues, Challenges And Policy Option*

1.0 Introduction

1.1 Background of the Study

Agriculture is the prime mover of the Kenyan economy. Rapid agricultural growth is a key to achieving the country's developmental and social goals but the Kenya agricultural sector has been growing erratically since the country gained independence. According to Action Aid International (2011), its growth is below potential and required rates in Kenya. Agricultural sector performance is of great importance in the country's food sector and also important in country's food security and poverty alleviation efforts since majority of the poor are situated in the rural areas and depend directly on agriculture related economic activities for their major source of livelihood. According to World Bank (2007) report over 70% of country's population is rural and two thirds of these depend on farming for their live hood.

Kenya is characterized by a mixture of small, medium and large farms of which the majority is family smallholdings. This mixture comprises of cash crop farming, food crops and livestock rearing. Kenya has a diverse climate where different crops and livestock are concentrated in different areas but production tends to be limited more by lack of access of farmers to credit, market and agricultural information than climatic factors (Doss, 2011). According to Handley, Higgins and Sharma (2009) the debate on academic and development circles regarding the viability of utilizing microcredit programs in alleviating poverty and empowering women in Africa will never end unless policies and programs are enhanced to improve women position in accessing information, credit and market for the agricultural produce since they form the bulk of agricultural work force in Kenya. World Bank (2007) observed that increased access to credit which is the focus of many women in development programs in Africa often does not transform the social and structural dynamics in which women live and work.

According to Adi (2013) Cultural norms and family responsibilities portray that men as main breadwinners and as good farmers that women whereus women form the bulk of the labour force and lack control, access and ownership of factors of production. According to Food and Agricultural Organization (FAO) (2011) women's ability to offer family assets as collateral and their incentives to invest in productive activities are influenced by family dynamics that are likely to prioritize men's investments. Socially accepted norms of behavior and roles women play in their families can have profound effects on the type of economic activities in which women can engage, technologies available to them the people and agencies with whom they can interact the places they can visit, the time they have available and control they can visit, they can exert over their own capital. According to Maertens and Swinnen (2009) using data from Paraguay comparing husbands and wives knowledge of financial markets found that rural women are 15 to 12 percent likely than men to have basic information about financial institutions in their communities. And even when they have access to information on financial services and market opportunities available to them women may be less equipped to process it because of their lack of exposure to other languages especially relative to male family members and lower levels of literacy.

Empowerment is the capacity of men and women to participate in, contribute to and benefit from growth processes in ways which recognize the value of their contributions, make it possible to negotiate a fairer distribution of the benefits of growth and respect their dignity (Kabeer, 2005). Women's economic empowerment and participation are fundamental to strengthening women's rights and enabling women

to have control over their lives and exert influence in society. It is about creating just and equitable societies (Meagher & Miller, 2010). Women participation in economic growth and empowerment can enhance equality, and vice versa though women do not reap the benefits of a growing economy in proportionally the same ways as men nor benefit equally from economic participation and empowerment. Nevertheless, women empowerment can strengthen their rights and address strategic gender interests as well as women's practical needs (Beyan, 2014). Growth and development can support gender equality in that wealthier people are more likely to educate both sons and daughters and less likely to have their daughters marry early or dropout of school as a result of lack of financial resources.

Manufacturing and service sectors tend to expand in a growing economy, attracting women into the formal labour force. Improvement of service delivery in public sector can lead to better health, high agricultural productivity and education outcomes which are areas where women's investments of time and finances are heavy and where poor service provision means increase in women levels of poverty (Diao, 2010). However, the relationship between growth and gender equality is neither direct nor automatic. Women's economic participation and empowerment therefore means working to address constraints that women face to participating in and benefiting from growth and development, and working to secure their rights (FAO, 2012). Achieving sustainable economic growth and women empowerment requires the ideas, work, and entrepreneurial inputs of both women and men. Women make up nearly half of the global work force, a third of business owners, and influence as much as 80 percent of consumer spending (Central Statistical Agency, 2013). Economies pay a development and economic cost when women are held back from full participation (McGuigan, 2009). According to Food and Agriculture Organization (FAO) (2011) if women had the same access to productive resources as men, they could increase yields on their farms by 20–30 percent, raising the total agricultural output in developing countries by 2.5–4 percent and lifting 150 million people out of hunger. Food and Agriculture Organization, estimates that productivity per worker would increase by some 25–40 percent with the elimination of discrimination against women workers and managers (Food and Agriculture Organisation, 2011).

Women empowerment is particularly desirable because development effects are multiplied; on average, women spend a larger portion of their incomes on their families, leading to improvements in child nutrition, health, and education, and work to break the cycle of intergenerational poverty (World Bank, 2007 Higher levels of gender equality are correlated with lower rates of poverty, a higher standing in the Human Development Index, and less environmental degradation (FAO, 2012). However, although the proportion of women in the workforce has increased steadily in the past decades, there are significant differences in workforce participation rates between men and women, with women receiving less for their participation (Butler & Mazur, 2007). Women are concentrated in informal sectors and in low-productivity, low-paying employment and businesses, limiting the benefits they can receive.

1.2 Objectives of the Study

The main objectives of the study were to;

Determine how women in the study area understand the term empowerment

Examine the forms of women empowerment in the study area

Find out the effects of women empowerment on their rural livelihoods

2.0 Literature Review

2.1 Understandings of Women's Empowerment in Africa

There has not been so much literature on women's and men's perceptions of women's empowerment in Africa. Two studies that have been reviewed in this respect revealed the following: A study about understanding the impact of Microfinance-Based Interventions on Women's Empowerment and the reduction of Intimate Partner Violence in South Africa revealed that there was no equivalent word for empowerment in the local language. Rather, women used phrases such as 'the power to be enlightened' or 'the ability to claim personal power and use it to change for the better' to express the concept of empowerment (Maertens&Swinnen, 2009). The study also indicates that although some women alluded to challenging gender norms and the broader social and political status of women, most of them defined women's empowerment within the more intimate spheres of the household and community life. According to FAO (2012), despite the enthusiasm and the capabilities women in Ghana exhibit when in power, society normally does not appreciate their being in power. Men, and even some women themselves, usually detest women who assume key and influential positions, especially in politics and governance. She argues that the society sees women as very conceited and disrespectful when in power. Some men find explanations in the biblical and African traditional setting which prescribes that women, no matter their level of education, should be submissive to their husbands and other men. She argues that some men believe that some empowered women become disrespectful to their husbands, and even try to assume the position of the man, especially when they earn more than the men. The women also believed that a woman in a powerful position tends to mistreat her fellow women (FAO, 2012).

2.2 Forms of Empowerment

The term empowerment is a multi- dimensional social process and it helps people gain control over their own lives. Further, it can be called as a process that fosters power in people for use in their own lives, their communities and in their society, by acting on issues they think as important. "Empowerment refers to increasing the economic, spiritual, political and social strength of individuals and communities. Empowerment of women is not only imperative but also crucial for all-round development of society and the nation as a whole. Empowerment of women now can be categorized into five main parts – social, educational, economic, political and psychological.

2.2.1 Social Empowerment

Social Empowerment refers to the enabling force that strengthens women's social relations and their position in social structures. Social empowerment addresses the social discriminations existing in the society based on disability, race, ethnicity, religion, or gender. Empowerment as a methodology is usually associated with feminism. Broadly put, the term empowerment is defined as "a multi-dimensional social process that helps people gain control over their own lives. It fosters the power in people for use in their own lives, their communities and in their society, by acting on issues they define as important" (Leung, 2011).

2.2.2 Educational Empowerment

Traditional concepts recognize higher education as an instrument of personal development. It helps in growing an individual's intellectual horizons, wellbeing and potential for empowerment (Lyon, 2008). It is considered as the single most important instrument of socio-political and economic transformation. But the picture of women's educational empowerment is not rosy in Kenya. "The recently released United Nations Development Report 2011 ranked Kenya 134 out of 187 countries"(World Bank.(2014). Without proper education to all children including girls, gender empowerment is not possible. This maxim - if one male child is literate personally he alone becomes educated but if one girl child is educated the whole family becomes benefited - has been realized by the national political leaders, policy makers, administrators and bureaucrats. When literacy percentage is increased, the women could be able to understand their actual rights which have been already given to them by the constitution of Kenya and accordingly the provisions contained in (Manda & Mwakubo, 2014). Information Technology and media (both print and electronic) are assuming vital roles in dissemination of knowledge to the people and bringing the world nearer to one's reach. In the present day situation it is not possible for any society to think about empowerment without the incorporation and utilization of IT (FAO, 2012). Poverty and illiteracy are intertwined with one another. Poor people are mostly uneducated or lowly educated. This mass of uneducated people feels one kind of powerlessness where some invisible forces from outside are controlling their lives. This powerless and inferior attitude creates a sense of intimidation. They began to depend on fortune, luck, destiny and above all God or supernatural elements. With attainment of education and knowledge women can overcome these problems. In this regard Meagher and Miller (2010) feels that, "Empowerment is the process by which the disempowered or powerless people can take up the control over their lives and livelihood and change their circumstances." In short, empowerment entails the ability of the disempowered to change the equation of power, their living conditions and their existing unequal conditions.

2.2.3 Economic Empowerment

Economic empowerment can be described as a means by which the poor, landless, deprived and oppressed people of all societies can be freed from all kinds of deprivation and oppression; can directly enjoy the benefits from markets as well as household; can easily manage a square nutritious food and fulfill basic requirements such as house, cloth, medicine and pure water etc. SEWA (Self Employed Women's Association) has emphasized on the economic empowerment of women. It holds that raising voice and visibility is not possible unless there is an access "to the ownership of economic resources by the poor women." according Oseni, et, al.,(2015) women's empowerment refers to the power of women to gain greater share of control over resources –human, material and intellectual like information, financial, ideas, knowledge and resources like money and access to it – and control over decision making in the nation, society, community, home, and to gain power. Economic empowerment reap through equal organizational benefits, equal treatments, equal working environment and equal work opportunities. Self Employed Women's Association (SWEA) argues for women's empowerment through the attainment of full employment and self-reliance of poor and rural exploited women (FAO, 2012).

3.0 Methodology

3.1 Research Design

This study adopted cross-sectional study survey with concurrent mixed methods approach entailing equal preference to quantitative and qualitative methodologies to generate rich information that helped fully to explore each of the survey objectives. This design was appropriate as it provided a better opportunity for participation of the beneficiaries as well as key partners and stakeholders in potato production project in Mauche and Mau-Narok division Njoro sub-county. It also ensured dependence on more than one source of information so that data was carefully triangulated through integrated analysis approach. Qualitative data was collected to triangulate individual quantitative household survey data for the purpose of validating the results. This, together with secondary data enhanced the process by assuring internal and external validly of the results.

3.2 Study Population and Sampling procedure

The study population was farmers who were registered in groups to produce potatoes in Mauche and Mau-Narok divisions in Njoro sub-county. The respondents were sampled using different approaches for quantitative and qualitative aspects of the survey. For quantitative segment, simple random sampling was done to identify beneficiaries' households (HHs) for the household survey. The survey target 240 farmers who were organized into 2 clusters of 12 farmer groups (Each cluster 6 groups) comprising of 20 farmers each working as a production group in Mauche and Mau-Narok divisions in Njoro sub-county Nakuru County, Kenya. Therefore, the population of this study was assumed to have approximately 240 individual farmer's household beneficiaries. The sample size representative of the farmers in this study was 148. It was determine based on the Krejcie and Morgan's (1970) sample size calculation which is the same as using the Krejcie and Morgan's sample size determination table. The sample size determination Table 1.0 is derivative from the sample size calculation which is expressed as below in equation (1) (Krejcie and Morgan, 1970). The Krejcie and Morgan's sample size calculation was based on p = 0.05 where the probability of committing type I error is less than 5 % or p <0.05.

$$s=x^2NP(1-P) \div d^2 (N-1) + x^2P(1-P) \quad (1)$$

Where,

s= required sample size.

x^2 =The table value of chi-square for 1 degree of freedom at the desired confidence level (0.05 = 3.841).

N =the population size.(240)

P =the population proportion (assumed to be 0.50 since this would provide the maximum sample size.

d =the degree of accuracy expressed as proportion (0.05).

$$148=x0.05^2240^*0.50(1-0.50) \div 0.05^2 (240-1) + 0.05^2 *0.50(1-0.50)$$

Table 1: Table for Determining Sample Size

N(POPULATION SIZE)	S (SAMPLE SIZE
200	132
210	136
220	140
230	144
240	148
250	152
260	155
270	159
280	162
290	165
300	169

3.3 Data Collection Methods and Tools

Various data collection methods, tools and processes were employed during the study exercise to gather rich and high quality primary data and information. These tools endeavored to capture all the core survey indicators and objectives in accordance with the TOR and project logical framework. Primary data collected integrated a combination of quantitative and qualitative methods including group discussion, structured interview, semi-structured interview, Key informant Interviews (KII) and some PRA tools such as Venn diagram, Gender Analysis Matrix, and Time Trends. The study was based on data and information gathered from both primary and secondary sources. Secondary sources comprised of relevant project documents and State and Non-state partner reports. Primary data was collected from sampled beneficiaries in the project focal areas.

3.4 Training enumerators and FGD facilitators

All the data collectors were trained in a central place for a period of 1day including understanding, translation, review of tools that were used and use of digital phones/mobile phones in data collection. The purpose of the training was to equip the enumerators and FGD facilitators with basic principles of the survey as well as requisite skills for data collection including interviewing skills, communication skills, and ethics of research involving human subjects, data quality management and Standard Operation Procedures during field work. Once the training was completed, a pretest was done in another 1 day to ensure that the data collection tools were appropriate and the data collectors were competent to carry out the assignment.

3.5 Data Collection Process

The data collection processes will be undertaken by a group of trained and competent enumerators and FGD facilitators. The exercise will involve seeking verbal informed consent before administration of questionnaires as well as explaining the purpose of the survey beforehand. FGD facilitators on the other hand will conduct sessions with selected community representatives in the selected project sites. The

sessions will be voice recorded using digital recorders after seeking informed oral consent of the participants. Key informants will be interviewed and responses recorded using digital recorders upon receipt of consent. The information generated from the qualitative survey will be used to triangulate quantitative data. Moreover, secondary information will be gathered through document reviews to augment and strength primary data collected using the aforementioned tools.

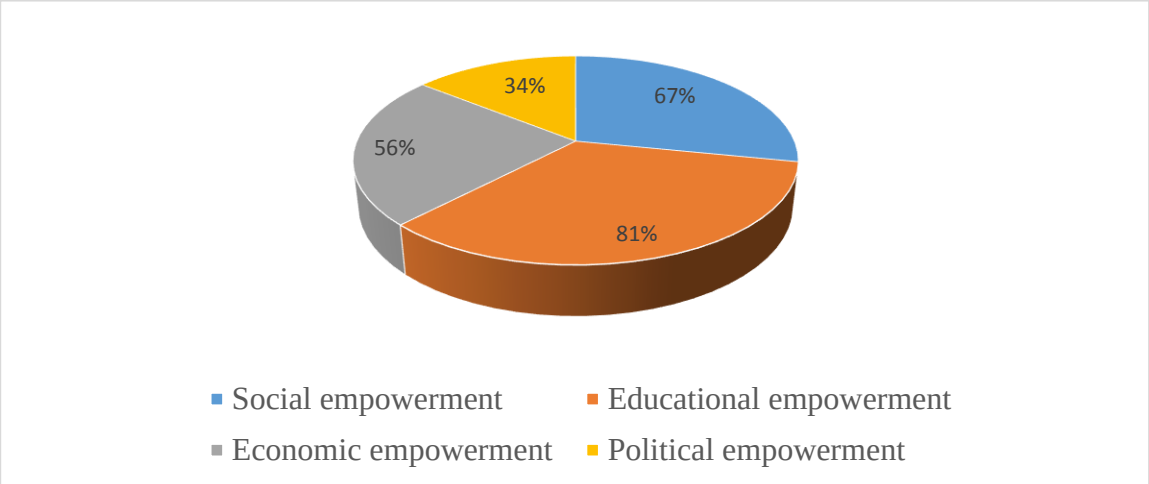
4.0 Results and Discussions

4.1 Understanding of the Term Empowerment

According to the report from focus group discussion the women in the study area explained the term empowerment as a social process where an individual gains control over their own lives and make independent informed decisions concerning their livelihoods. Other respondents reported that empowerment as a *process of promoting leadership and participation of rural women in decision making concerning factors of production which include land, labour and capital in order to improve economic status, food production, control of their reproductive lives and decision making at household level and public level.*

4.2 Types of Women Empowerment

From the focus group discussion and interview schedules the respondents reported that there were four main types of empowerment in the study area which include; economic, educational, social and political empowerment.



Majority of the respondents reported that they were empowered in terms of education since they were trained on various areas of agricultural production by government extension, Kenya agricultural livestock organization, Non-governmental organizations they reported that the training revolved around the

topics of access to credit, crop and livestock production, marketing among other areas. They also reported that the gained educational training from radio and television programmes that train farmers on good farming practices. The respondents reported that the role of the radio in empowering women provision of answers to areas they felt are a challenge in agricultural production and had a chance to interact with experts and other audience on their local vernacular language which everyone could understand the topic under debate concerning various agricultural topics. Even though each of the respondents' descriptions on the importance of using a radio as the main source of information were unique, the responses showed that the usage of radio brought many opportunities for these women, in the context of rural Njoro Sub-county. The radio was certainly the far most used ICT when it came to obtaining agricultural information for all of the women who were interviewed. The explained benefits with the radio were: *that access to radio was everywhere and used various dialects to communicate, it could be listened to everywhere and at the same time as the women carried out their other tasks, and that listening was neither being affected by ownership nor control of the radio. Besides only being a provider of agricultural information, radio programs were extremely important for the women, because this was how they would find out about what was new and about what was going on in the sector, in the country, and even in the world. For those women being illiterate, learning by listening were sometimes their only means of obtaining information. Having access to a radio was explained as both being the most powerful and affordable way of obtaining valuable information coming from the ICT sources available, and it also responded to the women's needs. There existed a number of different programs, which often were broadcasted in their own local languages. Listening to programs in local languages gave the women increased agency by developing a sense of autonomy and self-confidence, which they had not possessed before. They explained that this had really helped them in enabling and increasing their capacity to obtain and act upon the information being broadcasted, that previous were often difficult to obtain. The skills they learned from the radio furthermore provided opportunities for the women to "self-educate" themselves and increase their resources in terms of human capital, meaning more farming skills and increased knowledge and try out ideas for solving problems related to their agricultural production, which in the end could lead to positive economic opportunities. It also allowed them to in some extent think beyond their immediate day-to-day survival and exercise greater choices that could entail income benefits.* However, based on experiences from the extension officer being interviewed it is more common that the married women always asked their husbands first, before implementing and trying out new ideas. This was also something that was confirmed during the FGD. The testimony of the extension officer and the responses from the interviews and FGDs, gave the impression that women do not perceive themselves as being the ones undertaking final decisions, or even being able to making choices at all, in the presence of a male head. This is also in line with the research findings of Smith et al. (2003), who showed that women are often not left to make their own agricultural decisions, such as which input to use. But when they got the confidence to make their own decisions, the productivity increased as compared to when the man took all the decisions. This could also give the impression that women in single headed households are more empowered of this device than married ones.

The respondents reported that they were economically empowered when they were able to save, access credit from various sources, pull resources together and access and control land and labour. In the study area the respondents reported that they were able to access from their mobile phone helped which helped them to accumulated assets, such as social and financial assets, for both individual and for group members, but to different degrees. First of all, the women perceived the phone to be beneficial because of its flexibility and mobility (Adi, 2013), and this made them save a lot of time. They could use the phone without having

to forsake their workplaces in the home and in the farm. The phone then helped to alleviate some of the barriers women face in their physical mobility and accessing information on job opportunities. The extension officer mentioned that since most of the women do the manual work, it is also up to them to facilitate the tasks around the work. For example when it came to accessing casual jobs women had to wake up early and walk to the trading centres to wait for potential employers and when they do not get the job opportunities they walk back home having wasted their economic time. After the introduction of mobile phones and when women also accessed them, things changed and women could simply call a person or SMS to inform them about a job opportunity. Before the introduction of M-pesa, no women or very few women owned their own bank accounts and this also applied for many men. If households had a bank account (before M-pesa) it belonged to the head of the household, which usually was a man. But now, by owning a phone, the women could open their own accounts, buy products by using their phone and also both save and send money, leading to greater economic autonomy for the women. According to FAO (2011) this has of course also affected the men farmers' positively in similar way, increasing their economic autonomy (ownership of assets). Kabeer (2005) reported that this not sufficient in explaining if women have become economically empowered or not, since it mainly refers to control or command over financial and material resources. The term only reflects the aspects of, if financial assets are obtained in one's own name and how they choose to use or dispose them, and are therefore strongly connected with the individual persons' ability and decision power on how they should be used (ibid). Kabeers (2005) conceptualization of empowerment refers to something broader, since it deals with the process of change. How women exercise and increase their agency is thus the central aspect of the path to women's economic empowerment and strengthening women's ownership of assets (economic autonomy), is a critical and important factor of the process(ibid). Thus, through the mobile phone, most of the women have enhanced their agency and capacity to financial assets, which helped them to facilitate and resolve some of the barriers in their daily mobility. The use of the phone has increased their autonomy, access to opportunities and resources, but also strengthened their power to take control over their life both when it came to inside and outside their home. Through the phone they now could make strategic life choices that reflected their preferences and gain the ability to effect a change, as compared to before the mobile phone existed, when this option was denied to them. Since M-pesa is based on private accounts, it has enabled women to access, control and own more financial assets, which they could transform to other resources or help them to strengthen their capability to act and make their own decisions for improved livelihoods (McGuigan, 2014).

Socially, the respondents reported that they were empowered when they used their mobile phone as they were beneficial in terms of mobility and flexibility, since it could provide the women with capabilities to keep contact and reach out to persons regardless of the distance between them. As a result, of this their social networks were strengthened. The extension officer mentioned that women like to share a lot in groups who consist of women, but that they only had time to meet on Sundays when attending the church service in the nearest community area. But using the phone has now enabled them to communicate more often and as a result reinforced their social networks. For the group of women connected to "M-farm, Whatsapp, Telegram and facebook", in their mobile phones they were able to share agricultural information, hold meetings over the phone and deliberate on pressing issues without physically meeting enabling the group to come together, share information and enable future collective action opportunities as a marketing and access to land and capital without moving from one area to another.

The role of the TV in empowering women, from the focus group discussion and interview schedule the respondents in this study, reported that the TV did not play any major role in providing beneficial opportunities for the women. The main reason TV should not be considered an ICT tool that has increased women's agency is due to the fact that women did not have the time to watch the TV to any greater extent, and in that they lacked any real influence or control when choosing which program to watch. This privilege was mainly the men's, for those women with husbands. The women without husbands mentioned that even though not having a man present in the home, little time was left to watch the TV due to their double burden of being the breadwinner and taking care of domestic work entirely alone. All of the women had the alternative to watch TV since it existed in their home, but none seemed to have the ability to choose to watch the TV for agricultural education purposes

The role of the Internet in empowering women, from the focus group discussion and interview schedule the respondents in this study, reported that usage of internet could be said not to play any major role in providing opportunities in similar ways as the example with the TV. The Internet was not even used amongst the women. Firstly, most of them could not access it due to not having a smartphone or a computer, but also because of associated with high costs. Secondly, those that could access the Internet, mainly women employed in other sectors of the economy and practiced farming as an alternative source of income or a hobby women and owned a smartphone, gave many reasons for not using the internet, including one woman saying *"they are not for old people like us, they are for the young generation*" (Woman in the FGD Mau-Narok). It seemed that there existed a common perception that they did not see the relevance of using the internet for their agricultural production and the potential benefits it could provide them with, in terms of accessing agricultural information and learning new skills. This could mainly be deduced back to the fact that they had simply not been taught nor shown examples of any practical advantages of how the Internet could be used to benefit them. Once again, as with the TV, those that had access to Internet in some way (and not taking those who did not afford it in considerations due to high cost), had an alternative whereas they could have chosen to use the Internet, but did not. Strategic life choices always came before, what Kabeer calls "second-order" or "less consequential choices", which of course "may be important for the quality of one's life but do not constitute its defining parameters" (Kabeer, 2005).Since they did not see the relevance of Internet, they could not think what difference it could make in their everyday life, which in turn also affects their scope of action. Based on the women's experience from life, the given structures may inhibit them to shape interest in learning new skills. The context then that they are embedded in may therefore shape the women's individual interests, which in the end condition women's choices (Kabeer, 2005).

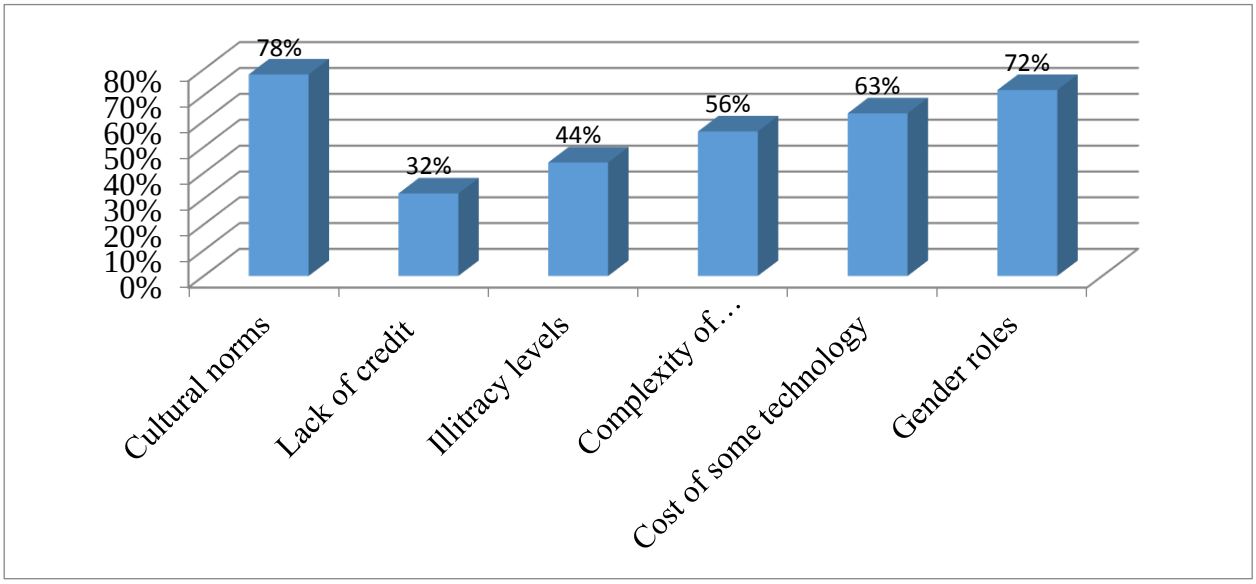
4.3 Effects of Women Empowerment

From the focus group discussion and interviews with the women in Njoro Sub-county the following consitions were seen to be of great importance in empowering women. There were different conditions that influence women empowerment this conditions include: Creating a safe space through joining women groups where they were able to discuss their issues freely without involvement of men especially on issues of savings through table banking, M-pesa , reproductive health issues and how to solve domestic conflicts that arise from management of agricultural production factors (land, labour, capital and entrepreneurship) among other issues. The women groups provided a safe and a trusted space for women to gather and learn. Support independence and mobility this was achieved through listening to the radio, use of mobile phones, joining farmers groups, cooperatives and attending extension education training

meetings which facilitated their independence in sourcing information which in turn helped them make informed decisions about access to labour market, production skills, value addition and agricultural marketing enabling them to share with each other their experiences without consulting their husbands. Through attending farmers field schools the women respondents reported that they were able to do simple things observing disease symptoms, perform small veterinary skills such as docking, dehorning, nursery management, pruning, grading breeding and selection among others through possession of mobile phones and joining cooperative movements the women respondents reported that they were able to open and operate their own accounts increasing their savings or income after joining savings cooperatives. Savings cooperatives, mobile baking and table banking groups allowed the women to invest money and then take turns receiving micro-loans to start micro-businesses or invest in education for their children. Through Farmers Field Schools, Kenya Agricultural Research, and Livestock Organization the respondents reported that they were able to get skills on beekeeping, mushroom farming, dairy farming, and other income-generating skills through training programs and were able to start her own income-generating business after joining farmers groups and savings cooperative. Through joining of farmers groups and listening to the radio conversation they were able to get information which they used to build their self-esteem and confidence. Majority of women reported that their self-esteem or confidence had increased since joining farmers groups and cooperatives as they were helped to become more comfortable in speaking in front of groups and sharing opinions.

The respondents reported that through joining of women groups, and cooperatives they were able to boost decision-making power, say that they have greater decision-making power in their homes and communities. They also reported increase in influence in their families and communities after receiving training or information from their local health care workers, on family planning, domestic violence and reproductive rights. The respondents reported that through joining of women groups, and cooperatives they were able building social networks, which enabled them to have more support and greater opportunities to effect change in their communities. The respondents said that once this network were in place, they are emboldened by the knowledge that they are not alone in facing issues like domestic violence, reproductive health or family planning, and that they are inspired to help other women in their community by sharing the knowledge they have learned about these topics. The respondents reported that through joining of women groups, and cooperatives they were able to hold public leadership roles. Women groups and cooperatives provide leadership training for women to increase their presence in the public sphere. Majority of the respondents reported that they able to express their opinions in public or in their home. Women report joining committees, facilitating meetings, participating in protests, raising their voices against violence, and organizing community programs

4.4 Challenges in Women Empowerment



The process of empowerment was affected by limited access to credit, health care and education among other challenges they faced. These are further aggravated by the global food and economic crises and climate change. Empowering them is essential, not only for the well-being of individuals, families and rural communities, but also for overall economic productivity, given women's large presence in the agricultural workforce worldwide. Women lack credit to expand their farming activities for they cannot get access to credit for failure to provide the necessary collateral. For instance Agricultural Finance Corporation (AFC) which gives credit to farmers requires that before they consent to give credit one must provide a title deed of the land, which in most cases women do not have, as land is usually registered in their husbands or male children's name.

Another problem facing women in development is the fact that the vast majority are uneducated. This has resulted from some cultural practices, that the boy child is valued more than the girl child. Hence most rural families especially among the poor will give priority to the education of the boy, while the girl is seen as a source of wealth to the family. Therefore, the girl may be married off at a tender age and hence terminating her education. Adult literacy classes are well attended by women, and although these courses are geared towards basic education and practical skills, they usually are not coordinated with other projects. For example when reading about hybrid-maize women could be supplied with maize seeds and other inputs.

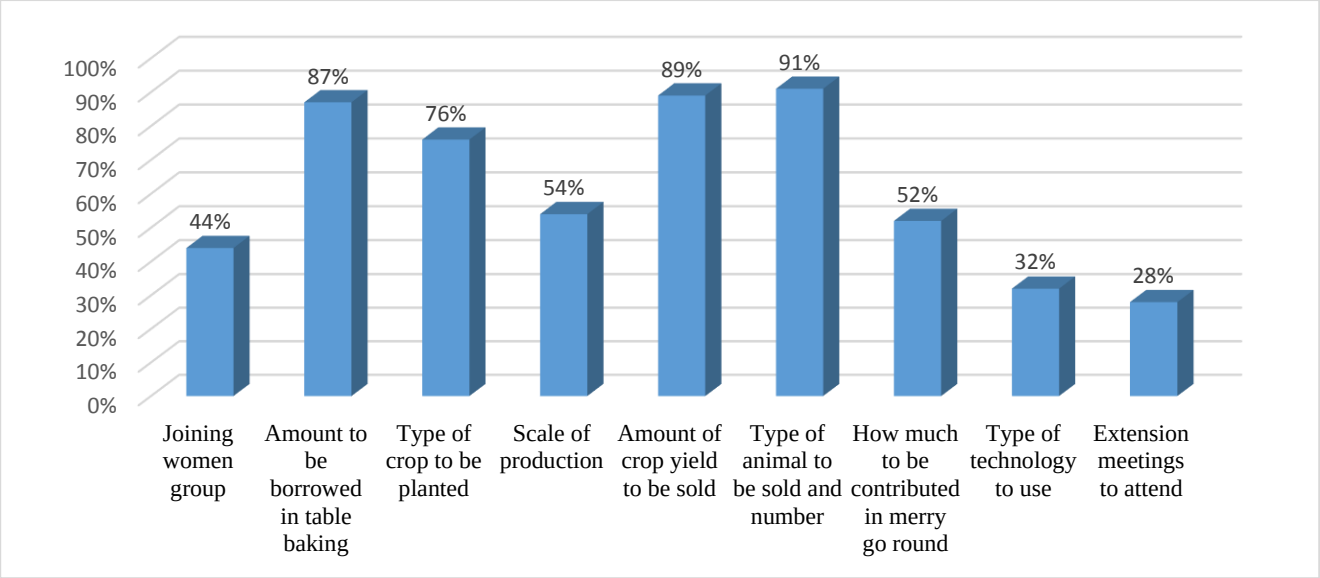
Women also lack agricultural training and extension advice even when improved food crops such as hybrid maize are promoted, training and inputs are usually received by male household head and not by women. The development of low-cost agricultural implements has been neglected: women continue to use short-handled hoes for breaking land and weeding. The extension services are constrained by social sanctions, which prevent visits from the male-dominated extension staff for among many ethnic groups, culture prohibits a male 'stranger' from visiting a married woman. Responsibilities of women tend to

increase with introduction of labour intensive crops, education of children and off-farm employment for men. Further, shortages of house hold labour increases the womens' responsibilities for others chores like fetching water, firewood and milking livestock (Adi, 2013).

In marketing cooperatives, the position of women is at the peripheral. Most cooperative societies in the past accepted only male members. Membership tends to be in the name of the husband, this creates problems. There is evidence to indicate that when a cash crop under male control competes for labour with food under female control, the cash crop tends to be neglected until work on the food crop is completed. Moreover, women may refuse to work on a crop or do so inefficiently when the income will go to the male household head as illustrated by a cooperative society that was set up for the marketing potatoes in Njoro. This was formally a plantation crop whose labour was supplied by women and children, whose small fingers were hotter, suited than men's to the delicate operation of plucking the wool. Independent Kenya adopted the policy of substituting cooperative marketing from individual holdings for wage labour. The plot-holders were men and so were the cooperative members, so though the women were still expected to do most of the work, when the crop was sold the proceeds went to the men and the women no longer got what they earned before from their employers

4.5 Tasks That Women Seek Permission in Agricultural Production

From the study the following activities were reported to seek permission before undertaking them



From the study results the respondents report that issues revolving money they consulted their husband s as they were the leading cause of conflicts in the society. Issues that were less concerned about money they did not consult much as there was less conflicts involved. The respondents reported that *"men wish to be consulted on issues revolving around finances as they felt superior and were the head of the household which was seen as a sign of respect.* The respondents reported that they were empowered when they joined women groups which was a form of social empowerment and they were able to share the challenges they

face both at household level and community level and they were able to seek solution through consultation among themselves. Through table banking the women reported that they were able to be economically empowered as they could be able to borrow credit at low interest rates and invest in small business enterprises such as poultry rearing and groceries business as off-farm activities. Through attending extension meetings and group meetings they were able to get new information on farming and entrepreneurship which was a learning process. As women elected their leaders through democratic process they felt they were politically empowered and had freedom to make independent choices on leadership and management of group affairs. According UN() to Social Empowerment refers to the enabling force that strengthens women's social relations and their position in social structures. Social empowerment addresses the social discriminations existing in the society based on disability, race, ethnicity, religion, or gender.

Extension Environment Characteristics Influencing the Use of Video Mediated Technology in Teaching Agricultural Knowledge and Skills to Farmers in Homa-Bay County, Kenya.

Javan O. Owiti[1]

Egerton University, Department of Agricultural Education and Extension, P.O Box 536- 20115,Egerton, Kenya.
Tel: +254-726-860-202 E-mail: owitijavan07@gmail.com

Jacob J.J.Ochieng' Konyango[1]
Machakos University, Department of Agricultural Education and Extension, P.O Box 137-90100, Machakos, Kenya.
Tel: +254-722-460-523 E-mail: jaonyango2003@yahoo.com

James Obara[2]
Egerton University, Department of Agricultural Education and Extension, P.O Box 536- 20115,Egerton, Kenya.
Tel: +254-722-604-782 E-mail: jobara@egerton.ac.ke

Mark N. Mutinda[3]
Africa Nazarene University, Department of Environment and Natural Resource Management (EMR), P.O Box 53067-00200, Nairobi, Kenya.
Tel: +254-721-299-114 E-mail: mmutinda@anu.ac.ke

Abstract

The study assessed extension environmental factors influencing the use of video mediated technology (VMT) by public extension agents in Homa-Bay County, Kenya. All the 85 extension agents in Homa Bay County were assessed using a structured questionnaire. The collected data was then cleaned, coded and analysed using descriptive and bivariate linear regression. The internal reliability of the created indices was determined using Cronbach's alpha (α) and an alpha of above .70 was considered adequate for this study. The study found out that there was low rate of use of VMT, and that the extension environmental characteristics had a positive and significant influence (β= .215, p=.048) on the use of VMT by the extension agents in Homa-Bay County. The influence of extension environment on the use of video mediated technology was rated as average (mean of 5.2) on a scale of 1 to 10. The extension environmental characteristics affecting the level of use of VMT among the extension agents in Homa-Bay were found to be low level of response by the farmers to VMT trainings, lack of electricity away from training centres in the local agricultural areas and inaccessibility of training centres by farmers due to long distances and poor road networks. The study recommended that the public education of the farmers on video mediated learning, establishment of Video Viewing Shops (VVS) strategically, adequate electricity connectivity and improved road network systems within the local areas would improve farmers' attitude towards the usefulness of VMT and increase their ability to access agricultural information in the attempt to improve farm productivity through better agricultural practices.

Keywords: Video Mediated Technology, Extension Environment, Teaching, Agricultural, Knowledge, Skills

Introduction

Agriculture plays a major role in the socio-economic development of many countries globally and remains to be the backbone of economic growth and stability of many African countries and Kenya in particular. Agriculture is the main source of income for almost 90% of the African population. About 70% of the African population, Kenya inclusive, lives on less than 1$ (one dollar) a day and the larger population of smallholder farmers in Kenya lives in rural areas and depends directly or indirectly on agriculture (Omorogiuwa, Zivkovic & Ademo, 2014). To improve farm productivity, these smallholder farmers need access to improved technologies, best practices, and to appropriate, timely and comprehensive information, skills and knowledge on production, value addition and markets (Umar, Musa, Olayemi & Suleiman, 2015). This can be achieved through use of proper agricultural extension information and communication channels such as video mediated technology by extension agents which make local farmers to be in tandem with better global agricultural ideas, knowledge and practices to boost their farm productivity (Van Mele, Wanyoeke & Zossou, 2010a).

Video mediated technology involves the application of participatory or educational videos in solving instructional challenges in extension and in improving farmers' ability and interest to learn new agricultural knowledge and skills (Ferriman, 2013). In these videos, farmers with a knowledge, skills or an idea in a given agricultural activity or enterprise within a particular locality are recorded demonstrating a practice or a process, then the videos can be aired on television, or extension agents can take them to villages, show them and discuss them with farmers (Van Mele et al., 2010c). The world's knowledge on use of videos in facilitating learning of agricultural skills by extension agents among farmers has been a great intervention (Suarez, Ching, Ziervogel, Lamaire, Medler & Wiser, 2008). It has been used to enhance self-learning by grassroots people and has emerged to be a powerful medium for knowledge sharing and in producing change in attitude in a cost effective format and engaging for both creators and users (Van Mele et al., 2010b; Okello et al., 2012; Soniia & Asamoah, 2011).

In Kenya and particularly in Homa-Bay County, ICIPE has successfully and effectively used video in training farmers on how to control Striga weed, stem borer and to improve soil fertility (Amudavi et al., 2009). The empirical evidence from Suarez et al. (2008) study concluded that the power of videos could thus enable extensive and intensive learning of various agricultural skills and technologies by farmers. Using videos as learning tool engages the farmers and enables skills and practices to be shown in a short period, and standardizes the technical information disseminated (Vidya & Chinnaiyan, 2010).

Dissemination of agricultural information and skills in the past two decades has been through extension methodologies such as field days, print materials, radios, farmer teachers, Farmer Field Schools (FFS), among others (Amudavi et al., 2009). Adoption of new knowledge and skills that is facilitated by these existing extension service delivery methods only may be short-lived due to large number of farmers, vastness of the area to be traversed by the agents and poor transport infrastructure (Bentley, 2009). The speed of changing technology calls for effective access of new knowledge and skills. Farmers who are

illiterate can easily access information through their mobile phones or television at their convenient time allowing them to give more time to farm work (Okello, Kirui, Njirani & Gitonga, 2012).

Video mediated teaching and learning is considered as an empowering extension methodology that offers considerable strength for improving the effectiveness of dissemination of agricultural information, knowledge and skills, for it uses the power of images and enables storage and quick retrieval of information. It is being promoted as an intervention to improve the extension service delivery. Despite the many benefits of VMT, its use in solving agricultural information dissemination problems still faces hurdles. Farmers have greatly benefited from video mediated learning, which has proved successful through trials by ICIPE in the same county. However, its use and acceptance by agricultural extension agents in Homa Bay County remains low. This study sought to determine why the rate of use and acceptance of VMT by agricultural extension agents for dissemination of agricultural knowledge and skills to farmers in Homa Bay County remains low. This study was designed to provide the missing information.

Objectives of the study

The objectives of this study were to examine level of use of VMT among extension agents in Homa-Bay County and to assess the influence extension environment characteristics (availability of electricity, responsiveness of the farmers to VMT and accessibility to the training centres) on use of VMT for teaching of agricultural knowledge and skills by public extension agents in Homa-Bay County.

Methodology

The study was conducted in Homa Bay County in Kenya. The County is in the Western part of Kenya, along the shores of Lake Victoria. Homa Bay County was selected for this study due to its vast agricultural potential and the increase in the number of farmers arising from school dropouts who have taken up farming as a livelihood. The County has challenges that include transport and low level of agricultural knowledge.

A structured questionnaire was used to obtain information from all the 85 extension agents working in Homa Bay County, Kenya, on availability of electricity, training centres and accessibility in enhancing the use of VMT in training farmers. The data was then analysed using descriptive and bivariate linear regression.

Measurement of variables

A self-rating scale (1-5) was used by the extension agents to rate their levels of use of the VMT and their perceptions of the different variable indicators used in this study. The extension agents rated the indicators of the three independent variables, extension environment; availability of electricity away from the training centres, responsiveness of the farmers to VMT and accessibility to the training centres. The

individual scores of each extension agent were then added together to form an index which was used in subsequent analysis (Bryman & Bell, 2011).

The dependent variable, level of use of VMT by extension agents was operationalized as the level of use undertaken by the individual agricultural extension agent on each of the following VMT, which included: Whiteboards, Flip charts, Overhead Projectors, Video Camera, Computers, CD-ROM, DVD, Television, Digital Cameras, Smart Phones, Agricultural Video clips, The Web, Search Engines, E-mail, Scanner, Web Publishing and Internet connectivity. The agents assessed their level of use of each of the item on a scale of 0 to 5, 0 indicating no use and 5 indicating high use.

The internal reliability of the created indices was determined using Cronbach's alpha (α) and an alpha of above .70 was considered adequate for this study.

Results and Discussion

Level of use of VMT by extension agents in Homa-Bay County

In this study, Video Mediated Learning (VML) will be frequently used alongside instructional media and instructional materials or Video Mediated Technology (VMT) to mean all video materials and equipment that are used to enhance the teaching and learning process by extension agents in extension teaching, while use will refer to a purpose for which something may be employed. In this study, the term will refer to incorporation of videos as part of extension teaching to reinforce learning by farmers.

The dependent variable of this study was the level of use of video mediated technology for teaching of agricultural knowledge and skills by public extension agents. The variable was operationalized as an index involving three different indicators, which included Use of VMT by the extension agents, frequency of use of VMT by the extension agents and the choice of VMT by the extension agents in relation to other extension methods.

The extension agents scored the three indicators on a scale of 0 to 5. The score of 0 referred to no use of VMT and 5 high use of VMT. The scores were then combined to form the index of level of VMT use. The frequency distribution, descriptive statistics and the chi-square test for the index are shown in Table 1.

Table 1

Frequency Distribution and Descriptive Statistics for Index of VMT Use

Level of VMT Use	Frequency	Expected N	Residual	Chi-square test
.00	13	14.2	-1.2	
3.00	46	14.2	31.8	x^2=93.659
5.00	13	14.2	-1.2	df =5
7.00	8	14.2	-6.2	p=.001
9.00	3	14.2	-11.2	
13.00	2	14.2	-12.2	
Total	85			

Mean 3.67±.281, median 3.0, Std. dev 2.59, minimum 0, maximum 13, range 13

The results on Table 1 show that the level of VMT use by extension agents in Homa-Bay County was low with a mean of 3.67 on a scale of 0 to 15. The majority of the extension agents (54.1 %) rated their use of VMT as low, the category of high (score of 9) and very high (score of 13) had only 5.9 %. These differences in the extension agents use of VMT were found to be statistically significant (Chi-square 93.659, df 5, p<.001).

Extension environment characteristics

The variable extension environment characteristics used in this study was conceptualized as an index involving assessment of three (3) indicators of good extension environment. The indicators were rated on a 5 point scale to gauge the condition of the environment. The extension environment indicators that were used included: (i) availability of electricity away from training centre, (ii) responsiveness of the farmers to VMT, and (iii) accessibility of the centres based on distance. The rating for the three indicators were then added together to form the index of extension environment characteristic and rated on a scale of 0 to 10 for the study. The descriptive statistics and the frequency distribution of the index are shown in Table 2.

Table 2

Frequency distribution and descriptive statics for the index of extension environment

Scale for the index	Frequency	Percent
3.00	3	3.5
4.00	11	12.9
5.00	45	52.9
6.00	16	18.8
7.00	6	7.1
8.00	3	3.5
9.00	1	1.2
Total	85	100.0

Mean 5.2± .11, median 5, mode 5, std. dev. 1.08, Minimum 3, maximum 9, range 6.

Majority of the extension agents (52.9%) had a low score index of 5. The average level was 5.2, ranged between 3 and 9. The low index reveals lack of electricity away from training centres, low level of response by the farmers to VMT and inaccessibility to training centres.

Influence of extension environment characteristics on the use of VMT

The influence of the individual extension environment characteristics (availability of electricity away from training centres, responsiveness of the farmers to VMT and accessibility to the centres based on distance) on use of VMT by extensionists was determined by use of bivariate linear regression and the results of the regression model are presented in Table 3 and Table 4.

The adjusted R^2 value of 0.035; this means that the independent variable extension environment characteristics explained approximately 3.5% of the variation in dependent variable use of VMT by extension agents as shown in Table 3

Table 3

Regression summary for the influence of environment characteristics on use of VMT

Model	R	R square	Adjusted R square	Standard error of the estimate
1	.215[a]	.046	.035	2.551

[a] predictors: (constant), index of extension environment characteristic

The regression coefficients, t test and significance of the effects are given in Table 4.

Table 4

Regression Coefficients for extension environment characteristics

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics
	B	Std. Error	Beta			VIF
(Constant)	6.391	1.381		4.627	.000	
extension environment	.515	.256	.215	2.010	.048	1.000

a. Dependent Variable: use of VMT by extension agents

Significant positive influence of extension environment characteristics on the level of use of VMT by the extension agents was found to exist (β=.215, p=.048).

Conclusion

Agricultural extension plays an important role in equipping both the extension agents and farmers with relevant agricultural information and knowledge. Video Mediated Technology is an important information communication tool in bridging the agricultural information gaps between extension agents and farmers for increased productivity. It has not been fully utilized in Homa Bay County due to some extension environment associated with low level of response by the farmers to VMT trainings, lack of electricity away from the training centres within the local agricultural areas and inaccessibility to training centres due to long distances and poor road networks.

There is therefore need for public education of the farmers on video mediated learning, establishment of Video Viewing Shops (VVS) strategically, adequate electricity connectivity and improved road network systems within the local areas to improve farmers' attitude towards the usefulness of VMT and increase their ability to access agricultural information in the attempt to improve farm productivity through better agricultural practices.

References

Amudavi, D.M., Khan. Z.R., Wanyama, J.M., Midega, C.A.O., Pittchar, J., Hassanali A. (2009). Assessment of Technical Efficiency of Farmer Teachers in the Uptake and Dissemination of Push-Pull Technology in Western Kenya. In: *Crop Protection* 28 (11): 987-996.

Bently, J. W. (2009). Impact of IPM extension for smallholder farmers in the tropics',in R.Peshin and A.K. Dhawan (eds). *Integrated Pest Management. Vol. 2*: Dissemination and Impact New York, NY: Springer.

Bryman, A. & Bell, E. (2011). *Business Research Methods*, Third Edition, Oxford: Oxford University Press. Accessed on 23rd August 2018 from https://www.researchgate.net

Ferriman, J. (2013). *How to effectively use video for training.* Accessed on 18Th June, 2015 from www.learndash.com/how-to-effectively-use-video-for-training/.

Okello, J.J., Kirui, K.O., Njirani, W.G. & Gitonga, M.Z. (2012). Drivers of Use of Information and Communication Technologies by Farm Households: The Case of Smallholder Farmers in Kenya. *Journal of Agricultural Science, Vol. 4(2),* pp. 111-124.

Omorogiuwa, O., Zivkovic, J., & Ademo, F., (2014). The Role of Agriculture in the Economic Development of Nigeria. *European Scientific Journal*, Vol. 10(4), pp 133-147.

Soniia, D., & Asamoah, C. (2011). Video as a tool for agricultural extension in Africa: a case study from Ghana. International Journal of Education and Development using Information and Communication Technology (IJEDICT), Vol. 7(1), pp 26-41.

Suarez, P., Ching, F., Ziervogel, G., Lemaire,I.Medler,J.S., & Wiser, B. (2008). *Video-Mediated Approaches for Community-Level Climate Adaptation*. IDS Bulletin,Vol.39(4).

Umar, S., Musa, M.W. & Olayemi, Y.T.(2015). Awareness and Use of Information and Communication Technologies among Extension Agents in Kaduna State of Nigeria. *Journal of Agricultural Extension*. Vol. 19(1), pp 66-76.

Van Mele, P.J., Wanyoeke, J. & Akakpo C. (2010c).Videos Bridging Asia and Africa: Overcoming Cultural and Institutional Barriers in Technology-mediated Rural Learning. *Journal of Agricultural Education and Extension, Vol.16 (1),* pp. 75-87.

Van Mele, P.J., Wanyoeke, J. & Zossou, E.P. (2010a). Enhancing rural learning, linkages and institutions. *Development in Practice. Vol 20(3)*, pp. 414-421.

Van Mele., P.J., Zossou, E,P. Vodouhe & Wanyoeke, J. (2010b). Women groups in response to public video screenings on rice processing in Benin. *International Journal of Agricultural Sustainability. Vol. 8.4,* pp. 270-277.

Vidya, P., & Chinnaiyan M. (2010). Development of an educational Interactive Video-DVD on dairy health management practices. *International Journal of Education and Development using Information and Communication Technology, Vol 6(1),* pp. 19-24.

Evaluation Of Effects Of Sewage Farming Vegetables To Consumers And Their Awareness In Peri-Urban Areas: A Case Study Of Ruai, Nairobi County.

By

Mary Wambura Kamau

Fourth Year Second Semester

Department Of Agribusiness And Trade

Machakos University

Abstract

Food safety has become everybody's concern and it's difficult to find anyone who has not encountered an unpleasant moment of foodborne illnesses at least once. Food borne illnesses are a result of consumption of contaminated food with micro-organisms, pathogens, heavy metals and other toxic elements. Due to lack of land and water for farming in Nairobi most farmers utilize the land along the sewage which is usually owned by the government and do their farming with the sewage water. Most of the vegetables consumed in Nairobi is produced with sewage water and I wanted to know how the produce affects the consumers since the water contains heavy metals, pathogens and micro-organisms. Sewage vegetables are sold everywhere in the market and they take biggest share in the market. Those who produce using clean tap water are mostly not able to take their produce to the market since consumers come to buy the vegetables at the farm. I realized that vegetables produced using clean water was very few to satisfy the population and so most farmers sold to friends. I used a stratified random sampling technique, I used questionnaire and interview method to collect data from the consumers, I interviewed consumers both from their homes and in the market place since most people consume what they sell. I adopted statistical package for social sciences method for data analysis.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background information

Today the number of Africans living in cities is 40 percent of the total population and half of the world's population lives in cities and towns (Hania Zlotnik, 2008). Due to the large population in the urban areas people depend on urban and peri urban agriculture for food. Access to clean water for irrigating vegetables in the urban areas is a problem and hence they use waste water for production.

Globally ,urban farming is believed to produce roughly 20 percent of the world's food supply with half of this food being grown using waste water which includes; domestic and industrial effluent combined with domestic waste .It is widely perceived as the cause of stench and disease but it is not so for the urban farmers who produce with the waste water and sell it to the consumers (koigi, 2011).Some chemicals and microbial organism that bring food safety issues are found in the sewage water and hence grow with the plant and ends up being consumed by the consumer

There has been an increase in consumer awareness for food safety and hazard free products especially by the middle and high income consumers and also most of the educated consumers. Consumer awareness of food safety and nutrition helps reduce risks of food borne illnesses (R.Bhuvneswari, 2015). The emergence of diseases originated by food in the recent years has put food safety into question. At the same time, social economic developments have increased consumer interest in consuming safe food. There is an increase of consumer's interest in environment friendly products. The changing consumer's expectations combined with unfavorable health incidence have increased the importance of studies concerning food safety (Gamze Aydin eryilmaz, 2015).

The study was focusing on the on food products especially vegetables produced in urban and peri-urban areas using waste water and then sold to consumers in Nairobi. this study was evaluate the effects of sewage produce to the health of the consumer and also consumer awareness of the hazards of sewage produce.

Objectives

Main objective

To evaluate the effects of sewage farming produce to consumers and the health risks they experience.

Other objectives

To determine the safety of vegetables grown in the urban and peri-urban areas.

To determine consumer awareness of the hazard of sewage produce and their perception towards it.

To determine the factors influencing consumer awareness of food safety.

To determine consumer willingness to pay for more safer vegetables

Operational definition of terms.

Food safety- refers to limiting the presence of those hazards whether chronic or acute, that may make food injurious to the health of the consumer.

Urban and peri-urban agriculture-agriculture practices within and around cities which compete for resources (land, water, energy, labor)that could also serve other purposes to satisfy the requirements of the urban population (UN, 2015)

Waste/sewage water farming-this is the use of waste water for irrigating crops in agricultural land

Limitation of the study

I had limited time to collect my data and hence this affected the sample size because with more time I could have collected more data. It was complicated to convince consumers to feel the questionnaires and also it was very expensive travelling to ruai for data collection.

CHAPTER TWO : LITERATURE REVIEW

Sewage farming in urban and peri-urban areas

20 million hectares of the world's farms are irrigated with sewage in many fast growing megacities and in most countries a quarter of the vegetables produced are grown in sewage effluent, clean water is desperately short supply where sewage is plentiful. (Fred .p., 2004). According to Scott, sewage is most likely the biggest source of water for urban and peri-urban farming which provides an estimated one fifth of the world's food and almost 100 percent of crops grown in the cities rely on sewage water since there is no other source of water for farming farmers should be helped to do it in a better way since banning the practice is impracticable.

The crops grown in sewage farms are contaminated with pathogens and micro-organisms such as bacteria, viruses, parasites and chemical substances which cause very many diseases ranging from diarrhea to cancer (WHO , 2017). Other includes abdominal pain, vomiting and even death. There is an increasing number of bacteria that are multi-resistant against common antibiotics and cannot be treated by current therapies. Antibiotic resistance has led to the need for more expensive drugs, which many cannot afford, resulting in increased morbidity and mortality (Prof Laura .P., 2018).

Consumer level of awareness of food safety is affected by various factors such as gender, education level, household income (Gamze *et al.,* 2015). The high income and middle income consumer are willing to pay (WTP) higher premium for safe vegetables than the low income consumers who buy their vegetables in the wet markets (Ngigi *et al.,* 2011)

CHAPTER THREE

METHODOLOGY

Study area

The study was conducted in kasarani subcounty, nairobi county. It was focused on ruai and njiru ward since they ,ruai is a peri urban area and hence most farming takes place there since nairobi sewage company is located there and hence nairobi sewage river passes through this area.

Data source

Primary data which I collected by use of questionnaires which I administered to the consumers and interviewing the consumers

Sampling technique

I used stratified random sampling technique where by I administered questionnaires in each strata based on the size of the stratum I used zoning method to ensure that I capture consumers from different areas.

Data analysis

I used statistical package for social sciences(spss) to analyse the objectives of this study according to the data collected from consumers.

CHAPTER FOUR

4.0 RESULTS

4.1 Health risks from sewage produce

The main crop grown along the sewage in Ruai is vegetables mostly kales and other indigenous vegetables. A high percentage of consumers are affected by vegetables produced by sewage water. 77.4 percent said they experienced health risks after consuming vegetables produced with sewage water while 22.6 percent did not experience any health risk. This results shows that a significant amount of people are affected by sewage produce. According to the consumer and who have experienced the health risks, the instance at which you experience the health risks is different among consumers, some do not experience the effects immediately after consuming the vegetables, it takes some time and the health risk may be severe. To others they experience the health risks immediately after consumption such as diarrhea and stomach upset.

The low income consumer disagreed that the health risks were as a result of irrigation of the vegetables with sewage water since they were the main consumers of the vegetables and hence were trying to justify them.

health risk after consuming vegetables

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	24	77.4	77.4	77.4
	no	7	22.6	22.6	100.0
	Total	31	100.0	100.0	

4.2 Consumer awareness of sewage farming and perceptions

are you aware of sewage water produce

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	8	25.8	25.8	25.8
	yes	23	74.2	74.2	100.0
	Total	31	100.0	100.0	

A high percentage of the consumers are aware of sewage water produce although most of them are not able to differentiate between the sewage water produce and the fresh water produce. Some said that sewage produce are more green than the fresh water produce and are more large and retain freshness more than the fresh water.

Consumer awareness is affected by other variables as shown in the table below

Variables		Percentage of consumer awareness	Out of
Level of education	Primary	100	100
	Secondary	83.3	100
	Tertiary	37.5	100
Occupation	Employed	66.7	100
	Unemployed	100	100
Financial status	Above kshs 20000	61.9	100
	Below kshs20000	100	100

There is a significant difference between consumer awareness of sewage produce and level of education, occupation and financial status. Consumer who are educated to primary level, and the unemployed and below 20000 are more aware of sewage water produce, this is because most of them live close to the sewage river and also interact much with each other for the unemployed and visit the farms.

4.3 Perception and preference

The employed consumers and with tertiary education and financial status above 20000 considered the water used to grow vegetables and wash them in the market as an important factor to them and also agreed that consumer should be careful on the produce on the quality of vegetables they purchase. A large percentage of consumers preferred vegetables produced with fresh water but under a condition that they are affordable, I found out that despite the health risks with sewage produce the price of the produce in the market was a key factor to the consumers in the area.

4.4 Willingness to pay for safer vegetables.

Crosstab

			household financial status		Total
			above 20000	below 20000	
the willingness to pay for an extra shilling for safer vegetables	0 shilling bundle	Count	1a	5b	6
		% within household financial status	4.8%	50.0%	19.4%
	less than 5 shilling bundle	Count	12a	4a	16
		% within household financial status	57.1%	40.0%	51.6%
	more than 16 shilling bundle	Count	8a	1a	9
		% within household financial status	38.1%	10.0%	29.0%
Total		Count	21	10	31
		% within household financial status	100.0%	100.0%	100.0%

There is a significant difference in the household income in relation to willingness to pay for safer vegetables. Household with higher income are more willing to pay an extra shilling for safer vegetables.

Conclusion

This study concludes that 77 percent of the consumers experience health risks after consuming sewage vegetables. It concludes that sewage water produce affects consumers' health. It also concludes that consumers' consumption decision is highly affected by the household financial status, occupation and level of education.

Recommendation

Due to the scarcity of fresh water in Nairobi county, sewage water should be treated and released when clean , this is due to the pathogens and metals in the water. The government should also input policies to control farming along the sewage water because banning sewage farming is not possible. The government should also ensure that the sewage water should be disposed through pipe to avoid contamination of the fresh river water and ensure companies dispose their waste in an environment friendly way.

REFERENCES

Bob.K. (2015). *Urban farmers use waste water to feed growing cities.* Nairobi: Business Daily

Fred .p., S. (2004). *Sewage water a tenth of world's irrigated crops.* New Scientist.

Gamze Aydin eryilmaz, O. K. (2015). factors affecting consumer's awareness of food safety. *agrofoodindustry hi tech*, volume 26 number 3.

Hania Zlotnik, s. n. (2008). *african urbanization.* america.

Ngigi .M., J. O. (2011). Urban consumers' willingness to pay for quality of leafy vegetables along the value chain. *International Journal of Business and Social Sciences*, vol.2 No.7.

Prof Laura .P., D. B. (2018). *Irrigating vegetables with wastewater in africa cities may speard diesases.* University of Birmingham.

R.Bhuvneswari, .. D. (2015). Food safety awareness among consumers to avoid the risk of food borne illnesses. *business management and social sciences research*, volume 4 ,number 8..

UN, (2015). *Food and Agriculture Organization: Urban and peri-urban agriculture.* United Nations.

WHO. (2017). *Food safety.* WHO.

WHO. (2015). *Food safety.* SEARO.

SUB-THEME 2- HEALTHCARE, LEISURE AND TOURISM INNOVATION

Significance of Social Media in The Kenya Tourism Industry

Rose Achieng' Agalo

Abstract

The emerging significance of Social media in the tourism industry are increasing. Social media have changed the way tourists explore, search, book and experience travel. Most operations and transactions are currently carried online. With the increasing number of users, social media platforms are seen to have a significant influence in the tourism industry. This paper examines the significant role social media plays and how service providers in the Kenyan tourism industry can utilize them to their advantage. Kenya is ranked among the top tourism destinations in Africa. It is an income generating sector and for example, contributed to 9.7% of the Country's GDP in 2017. It is also one of the key sectors in the Kenyan economic pillar of vision 2030. In the financial year 2017/2018, Kenyan tourism arrivals grew by 6.8 % while tourism receipts posted a 9.9% growth of Ksh 117.6 Billion. Hence social media in the Kenyan tourism industry is envisioned as a means of reaching prospective tourists, showcasing emerging destinations within the Country, and newly improved tourism products. Such use will further improve Kenya's tourism global visibility as well as create increase in tourism arrivals.

Keywords: Social media, tourism, tourism destination

Introduction

Tourism is the world's largest industry with over a billion travelers generating $1.4 trillion dollars export earnings in 2013 worldwide (WTO, 2018). This is due to the establishment of a more affordable and democratic global tourist industry particularly in terms of transport and accommodation. Development of infrastructures that attract tourists has proven to be a catalyst for economic development especially employment. Other than employment, other benefits of tourism include increased standards of living for local residents, increased incomes, development of infrastructure and preservation of heritage sites. Majority of tourists (52%) travel to enjoy leisure time, the other (27%) travel for business purposes, visiting family and friends, religious pilgrimage or to receive health treatments (WTO, 2014). The utilization of social media in the tourism industry prompted this study to analyze the significance of social media in the world's largest industry.

Social media, is a group of internet-based applications that build on the ideological and technological foundations of web 2.0 (Kaplan & Haenlein, 2010:61). (O'Reilly, 2005) lists radical decentralization, radical trust, participation instead of publishing, rich user experience, the web as a platform, users as contributors, collective intelligence, remixing data, attitudes, better softwares by more users and undetermined user behavior as the main Characteristics of Web 2.0. Today, the use of social media in the tourism industry is on the rise. It has enhanced communication role in many aspects of tourism. It is

particularly useful in information search, decision-making behaviors, tourism promotion and in focusing on best practices for interacting with prospective tourists.

Social media is a new phenomenon globally and, the increasing use of social media platforms by tourists leaves little option for tourism stakeholders in Kenya for not using social media platforms for creating tourism awareness. Surprisingly, the power of social media networks as a tool for creating tourism awareness remains to be fully harnessed by the tourism industry in Kenya despite the abundance of opportunities presented by social media.

Certainly the power of the tourism product is more than ever consumer-driven. Consumers demand what they want from tourism destinations. Their expectations are higher and subsequently they are much more difficult to impress (Buhalis Law, 2008).with this view, we see advanced communication technologies enabling tourism destinations to be efficient, flexible and collaborate more in providing for consumer demands (Lange-Faria & Elliot, 2012)

Social media has 3.196 billion, active users. Facebook leads with 2.234 billion users, YouTube 1.9 billion users, and WhatsApp 1.5 billion users (Chaffey, 2018). Trip advisor, one of the largest social media reviewing platform for tourism, travel and hospitality businesses and establishments has 6.6 million businesses and properties in 135,000 destinations, and 255 new contributions are posted every minute worldwide. (Fact Sheet, 2016). These statistics prove that social media is indeed in dominant use in the tourism industry.

Kenya has been divided into various different sections that represent different tourism circuits. A tourist circuit is defined as a route on which at least three major destinations are located such that none of these are in one town, village or city. At the same time, they are not separated by a long distance and should have defined entry and exit points (Cullinan, et al in Chowdhary, 2014). Destination Kenya is a combination of all the tourism circuits all of which have unique attractions. The tourism circuits include Nairobi circuit, Central Kenya circuit, Coastline circuit, Eastern circuit, Southern circuit, North Rift circuit, South Rift circuit and the Western circuit. (Ktb.go.ke, 2019)

Concept of social media in the tourism industry.

Based on social theory (Fuchs, 2015) social media communication has key constitutive features in the modern society which include: integrated sociality, integrated roles and converging communication on social media.

Social media enable the convergence of the three modes of sociality (cognition, communication and cooperation) in an integrated sociality. One step does not necessarily lead to another level of step. However digital technology has the potential to combine all the three activities on a social media platform. For example, a tourist on cognitive level may post a video on facebook, others then comment (communicative

level) and can go further to manipulate and remix the content to give rise to a new content with multiple authorship from the original author.

Tourists have different social roles such as employees, consumers, family members, and citizens. However on social media, all these roles become mapped onto a single profile observed by different people who are associated with the different social roles. Certain social media platforms such as facebook, instagram and twitter are based on creation of personal profiles that describe one's various roles of life. This makes social media platforms social places in which social roles tend to converge and become integrated in single profiles (Fuchs, 2017).

Social media platforms enable integration of different forms of sociality and social roles to serve a myriad of possible social purposes that a single social media platform can serve. Tourists use social media platforms for searching and communicating information relevant to their travel while tourism destinations use it for creating awareness.

Discussion

Social media provides tourism destinations a platform for promoting their products and services. It also presents various avenues for service providers in the tourism industry to grow their market share and build relationships with their consumers. This study argues for the incorporation of social media into the daily media communication routine of service providers in the Kenyan tourism industry. Constant online interaction between service providers and their prospective consumers boosts their visibility on various social media platforms across the globe. Similarly, the study also emphasizes on the integration of social media strategies in communication operations of service providers as a means of enabling them derive value from social media. The approach makes social media is a valuable tool for tourism promotion but ofcourse with potential consequences. Having online presence on multiple social media platforms without a clear strategic approach poses a number of challenges making it difficult to effectively measure social media returns on investments .(Lardi & Fuchs, n.d.) Social media strategy will guide actions of service providers in tourism industry and also act as a measure to determine whether it bears success or failure in social media usage.

Increase in tourism arrivals, both international and domestic as a result of promotion of various destinations via social media promises to lead to economic empowerment of Kenya citizens at large. In the financial year 2017/2018 in Kenya, tourism arrivals grew by 6.8 % while tourism receipts posted a 9.9% growth of Ksh 117.6 billion. Revitalized marketing efforts which included digital marketing was among the key drivers for Kenyan tourism rrowth in 2018. (Ktb.go.ke, 2018).The first Millennium development goal (MDG) advocates for poverty eradication yet travel and tourism industry stands to play a major role in poverty eradication through job creation and other economic opportunities. Tourism is a labor-intensive industry compared to other industries. It has low employment barriers to entry for and usually includes a wide range of enterprises that provide development opportunities to the local community

economy. Its workforce majorly comprises of high ratios of youth and female, hence promoting women empowerment and youth employment. This is in line with the third MDG goal which emphasizes on the need to empower women.

Social media platforms are therefore processual frameworks for transmitting information to large audiences. It does this in partially new ways such as uploading videos and posting photos on social media platforms increasing online presence of service providers in the Kenya tourism industry. This improves the visibility of destination Kenya. Globally, there are 3.397 billion active social media users. Facebook leads by 2.271 billion users, youtube, 1.5 billion users and WhatsApp 900 million users (Brandwatch, 2018). Social media in Kenya has recorded an impressive number of active users. Facebook, has 7.1 million active users, YouTube 8 million, Instagram 4 million, Twitter and Linkedin have 1 million each (BAKE, 2017). These are common social media platforms out of many others making social media platforms a promising audience for service providers in the Kenya's Tourism industry. Owing to the fact that it is free to create social media accounts since none of the largest platforms have any sign-up fees for a service provider to open accounts. Social media has become a cheaper option for enhancing visibility among tourism service providers unlike traditional advertising.

Again customer feedback plays a vital part in customer management. Through social media, service providers in the tourism industry are able to listen to the market and monitor customer impressions. This leads to co-creating new products and services with tourists, engaging tourists using various social media platforms as well as servicing tourists through social media.

Currently, the way tourists search for and evaluate travel information is changing. Information regarding destinations and service providers is available at the touch of a button. Social media platforms allow for collaboration and online sharing of information. User generated content (UGC) enables tourists to submit , review, and respond to online content (Gretzel, 2007). It is an effective form of consumer to consumer e-marketing. Due to the intangible nature of the tourism industry a prospective traveler tends to rely more on information supplied by other people through UGC on social media platforms. The rising popularity of social media sites has made more tourists to rely on social media platforms for information search to make informed decisions about destinations to visit and service providers.

Conclusion

Service providers in the tourism industry should take advantage of using social media platforms to promote their products and services globally. They should also have meaningful content on their social media sites to enable tourists acquire rich information while searching for information and making decisions regarding destinations to visit

A social media strategy is also vital for service providers in the tourism industry. It lays out the basic framework of operations and engagements on social media platforms. . A good formulated strategy is what

makes a service provider unique and well positioned in the target market in order to attract prospective tourists and leverage off competitors.

The Ministry of Tourism is mandated with creating effective policies that promote the Country's tourism industry, creating a conducive environment for tourism businesses to operate in and to lobby investors to invest in capital projects designed to attract tourists and green investments in the tourism industry that promote sustainable tourism. Through the use of social media, the Ministry of tourism will be able to promote tourist attraction sites in Kenya as well as service providers in the tourism industry. The ministry of tourism should also put in place a social media framework that guides tourism within the Country while giving current updates of tourism activities enjoyed in the Country.

References

Brandwatch. (2018). *122 Amazing Social Media Statistics and Facts*. [online] Available at: https://www.brandwatch.com/blog/amazing-social-media-statistics-and-facts/ [Accessed 14 Feb. 2019].

Buhalis, D. and Law, R. (2008). Progress in information technology and tourism management: 20 years on and 10 years after the Internet—The state of eTourism research. *Tourism Management*, 29(4), pp.609-623. (Lange-Faria & Elliot, 2012)

Cf.cdn.unwto.org. (2014). [online] Available at: http://cf.cdn.unwto.org/sites/all/files/pdf/unwto_annual_report_2014.pdf [Accessed 29 Mar. 2019].

Cf.cdn.unwto.org. (2018). [online] Available at: http://cf.cdn.unwto.org/sites/all/files/pdf/unwto_annual_report_2014.pdf [Accessed 29 Mar. 2019].

Chaffey, D. (2018). *Global social media research summary 2018 | Smart Insights*. [online] Smart Insights. Available at: https://www.smartinsights.com/social-media-marketing/social-media-strategy/new-global-social-media-research/ [Accessed 31 Jan. 2019].

Fuchs, C. (2015). *Culture and economy in the age of social media*. New York: Routledge.

Fuchs, C. (2017). *Social media, a critical introduction*. 2nd ed. London: Sage.

Kaplan, A. & Haenlein, M. (2010). Users of the world, unite! The challenges and opportunities of Social Media. Business Horizons, 53(1), 59-68. http://dx.doi.org/10.1016/j.bushor.2009.09.003 (O'Reilly, 2005)

Kenyaweb.com. (2019). *Digital Marketing: How Relevant is it for your Business in Kenya*. [online] Available at: https://www.kenyaweb.com/index.php/blog/77-digital-marketing-how-relevant-is-it-for-your-business-in-kenya-today [Accessed 14 Feb. 2019].

Ktb.go.ke. (2018). *Kenya Tourism Board*. [online] Available at: http://ktb.go.ke/tourism-performance-201718/ [Accessed 14 Feb. 2019].

Ktb.go.ke. (2019). *Kenya Tourism Board*. [online] Available at: http://ktb.go.ke/ [Accessed 29 Mar. 2019].

O' Reily, Tim.2005a. What is web2.0? www.oreillynet.com/pub/a/oreily/tim/news/2005/09/30/what-is-web-20.html?page=1[Accessed 31 Jan. 2019].

Park, Y. and Gretzel, U. (2007). Success Factors for Destination Marketing Web Sites: A Qualitative Meta-Analysis. *Journal of Travel Research*, 46(1), pp.46-63. (BAKE, 2017).

Factors Associated with HIV Affected Clients' Behavioral Practices and Health Outcomes

By

Musengya Judith[1] (PhDs Epidemiologist) Musengya Judith[1]

Email: jumusengya2019@gmail.com

Muindi Serah[2] (Counseling Psychologist) Muindi Serah[2]

Email:mumbiserah@gmail.com

Abstract

A three year cohort study in Machakos County captured the behavioural practices of HIV affected clients undergoing treatment at Comprehensive Care Centres in Machakos and Athi-River hospitals. Selection of 131 HIV infected persons was done on first come basis and interviews conducted after signed informed consent.

Thirteen categories of treatment choices were exhibited by HIV infected clients. The HIV treatment using herbs, prayers and tethered Nutrition, ARVs and Septrin, social support and laboratory testing was studied alongside others e.g Micronutrient bioavailability, biodiversity and health outcomes.

Tethered group exhibited a 45% improvement in ARV adherence, and a corresponding 45 % of the HIV infected Clients improving to a viral load of non detectable level. Some 14 of 131(10.7%) were still awaiting their viral load results. There was a (8 of 131) 6.1% using multivitamins formulations to boost their appetite. A group optimizing on the recommended diet biodiversity were 59 of 131 (40.04%) and 9 of 131(6.9%) eating nine+ foods daily.

The basis for micronutrients and functional Biochemical reactions integrated and tethered on dependent factors leads to restoration to normal of biochemical metabolic reactions in the body thus cure for HIV infected person as the ARVs destroy the HIV virus. The Syndemics interplay of external environment, micronutrients, adhered diets and Metabolism as well as tethered targeted epidemiological interventions resulted to a tethering therapy procedure improving the health of HIV infected persons.

This paper presents a paradigm shift for establishment of tethered social and spiritual support as well as counselling, tethered ARV adherence, micronutrient biodiversity and bioavailability and Nutritional supply.

Key words :- *Tethered, Behavioural, Syndemics, Nutrition,Bioavailability and Biodiversity.*

Factors associated with HIV affected Clients' behavioral practices and health outcomes

Introduction / Background

Over 36 Million individuals are currently living with HIV /AIDS, 95% of whom are from developing countries, assuming that each HIV /AIDS case directly influences the lives of four other individuals a total of more than 150,000,000 people are being affected by the disease. [1] [2] [3] [4] Thus, it is of great importance to address the issues arising from HIV mortality and morbidity, and such information will be useful for planning and development. A high cost is expended in the disease's surveillance, prevention, and control and therefore an endeavor to lower the cost of spending on the same is timely.

On HIV/AIDS Food and Nutrition Security, there are impacts and actions required in planning as was highlighted by Stuart Gillespie in May 2001. It is estimated that Asia will overtake Sub-Saharan Africa in Absolute numbers between 2010 and 2020, and Asia will be the HIV/AIDS epicenter. [5]

Justification

AIDS is caused by a Pathogen called HIV of retroviral Genus. This virus can change from RNA to DNA. It has a Single stranded RNA molecule with a reverse transcriptase enzyme and surface membrane proteins. It is transmitted from human to human by contact with blood or body fluids from infected persons through sexual intercourse (major), blood transfusion, mother to child through placenta, delivery, and breastfeeding, cuts, wounds and sharing of sharp objects. [6]

[1] Academy for Education Development, Washington DC, 2004, Food and Nutrition Technical assistance project, HIV/AIDS: A guide for Nutritional Care and Support.

[2] Alison Barker1995, Breast Feeding Retention rates Associated with Post-natal Oral Zinc Supplementation, pages 369-375.

[3] Ann Mills, Fawzia Rasheed and Stephen Tollman, Strengthening Health Systems, WHO and World Bank P

[6] Vivek Chitnis and Savita Pattwa (2002), Cell Receptor Repertoure, Chapter 26, PCR Testing Methodologies, Page 245-255

It is highly infectious and presents itself severely leading to high mortality and morbidity from symptoms of opportunistic infection due to immune-suppression.

AIDS though preventable has no cure but there are Antiretroviral drugs used to reduce viral loads. The risk of HIV and other diseases has drastically worsened due to co-infection with Tuberculosis Bacillus (TB) varying widely with regions. The risk of Tuberculosis among HIV-infected persons is closely correlated with the number of CD4+ lymphocytes. An estimated rate of active TB among HIV-infected persons was at 6.9 per 100 persons. The development of TB among HIV/ AIDS clients increases the mortality of the HIV Positive clients.[7] [8] [9] [10] [11] It has also been shown that in Sub-Saharan Africa, a significant number of new cases of TB and recurrent cases of TB result from recent transmission attributed to HIV pandemic.[12] In 1994 survey results showed that 40% of registered TB cases were known to have HIV. [13] [14]

Diarrhoea is a common secondary infection among those living with HIV/AIDS. The characteristics of the infection include purging of watery stool. At times the stool is bloody. Diarrhoea can be persistent, may have other symptoms like vomiting or fever. If untreated, the cases suffer dehydration, electrolyte imbalance, acidosis, circulatory collapse or even death. Diarrhoea is the commonest cause of death in

---

[7] Lim-Quinzon MC, Benabaye RM, White FM, Dayrit MM.and White ME,Cholera in metropolitan Manila: foodborn transmission via street vendors. Bull WHO 1994; 72 (4): 745-749.

8. Mbakaya et al 2004b Micronutrient Zinc deficiency as a possible co-factor in the transmission and progression of HIV/AIDS in Kenya

[9]Mbakaya et al., 2010c, unexplained co-infection with Malaria, HIV and AIDS *News/Report JAGST VOl.* 13(1)2011.

10. Swaminathan; S, Ramachandran et, al. Risk of development of TB in HIV infected Patients. *International journal of Tuberculosis and Lung Disease* 2000;4 (9): 839

[11] Ibid. Lim-Quinzon MC, Benabaye RM, White FM, Dayrit MM.and White ME

12. Ngare D. K and Mutunga J.N 1999; Prevalence of Malnutrition in Kenya, East African Medical Journal; 76 (7): 376-380.

[13] *labtestsonline.org/understanding/.../cd4/...*

[14] Elliot,A.M; Namambo,K., et al. The sputum smears results of HIV patients in Lusaka.International Journal of Lung and Disease 1993; 74 (3):19.

Africa.[15] [16] [17] Diarrhoea is a problem for many people with HIV /AIDS as reported by Food Agricultural Organization in 2005. Diarrhoea is a symptom of infection by bacteria, viral or parasitic enteric agents. Unsafe water contributes to high infant mortality rates. There is lack of a basic infrastructure and women and children are forced to spend more hours daily fetching clean safe water for drinking, washing, and other household chores compared to the more developed countries. Poor and non-poor depend on river water while urban populations use piped water. [18] [19] This leads to exposure to pathogenic organisms that cause opportunistic infections mostly to those living with HIV.

A wide range of food borne diseases affect most developing countries. However, with poor or non-existing reporting systems in most countries, reliable statistics on these diseases are not available. Their magnitude is therefore difficult to estimate.

Yearly over 3 million children die as a result of diarrhea diseases while some 1500 million episodes occur under the age of five. Many more millions die from the combined effects of diarrhea and malnutrition. Even children who are HIV negative but born to HIV-positive mothers have a greater risk of developing recurrent bouts of diarrhea. [20] Contaminated water supplies of food play a major role as source of pathogens. It is estimated that up to 70% of cases of diarrhea diseases may be caused by contaminated food. Both TB and HIV affect the most economic and productive age group of 15-45 years. Thus diarrhea

[15] Cardenas V, Saad C, Varona M and Linero M: Waterborne Cholera in Riohacha, Colombia1992.

[16]Clinical Chemistry and immunology

[17] The Holy Bible, Deuteronomy 28:1-22

[18] SO/IEC/17025: 2005(E) cites the General requirements for competency of testing and calibration Laboratories.

[19]Kenya Bureau of Statistics; 1st report on poverty in Kenya .Vol II Poverty and social indicators: July 1998.

[20] Muindi J. M, Enhancing Protective control measures for reduction of Diarrhoeal Disease in Athi-River, Kenya, MSc Thesis,JKUAT, 2007. 47. Vivek Chitnis and Savita Pattwa (2002), Cell Receptor Repertoure, Chapter 26, PCR Testing Methodologies, Page 245-255.

attributed to HIV will also affect this group of people.[21] [22] The most affected age groups (15-45years) are the most economically productive age thus a decline in family income and our country's GDP

Study Design and Methodology

A cohort study was carried out in Machakos County involving a participatory process undertaken by researchers, healthcare staff and patients (HIV affected clients) to capture the behavioural practices of HIV affected clients receiving Comprehensive Care Centres in Machakos and Athi-River hospitals.

The interplay of herbs, prayers, Nutrition, ARV drugs and other healthcare Matrix components for HIV infected clients undergoing treatment was studied. The Bioavailability and Biodiversity exhibited by HIV infected clients while undergoing HIV treatment and management was explored in relation to health outcomes.

Results

A study group consisting of willing 131 HIV infected persons was selected on first come first served basis and interviewed after informed consent was obtained and signed and followed up for three years. There was a 45% improvement in ARV adherence, and a corresponding 45 % of the HIV infected Clients improving to a viral load which is non detectable level. 14 of 131 were still awaiting their viral load reference Laboratory test confirmations. There was a (8 of 131) 6.1% using formulated multivitamins to boost their appetite. Those optimizing on the recommended diet biodiversity were 59 of 131 (40.04%) and 9 of 131(6.9%) eating nine+ food species. There were 13 categories of treatment choice groupings of HIV infected clients. Although a National Food Composition Tables and the Planning of Satisfactory Diets in Kenya exists, it was not well availed and disseminated to nutritionists and is hardly used at the CCCs in Kenya. Swellings were noted in different parts of the body of some few clients creating a need to get a Cancer test and treatment if found positive. Some complications with scurvy like symptoms may have resulted to nutritional and micronutrient deficiency associated disorders. Some cases also suffered ARVs' regimens allergies and toxicities while others forgot to take the ARVs and antibiotics as scheduled introducing antibiotic resistance complications. HIV treatment and Management guidelines are used for effective HIV surveillance at the CCCs.

[21] Dr l. Chebet Dr.Chakaya, Mr. M. Ndolo, and Dr. Tanu, Facts on TB and HIV MOH report

[22] 10. *labtestsonline.org/understanding/.../cd4/...*

Discussion

The patients Metabolites levels were not routinely tested though Multivitamins, Micronutrients as well as diets were recommended and in use by some of the clients. For persons suffering from other bacteriological infections, culture and drug sensitivity testing was required during standard laboratory diagnosis.

Majorly, direct fecal-oral route transmission is by ingestion of contaminated water, food or both. For such patients especially those with diarrhea, rehydration therapy was used for restoration of lost fluids and electrolytes while antibiotics were administered to combat bacteriological infections.

Those persons who are infected with HIV experience a compounded challenge especially in counties with Limited access to safe drinking water and Poor sanitation especially in Kenya among other African countries. Poverty and food scarcity compounded with ignorance and poor micronutrient bioavailability intensifies ill health outcomes even when the HIV infected clients adhere to ARVs.

When one is infected with HIV,vthe body starts to experience a drawdown of metabolites since the virus begins to change from RNA to DNA. It has a Single stranded RNA molecule with a reverse transcriptase enzyme and surface membrane proteins which require extra provision of substrates, enzymes, cofactors and specific ionic mediums and energy all tied up to nutritional intake as well as micronutrients supply and availability during Metabolism. While Potassium, sodium, Sulphur, Nitrogen and oxygen are required for energy provision and should be restored to normal balance for the sodium potassium pump to operate well, Calcium and selenium are important for normal bones and nervous transmission. Magnesium is a key component for proper cell membrane formation while Zinc boosts immunity and all these are prevalent in especially seeds of edible fruits e.g water melons, quavers and also in cashew nuts and deep green leafy vegetables. The liver and spleen also do contain B 12 useful for detoxification of the body.

There is thus an information gap among people living with HIV on metabolites and micronutrients' benefits to the body and which foods one can eat so as to avail them in our body systems. Tethering of the learned and established habits to the new replacement therapies, habits and rewards must be done and explained to tie the recoveries so that they can be restored to gain sobreighty and health.

Even when micronutrients are availed in fortified foods, there is no current information to guide users on when one should know that they are about to exceed body requirement. This calls for consistent monitoring of metabolites levels in the body systems for those using micronutrient fortified foods thus assure safe levels use and avoid toxicity. During metabolism, there is a principal called substrate or product inhibition of a biochemical process. The excess product at times inhibits the forward reaction and thus the reverse takes place reducing the product but raising the level of the substrate. These reactions also depend on the catalytic effect of the enzymes which work together with cofactors. For the utilization of Zn in the body, copper should also be present and therefore this dependency or inhibition can occurs depending on how much of each micronutrient is present.

Some of the micronutrients are not supposed to meet because they complex with each other and precipitate thus causing lack of what was taken into the body thus affecting timing of intake especially for ion containing foods. Fortified foods should also be routinely monitored to guide users on safe combinations that one can take so as to avoid toxicity due to use of excess fortificants. This is clearly explained by the full Biochemical Pathways and somehow natural foods were made in a way that by the time one eats to their full, the levels balance themselves automatically and that is why the HIV infected person should have their biochemical pathways restored before they revert back to health. This is how the tethering assures the HIV infected client to access certain foods only at certain times as well as ARVs and helping them routinely should adhere to treatment and biodiversity and bioavailability so as to retain a restored normal biochemical balance for wellness. The emotional and spiritual state of the HIV infected client too should be restored to normal otherwise they cannot retain a schedule required for treatment. If they can visualize themselves getting well, then they can develop a goodwill towards the schedule of treatment and recommended biodiversity.

Conclusion

The correlation of syndemics is the basis for micronutrients and functional Biochemical reactions integrated and tethered on dependent factors that lead to restoration of biochemical metabolic reactions in the body thus cure for HIV infected person as the AVVs destroy the HIV virus. This tethering was further explored for the three years resulting to the development of a therapy procedure which improves the health of persons who are infected with HIV. This procedure basically requires a paradigm shift for establishment of tethered social and spiritual support, tethered ARV adherence as well as tethered micronutrient biodiversity and bioavailability and tethered Nutritional supply.

Provision of counselling services coupled with tethering results in treatment of HIV positive patients. The theory used in this treatment is names natural social support theory developed by Muindi Serah while providing counselling services to HIV infected patients in this work over three years. This theory can also simply be known as the Back to Health implementation matrix for HIV infected persons to God be all the glory.

Recommendations

Those undergoing HIV treatment should have their Metabolites and toxins monitored routinely and any use of micronutrients and food fortificants also routinely Monitored. A multisectoral approach should be adopted for HIV diagnosis, treatment and management and should include Spiritual Ministers, psychologists, Biochemists, Epidemiologists, Caterers, Nutritionists, Health educators, Nurses, clinicians and laboratory personnel as well as community health workers support teams.

Tethering should be emphasized as a tool for improving adherence to Biodiversity[8], bioavailability, social and spiritual support, ARV use as well as optimizing use of discussed HIV infected patients' Laboratory results

This Back to health implementation Matrix for HIV infected persons /Natural Social Support (Muindis'theory) should be further disseminated and adopted for use in Kenyan Comprehensive care centres and beyond. The National Food Composition Tables and the Planning of Satisfactory Diets in Kenya in existence should be reviewed availed and disseminated to nutritionists and used at the CCCs in Kenya.

Acknowledgements

We give all praise to Jesus and our acknowledgements go to the study population, PhD supervisors, NPHL, ITROMID, JKUAT and Machakos University fraternity and Equator Gemstones LTD for this opportunity.

References

Academy for Education Development, Washington DC, 2004, Food and Nutrition Technical assistance project, HIV/AIDS: A guide for Nutritional Care and Support.

Alison Barker1995, Breast Feeding Retention rates Associated with Post-natal Oral Zinc Supplementation, pages 369-375.

Ann Mills, Fawzia Rasheed and Stephen Tollman, Strengthening Health Systems, WHO and World Bank Project, 2004.Chapter 7, pages

Bernet and Rugalema, 2001

Ibid. Bernet and Rugalema, 2001

Sehmi K. J, National Food Composition Tables

Muindi J. M, Enhancing Protective control measures for reduction of Diarrhoeal Disease in Athi-River, Kenya, MSc Thesis,JKUAT, 2007

King James, Holy Bible, Genesis 1:27-30

Mbakaya et al 2004b Micronutrient Zinc deficiency as a possible co-factor in the transmission and progression of HIV/AIDS in Kenya

Mbakaya et al., 2010c, unexplained co-infection with Malaria, HIV and AIDS *News/Report JAGST VOl.* 13(1)2011.

Swaminathan; S, Ramachandran et, al. Risk of development of TB in HIV infected Patients. *International journal of Tuberculosis and Lung Disease* 2000;4 (9): 839

Ibid. Lim-Quinzon MC, Benabaye RM, White FM, Dayrit MM.and White ME

Ngare D. K and Mutunga J.N 1999; Prevalence of Malnutrition in Kenya, East African Medical Journal; 76 (7): 376-380.

labtestsonline.org/understanding/.../cd4/...

Elliot,A.M; Namambo,K., et al. The sputum smears results of HIV patients in Lusaka.International Journal of Lung and Disease 1993; 74 (3):19.

Cardenas V, Saad C, Varona M and Linero M: Waterborne Cholera in Riohacha, Colombia1992.

Clinical Chemistry and immunology

The Holy Bible, Deuteronomy 28:1-22

SO/IEC/17025: 2005(E) cites the General requirements for competency of testing and calibration Laboratories.

Kenya Bureau of Statistics; 1st report on poverty in Kenya .Vol II Poverty and social indicators: July 1998.

21. Muindi J. M, Enhancing Protective control measures for reduction of Diarrhoeal Disease in Athi-River, Kenya, MSc Thesis,JKUAT, 2007. 47. Vivek Chitnis and Savita Pattwa (2002), Cell Receptor Repertoure, Chapter 26, PCR Testing Methodologies, Page 245-255.

22. Dr l. Chebet Dr.Chakaya, Mr. M. Ndolo, and Dr. Tanu, Facts on TB and HIV MOH report

10. *labtestsonline.org/understanding/.../cd4/...*

Authors

Musengya Judith[1] Phone: +254 701 385 837, Email: jumusengya2019@gmail.com

Of Box 38, 00204, ATHI-RIVER

Affiliation: A PhD student at ITROMID, JKUAT and working at National Public Health Laboratory Services, Kenya, P.O Box 20750-00202, NAIROBI

Communications to

Muindi Serah[2] Phone: +254 717 296 275, Email: mumbiserah@gmail.com

Affiliation: Hopewell Firm, P. O BOX 1582 -30100, ELDORET.

Authors' Contacts

Musengya Judith, PhD (s) in Epidemiology

A Laboratory Epidemiologist (NPHLS)

P.O BOX 38-00204

ATHI-RIVER

Email:jumusengya2019@gmail.com

Kenya, Africa.

Muindi Serah

Licensed Counseling Psychologist,

Hopewell Firm

P.O BOX 1582-30100 Eldoret

Email: mumbiserah@gmil.com

Kenya, Africa.

A Review of Literature on Local Community Participation Towards Sustainable Tourism Development in East Africa.

Mwawaza M. S[a*] and Shirandula, D[b].

Department of Hospitality Management,

School of Hospitality and Tourism,

Machakos UniversityP.O Box 136-90100 Machakos, Kenya.

[a]*E-mail: stellamshai@gmail.com*

[b]*E-mail: dshirandula@mksu.ac.ke*

ABSTRACT

Tourism is a major contributor to global economic growth, hence it has been earmarked for the achievement of the aspirations of the 2030 Agenda for Sustainable Development. As a result, UNWTO has partnered with governments, private partners, international and regional finance institutions and other organizations to realize sustainable Development Goals (SDGs). One of the SDG goals is to promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all by 2030 by devising and implementing policies to promote sustainable tourism. Impliedly, inclusivity of local communities is critical to the achievement of the aspirations. Ironically, literature contends that local communities lack participation opportunities in decision-making relating to tourism and experience inadequate financial, social and vocational benefits from projects that commercially exploit their resources. Therefore, this study reviewed the extent to which local communities participate in sustainable tourism development. This study adopted a qualitative approach by reviewing and analyzing existent literature on the topic under study. Based on the literature, the findings of these studies reveal that local communities participation in tourism is coercive, a low form of participation which denies the local communitymore opportunities to participate in key policy and decision making process. This study concludes that local community participation towards sustainable tourism development is more coercive and induced than spontaneous. Besides much participation is associated with socio-economic pillar of sustainability at the expense of the ecologic pillar. In addition, several personal and environmental factors influence local community participation. Consequently, this study proposed an integrated framework of factors which influence local community participation that can be used in East African countries. However, a quantitative study is recommended to investigate the reliability and the extent to which the framework can be applied in the Kenyan tourism destinations.

Key words:community participation; Local community; Sustainable tourism development;tourism

INTRODUCTION

Tourism has been earmarked for the achievement of the aspirations of the 2030 agenda for sustainable development, hence UNWTO has partnered with governments, private partners, international and regional finance institutions and international organizations to realize the sustainable development goals, one of which is to promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all by 2030 by devising and implementing policies to promote sustainable tourism development (UNWTO 2014).

The World Tourism Organization (WTO) (1998: 19) defines sustainable tourism development as "tourism which meets the needs of present tourists and host regions while protecting and enhancing opportunity for the future. It is envisaged as leading to management of all resources in such a way that economic, social, and aesthetic needs can be fulfilled while maintaining cultural integrity, essential ecological processes, biological diversity, and life support system." (ETE/ UNESCO 2009).

In other words, sustainable tourism development is ecologically sustainable, economically viable as well as ethically and socially equitable. More specifically, sustainable tourism development is summarized under the following four main principles: communities' wellbeing; protection of the natural and cultural environment; quality tourism product development and tourist satisfaction and adaptive management and monitoring. More precisely, sustainable tourism development supports and ensures the economic, social and cultural well-being of the communities in which tourism takes place. Secondly, sustainable tourism allows the use of natural and cultural resources for gaining economic profit while at the same time guaranteeing that such resources, both natural and cultural are protected and the maintained. Thirdly, sustainable tourism development is anchored on the quality of tourism products offered by a region and is characterized by material criteria like the quality of transport, accommodation and food, but also by non-material criteria like hospitality and experiences. Lastly, sustainable tourism development depends on the application of adaptive management and monitoring of tourism activities to ensure that tourism is developed in a way which is ecological, economic and socially sustainable (ETE/ UNESCO 2009).

On the other hand, local community participation in tourism is defined as the involvement of all local people and other stakeholders in the formation of programmes or policies that would assist to change their communities (Phiri 2009).Studies (Arnstein 1969; Pretty 1995; Tosun 2006) posit that local community participation in tourism projects is key to the achievement of sustainable development agenda both at the international and national fronts. According to Mugizi, Ayorekire&Obua, (2017) some of the positive socio-economic contributions of tourism towards sustainable development agenda can be realized through tourism revenue earnings, creation of employment opportunities, employment quality, balance of payment, local prosperity by reducing leakages, community wellbeing, social equity, biological diversity and resource efficiency.

However, according to Murphy (2013) one important factor to consider in order to sustain the socio-economic contributions forsustainable tourism development is the need to involvelocal community participation in the development process. In as much as local community participation contributes toecologically sustainable, economically viable and socially equitable tourism development, studies (Nsabimana 2010; Muthuri 2012; Muganda, Sirima, &Marwa, 2013;Mugizi*et al.,*2017) assert that there is little local community participation in tourism planning and development.

Besides, most studies focus on importance and the extent of local community participation rather than the factors that influence such participation (Tosun 2006). For instance, Nsabimana (2010) study focused on the extent to which communities are involved insustainable tourism development and conservation activities in Rwanda while Muthuri (2012) focused on factors hindering local community participation in tourism development in Kenya. Muganda*et al.*, (2013)study extensivelyfocused on therole of local community participation in tourism development in Tanzania.

From the studies reviewed, it's evident that several factors influence local community participation towards sustainable tourism development. Muganda*et al.,* (2013) reckons that the local community perceptionstowards their participation in tourism projects is imposed on them. Consequently, a knowledge gap exists between what local community thinks of their roles in sustainabletourism development is as opposed to their imposed roles.

Besides in most developing countries, interferences from authorities in local community tourism projects and little consultation between the government and local community in key decision making seem to be rampant. For instance, in Kenya the findings of a study carried out in Kimana Community Wildlife Sanctuary around Amboseli National Park, point out interference from the government in bid to control the sanctuary (Ondicho 2012).

More often, the decision and policy making processis top down and mostly dominated by the government, private sector and /or NGOs (Scherl& Edwards 2007).Deriving from the Doxey's Irritation Index model (1975),little consultation between the government and local community may cause local communities to demonstrate misgivings about tourism when they are less involved in key decisions. This may eventually develop into irritation expressed either verbally or physically against tourists. Nsabimana (2010) and Muthuri (2012) underscore that little consultation between the government and local community leads to resistance to tourism which may results into illegal activities by the local communities against tourism.

Mugizi*et al.,* (2017) notes that a heterogeneous nature of the communities presents unequal opportunities and different expectations in the participatory approach to tourism planning and development.Mugizi*et al.,* (2017) expounds that while some local community members may have little information about tourism, others may lack the resources to benefit fromtourism activities hence, they may be prone to manipulation and exploitation from the privileged. For instance, there are cases in Kenya wherecommunal

pieces of land of local communities around tourism protected areas are managed by foreigners, which has caused resource use conflicts (Okello 2011).

Based on the literature reviewed, there seems to be a myriad of factors which influence local community participation in sustainabletourism development. Therefore, the purpose of this study was to examine Therefore, this study reviewed the extent to which local communities participate in sustainable tourism development. The study was guided by the following research objectives

Research objectives

To identify the level of local community participation towards sustainable tourism development in East Africa

To identify factors that influence local communities' participation towards sustainable tourism development in East Africa

To propose a framework for local community participation towards sustainable tourism developmentin East Africa.

Literature Review

According to UNEP & UNWTO (2005) sustainable tourism development requires the informed participation of all relevant stakeholders, as well as strong political leadership to ensure wide participation and consensus building. Achieving sustainable tourism is a continuous process and it requires constant monitoring of impacts, introducing the necessary preventive and/or corrective measures whenever necessary.The main focus of sustainable tourism development is firstly, to make optimal use of environmental resources that constitute a key element in sustainabletourism development, maintaining essential ecological processes and helping to conserve natural resources and biodiversity. Secondly, sustainable tourism development aims at enhancing respect to the socio-cultural authenticity of host communities, conserve their built and living cultural heritage and traditional values, and contribute to inter-cultural understanding and tolerance. Lastly, it ensures viable, long-term economic operations, providing socio-economic benefits to all stakeholders that are fairly distributed, including stable employment and income-earning opportunities and social services to host communities, and contributing to poverty alleviation (UNEP & UNWTO 2005).

For this study, sustainable tourism development was conceptualized as economic, social, and ecological sustainability of the tourism resources (ETE/ UNESCO 2009). More specifically, the social dimension was measured by community wellbeing and social equity, while economic dimension was measured by employment quality, reduction of leakages and economic viability. In addition, ecological dimension was measured by biological diversity and resource efficiency(UNEP & UNWTO 2005).

On the other hand, there has been a lot of literature on local community participation in sustainabletourism development activities. As a concept local participation is regarded as a bottom -up process that empowers marginalized groups thus providing them with opportunity to have a say and greater control over decisions and activities that affect their lives and well-being (Scheyvens, 2007).

In order to conceptualizelocal community participationin sustainabletourism development, community participation model propounded by Tosun (1999a). Later on in 2006, the model was reviewed in relation to other models from other disciplines such as developmental studies hence, a more comprehensive model was developed. Since then, Tosun (2006) model has widely beenin tourism studies.

Tosun (2006) model is a combination of Arnstein(1969) and Pretty (1995) models of community participation which focused on participatory development approaches in development studies. According to Arnstein (1969) citizen participation is the redistribution of power that enables the have-not Citizens to be deliberately included in the future. It is the means by which they can induce significant social reform, which enables them to share in the benefits of the affluent society. Arnstein(1969) approach was in terms of a ladder or typology of citizen participation including eight levels, which are classified in turn among three categories relative to authentic citizen participation. While the lowest category represents manipulative participation, the highest category refers to degrees of citizen power. The middle category indicates degrees of citizen tokenism.On the other hand, according to Pretty's (1995) typology of participation, local participation is a critical factor to the success of development projects. As such, development projects and programmes implemented by Non-governmental Organizations (NGOs) and governments need to incorporate a strong aspect of local community participation. Each level of participation allows for differing degrees of external involvement and local control, and reflects the power relationships between them.Self-mobilization is the most crucial of all the seven categories because without it the local communities would not have a platform to make meaningful contributions to decisions that are made to guide the implementation of development programmes that benefit them. Clearly, the benefits received by local communities from tourism and related activities will depend on the extent to which they have been involved and the equitable manner in which the benefits have been shared.

Tosun (2006) model takes a participatory approach to tourism to facilitate implementation of principles of sustainable tourism development by creating better opportunities for local people to gain larger and more balanced benefits from sustainabletourism development taking place within their localities. This results into more positive attitudes to tourism activities and conservation of local resources, and increases the local communities' tolerance to tourism. These could ensure both visitor satisfaction and ongoing benefits for the residents of destinations areas. More specifically, there are 3 typologies of community participation in tourism. The typologies are classified as spontaneous, induced and coercive (Tosun 2006). Firstly, spontaneous participation refers to an ideal mode of local community participation which provides full managerial responsibility and authority to local community (Tosun1999a). Spontaneous level of participation represents situations when the local community has full control and authority (Sakhile&Tembi 2017).

Secondly, induced community participation in tourism is perceived to be the best type of participation as the local community is allowed to hear and be heard. They have a voice in the sustainabletourism development process, but they do not have power to ensure that their views will be taken into account by other powerful interest groups such as government bodies, multinational companies, international tour operators, etc. Therefore, it seems to denote level of tokenism. This type is the most common mode to be found in developing countries where a local community only endorse decisions regarding tourism development issues made for them rather than by them (Tosun1999a).

Induced community participation is top-down, passive and indirect in the sense that local communities may participate in implementation and sharing benefits of tourism, but not in the decision making process. This level of participation implies that the local community has no autonomy to influence decision-making. This is often referred to as top-down approach. Lastly, coercive participation is realized when some of the decisions are made to appease the local community by meeting a few basic needs, so as to avoid socio-political risks for sustainabletourism development (Sakhile&Tembi 2017).

Lastly, coercive participation is manipulated and contrivedas a substitute for genuine participation. Thereal objective is not to enable people to participate in sustainabletourism development process, but to enable powerholders to educate or cure host communities to turnaway potential and actual threats to future of sustainabletourismdevelopment. Some decisions may be taken to meetbasic needs of host-communities by consulting localleaders so as to reduce socio-political risks for touristsand sustainabletourism development. Although it seems thatsustainabletourism development is to take place based upon hostcommunities' priorities, it is heavily skewed towards thefostering and development of tourism, and would primarily be concerned with meeting the needs anddesires of decision makers, tourism's operators andtourists.

Figure 2.0 illustrates the typologies of community participation as modified by Tosun (2006)

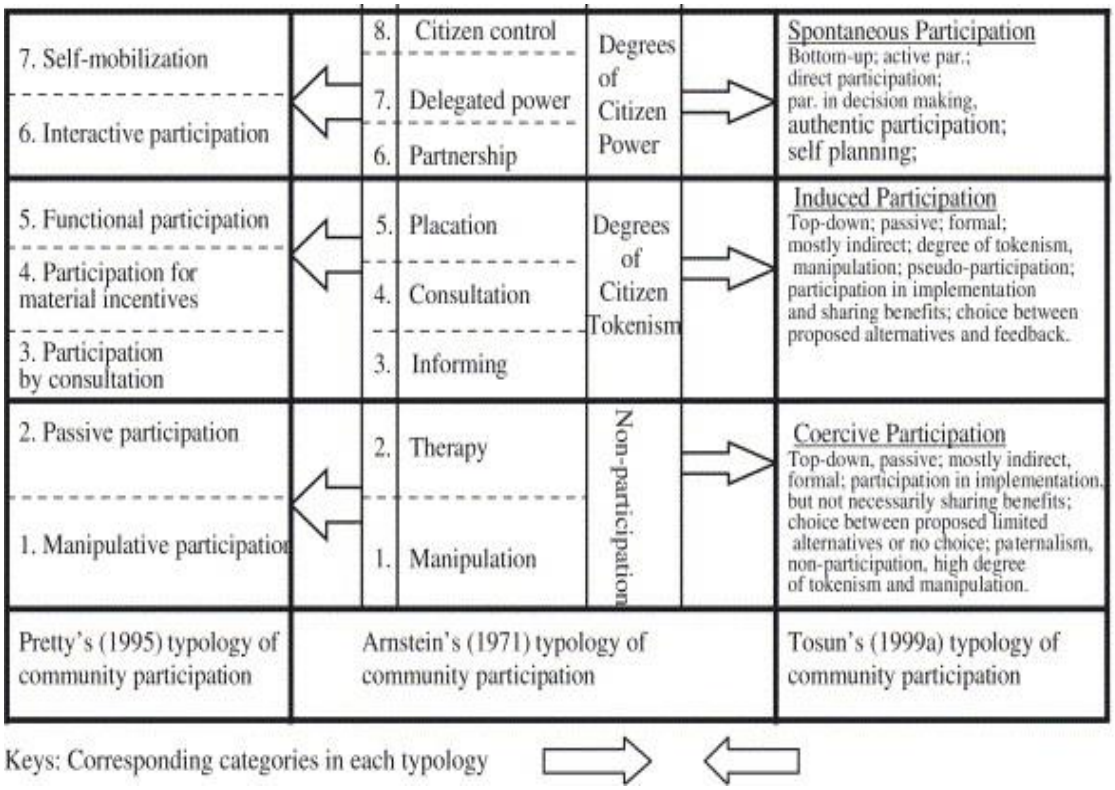


Figure 2.0: Community Participation

Tosun(2006).

In as much as Tosunmodel (2006) is widely used in studies of local community participation in tourism, it has some limitationswhich relate to centralization of tourism administration, attitudes of professionals towards tourism, lack of human and financial resources as well as dominance of the elite in tourism activities, hence creating an impression that tourism programmes often benefit those with the capacity to participate in the planning, development and management of tourism which is not often the case. The capacity is what has been referred to as self-mobilization because it empowers the local community to make and execute decisions (Tosun 2000).

Besides, the model falls short of the explanations on why and how the different levels of participation exist. It is significant to examine understand factors which may result into the typologies in order to enhance local community participation in sustainabletourism development. However, there are various factors that can lead to spontaneous, induced and coercive participation. Such factors may result from individual personal issues to more complex systematic and structural issues. The individual personal issues

may be within the local communities' ability to influence them while the systematic and structural issues may be resultant from the environment in which they operate in.

This study proposed a model of such factors as shown in figure 2.1

Proposed model for the study

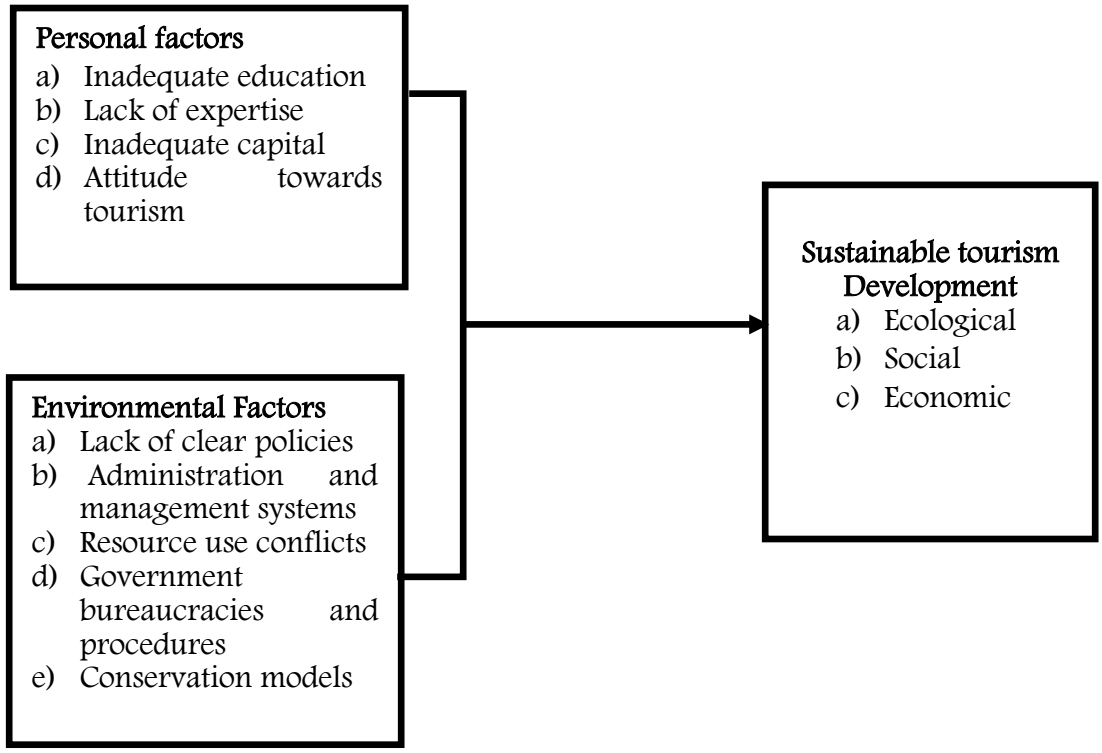


Figure 2.1:Factors influencingLocal Community Participation

Modified from Nsabimana(2010); Muthuri(2012); Muganda, *et al.,* (2013) and Mugizi*et al.,* 2017).

METHODOLOGY

The study adopted content analysis research design. It tooka qualitative approach by reviewing previous studies on local community participation towards sustainable tourism development.

Table 2: Summary of reviewed studies

	Title& Authors	Findings of previous studies	Methodology
1	The role of local communities in tourism development: Grassroots perspective from Tanzania Muganda,, Sirima, &Marwa, (2013)	Local people views on their role indicated that they think that they should be involvedin policy formulation and decision making the process; financially supported and be made 'watchdogs' in development issues. Illiteracy, limited capacity due to lack of education, lack of knowledge and skills were cited as some of the factors affecting involvement in tourism activities Decision making and policy formulation is still top-down and passive, not only in Barabarani area, but Tanzania in general.	Mixed method approach Data collected between June-august 2008 Questionnaire, survey and observation tools used Sample size: 139 households from a population of 2480
2	Factors that influence local community participation in Tourism in Murchison falls conservation area in Uganda Mugizi, Ayorekire&Obua, (2017)	Majorly, participation is at coercive level, attributed to the nature of tourism employment opportunities such as security guards, trail maintenance, casual labourers, waiters, tour guiding and attendants in craft shops and restaurants. Highest level of participation is functional, which involves activities such as advising community tourism groups, representing communities on discussion platforms for conservation issues and providing leadership in Community BasedTourism Enterprises. None of the participation is at self-mobilization level due to limited education, lack of capital to support independent initiatives or inadequate support from donor agencies.	Sample size: 335 households randomlyselected Data collected by use of questionnaires and interviews.
3	The extent of community involvement in Tourism Development and conservation activities in Eastern Rwanda Nsabimana, (2010)	There is little participation in economic activities such as employment (though in low numbers for menial jobs) Local community operate small scale businesses such as curio shops, Hardly involved in process of decision making and policy formulation. Policies regard local residents as dormant participants who need to only be informed and economically assisted, (less valued as partners in decision making processes).	Data collected by use of questionnaire and interviews Research Design: exploratory
4.	Factors hindering Kawiru Community participation in tourism development in Meru National Park, Meru County Muthuri, (2012)	Lack of Community-Based Organization Locals not effectively involved in the management of parks. Poor knowledge on tourism, high illiteracy levels, financial constraint and negative attitudesaffect participation No clear policies which engage locals and challenge illiteracy	Cross sectional descriptive design T/Popln.19,679, sample frame: 1,800 and sample size 126. Questionnaires, observation interviews

RESULTS AND DISCUSSION

Based on the analysis of the previous studies it is apparent that communities have not been involved adequately insustainabletourism development in spite the fact that they form an integral part of sustainabletourism development agenda. Studies (Nsabimana 2010; Muthuri 2012; Muganda*et al.,* 2013; Mugizi*et al.,* 2017) have indicated several factors which influencetheir participation in sustainable tourism development. The factors are both personal andenvironmental.

Personal factors such as inadequate education, lack of expertise, inadequate capital to operateand negative attitude towards tourism may affect the level of participation. The findings coincide with Ondicho (2012) and Okello(2011) studies whichunderscored that thatmost often, local communities education is inadequate and hence the reason why most locals areleft to do seasonal unskilled jobs. This eventually degenerates intolocal community intolerances to tourism conservation. In addition, lack of expertise creates room for interferences from the government, private non local investors and the local elites who take advantage of the locals and control some of the local community based initiatives. Negative attitude towards tourism is occurs whenthere is delayed compensation for destruction and death of the locals caused by human wildlife conflict and the failure to benefit from tourism.

On the other hand, lackof clear policies on how to engage the local communities in sustainabletourism development, less effective administration and management systems where most decisions are centralized and resource use conflictsare major factors which affect local community participation in sustainabletourism development. In addition, competing interests between otherstakeholders and the local communities, government bureaucracies and procedures (which cause delays in compensation of reported human wildlife cases) also affect local community participation. The other factor noted to have an influence on local community participation in sustainabletourism development is the conservation models adopted by parks.

These findingscoincide with Okello (2005) which asserted that management systems adopted by the central government in decision making process is often top down, marred with bureaucratic and cumbersome procedures especially when it comes to compensation for human wildlife conflicts. Besides, the conservation models adopted for instance, by theInternational Union for Conservation of Nature Category II Park model which has been criticized for displacing people, outlawing human settlement and designating resources as 'protected' have worked against local community participatory approach to sustainabletourism development.Other findings (Scherl& Edwards 2007) also emphasizes that the decision and policy making process is classically top-down and is dominated by the government, private sector and/or NGOs.

Furthermore, Okello (2005) pointed out that resource use conflict, especially in cases where there is conflict of interests for instance between the government (e.g. through Kenya Wildlife Service, (KWS)and the local community in a projectcan influence participation. For instance, most often KWS interest in a

community based tourism projectis creation of space for wildlife dispersal, the private investors' interestis profitmaximization, while the local elite's main interest is reported to be mainlyas being swindling of funds from the projects for personal gains (Okello2005). This scenario leaves the local community in a situation of little benefit from what is supposed to be their resource.

CONCLUSION

Apparently from the reviewed literature, local community participation towards sustainable tourism development is more focused on the coercive and induced form than spontaneous. Besides much attention of participation is associated with socio-economic pillar of sustainability at the expense of the ecologic pillar.There seems to be more subtleinitiatives and policies which encourage local community conservation practices. Moreover, due to the low form of participation, the local community are more prone to negatively interfere with conservation activities, which threatens ecologicalsustainability. In addition, personal and environmental factors influence the participation of local community in sustainable tourism development. These factors if well addressed by stakeholders canpositively influence local community participation at all levels. However, for generalization of the findings of this study, there is need for further research using more quantitative methods of analysis.

REFERENCES

Arnstein, R. S. (1969). A ladder of citizen participation. *Journal of the American Institute of Planners*, 35, 216–224

Ecological Tourism in Europe/ UNESCO Regional Bureau for Science and Culture in Europe (BRESCE) (2009). Sustainable Tourism Development in UNESCO Designated Sites in South-Eastern Europe. http://portal.unesco.org/en/files/45338/12417872579Introduction_Sustainable_Tourism.pdf/Introduction_Sustainable_Tourism.pdf(Accessed on 31/08/2018)

Mbaiwa, J.E. (2005). Wildlife resource utilization at Moreni Game Reserve and Khwaicommunity area in the Okavango Delta, Botswana. *Journal of Environmental Management,* 77: 144-156.

Mitchell, R. E., & Reid, D. G. (2001). Community integration: island tourism in Peru. *Annals of Tourism Research*, 28, 113–139.

Muganda,M., Sirima,A. &Marwa,P. (2013). The Role of Local Communities in Tourism Development: Grassroots Perspectives from Tanzania, *Journal of Human Ecology*, 41:1, 53-66

Mugizi, F., Ayorekire, J., &Obua, J. (2017). Factors That Influence Local Community Participation in Tourism in Murchison Falls Conservation Area. *Journal of Environmental Science and Engineering A,6*(4)

Murphy, P. E. (2013). Tourism*:* A Community Approach (RLE Tourism).London: Routledge

Muthuri, P.M., (2012). Factors hindering Kawiru Community participation in tourism development in Meru National Park, Meru County, Kenya:*Kenyatta University*

Nsabimana, E. (2010). The extent of community involvement in Tourism Development and conservation activities in Eastern Rwanda.(Master's thesis,Cape Peninsula University of Technology, Cape Town).

Okello, M. M. (2011). Community Opinions on Wildlife, Resource Use and Livelihood Competition in Kimana Group Ranch nearAmboseli, Kenya. *The Open Conservation Biology Journal,5*(1), 1-12.

Okello, M.M.(2005)Land Use Changes and Human–Wildlife Conflicts in the Amboseli Area, Kenya.*Human Dimensions of Wildlife*,10:1,19-28,

Ondicho T.G. (2012). Local Communities and Ecotourism Development in Kimana, Kenya. *Journal of Tourism.* ; XIII (1):41-60.

Phiri, M. (2009). Evaluation of the performance of Joint Forest Management (JFM) Programme: Case of Dambwa Forest Reserve in Livingstone District, Zambia, (Doctoral dissertation, Stellenbosch: University of Stellenbosch).

Pretty, J. (1995). The Many Interpretations of Participation. *Focus* 16 (4): 4-5.

Sakhile M., &Tembi M, T. (2017). Community involvement and participation in tourism development: a Zimbabwe Study. *African Journal of Hospitality, Tourism and Leisure*, Vol (1)-(2017) ISSN: 2223 814 X Online @ http//:www.ajhtl.com (Accessed on 31/08/2018)

Scheyvens, R. (2007). Exploring the Tourism-Poverty Nexus. *Current Issues in Tourism* 10 (2-3): 231-54.

Simmons, D. G. (1994). Community participation in tourism planning. *Tourism Management*, 15, 98–108

Tosun, C. (1999a). Towards a typology of community participation in the tourism development process. *International Journal of Tourism and Hospitality*, 10, 113–134

Tosun, C. (2000). Limits to Community Participation in the Tourism Development Process in Developing Countries.*Tourism Management* 21 (6): 613-33.

Tosun, C. (2006). Expected Nature of Community Participation in Tourism Development. *Tourism Management* 27 (3): 493-504.

Tosun, C., & Timothy, D. J. (2003). Arguments for Community Participation in the Tourism Development Process. *Journal of Tourism Studies* 14 (2): 2-15.

UNEP & UNWTO,*(*2005).*Making Tourism More Sustainable-A Guide for Policy Makers*, p.11-12

WTO, (1998). Tourism 2020 Vision. Madrid: WTO

Welfare Initiatives and Their Roles on Job Stability of Catering Employees in Selected Universities in Nairobi City County, Kenya.

[1]Waweru Bernard K., [2]Maranga V.N., & [3]R. Mugambi

[1] Post Graduate Student, Kenyatta University.

[2] Lecturer, Kenyatta University.

[3] Lecturer, Kenyatta University.

Email: kamauwaweru24@gmail.com

Abstract

The study sought to establish welfare initiatives and their roles on job stability of catering employees in selected universities in Nairobi City County, Kenya. The study covered aspects of efforts, programs, services, benefits and facilities provided by the universities to their catering employees. The study also covered the aspects of concerned with roles of welfare initiatives on job stability such as; employee's sense of being valued, employees' attachment, improved performance, fringe benefits, employees' commitment, talents retention, hard work, competency, a sense of ownership, employees loyalty, employees satisfaction and a sense of fulfillment. The study was descriptive covering a stratified sample of 189 respondents drawn from 300 employees. Data was collected through self-administered questionnaires and an interview guide questions. The respondents agreed with the provision of uniforms, medical facilities, clean safe working station and employee's assistance with means of between 1.5 to 2.5. However, with a mean of between 3.5 to 4.5, they strongly disagreed that, they are provided with welfare initiatives; meals allowance, long service grants, paid holidays and recreational facilities. Moreover, with a mean of 2.57, the respondents were neutral with the provision of; sufficient number of toilets (2.57) and housing facilities. The results of standard deviations were as follows; leave policy (1.53), sporting facilities(1.24), regular salary increment (1.37), comprehensive pension policy (1.35), sufficient number of toilets (1.08), meals allowance (1.25), long service grants (1.15), canteen facilities (1.04), counseling service (1.12), paid holidays (1.30), recreational facilities (1.09), well maintained restrooms (1.13), medical facilities (1.02), employee's funeral assistance (1.32) and transfer assistance (1.37) had a standard deviation >1, implying that, there was a significance variance. Housing facilities (0.99), uniforms (1.00) and a clean station (0.94), had a standard deviation <1, meaning, there was no significance variance and hence consensus in responses. With a mean of 1.86 and a standard deviation of .979, majority agreed that welfare initiatives make them feel valued by their universities. 86.2% agreed that, being valued makes them more attached to their universities. A mean of 1.84 and a standard deviation of .839 revealed that, welfare inspires employees to work hard and better. It is evidenced with a mean of 1.82 and a standard

deviation of .921 that, fringe benefits enhances employee's commitment. A mean of 2.50 and a standard deviation of 1.483 revealed a concurrence that, welfare initiatives attracts and retains talents of university catering departments. A majority of respondents 42.8% were of the opinion that, welfare initiatives inspires hard work and competency among the university catering employees. A mean of 2.39 and a standard deviation of 1.557, the respondents opined that, welfare initiatives enhance their satisfaction levels. Moreover, with a mean of 1.39 and a standard deviation of .769, the respondents were of the view that, welfare initiatives allows them to take pride in their organizational membership. A majority of the respondents (86.8%) held that, welfare initiatives allow employees loyalty. It is evidenced with a mean of 1.93 and a standard deviation of .716 that, welfare initiatives enables employees to work with passion and fulfillment. The findings demonstrated with a mean of 1.81 and a standard deviation of 0.820 that, welfare initiatives enables employees to continue working with their organizations.

Key Words; Welfare Initiatives, Welfare Services, Welfare Benefits, Employees' attachment, employees loyalty, employees satisfaction, psychological contract, and employees fulfillment.

Introduction

Employees high in well-being stay with an organization for a longer period of time. This is attributed to psychological fulfillment which results to high job embeddedness. Therefore a mutual exchange relationship between the employer and the employee in terms of welfare initiatives is crucial. This calls for a shared obligation and a fulfillment of an obligation by each party.

Background

Employees often find reasons to stay with an employer who cares for their personal and professional welfare. Therefore, universities need to carry out structured welfare initiatives to support employees and their families. This is to enhance their quality of work life. In this context, employees welfare initiatives refers to all efforts, programs, services, benefits and facilities provided by the universities to enhance job stability and quality of work-life of university catering employees. According to (Omonijo, Oludayo, Eche, Uche, Ohunakin, 2015) majority of employees are no longer comfortable working in an institution of higher learning without adequate fringe benefits. Universities mainly comprises of Teaching and non-teaching staff.

According to (Azeem and Quddus, 2014), when we use the language of "human anatomy", the "non-teaching staff" is the "Central nervous system" of a 'human body", in this context, 'the university". University catering employees are a part of this 'Central nervous system" of the body "University". Therefore, the success of a university as an organization is dependent on the believe of the employees, that their well-being is taken care of (Eisenberger and Stinglhamber, 2011).

According to (Njeru, Moguche and Mutea, 2017), employees are directly influenced by the nature and quality of welfare services. As such employee's welfare services should be adequately competitive and focused towards solving the real needs of the employees. This concurs with (Ruby, 2012) who postulated that, the welfare of workers is a crucial factor that contributes to the success of an organization. According to a report by (University of Nairobi, 2013). The well-being of a university staff is vital for the realization of the vision and mission of the University. This is further demonstrated by (Owence, Pinagase and Mercy, 2014), who stated that, employees valued benefit encourages job stability.

Welfare initiatives

According to a report by the (University of Sussex, 2012) welfare initiatives includes; safety advice, private medical insurance, sporting facilities, a supermarket, staff library facilities and the on-campus health center, child cares, campus cafes, on-campus banks and staffs accommodation. The Pakistan study by (Khan, 2014) demonstrated welfare initiatives to include retirement benefits, job security. In India, employee's welfare is advanced in legislations such as (Insurance Act, 1948), and the (WCA Act, 1923). This rule provides for welfare benefits such as; lockers, seats, first aid, an ambulance, sickness, maternity, dependent's funeral and medical benefits (Ravindra, 2013). The government has further provided the catering establishment act of 1958, which regulates the conditions of persons working in catering establishments (Government of Tamil Nadu, 2014).

The Nigerian study by (Omonijo, Oludayo, Eche, Uche, Ohunakin, 2015) in a faith- based institution of higher learning in South-West Nigeria found out that the following welfare initiatives are offered; house allowance, medical allowance, paid holidays, pension scheme, subsidized meal, transportation, annual salary increment, time off, on-campus accommodation, in service training and sick leave. Bagudu,Usman and Ibrahim (2013), studied staffs turnover among state owned institutions in Nigeria, and found out that, employee's welfare include better working environment, accommodation, staff schools, medical facilities, salaries and fringe benefits. Kenya legislations provide for employee's welfare in (KEA, 2007) cap 226 on rights and duties in employment. It provides for hours of work, annual, maternity and sick leaves, housing, water, food and medical attention. The (OSHA, 2007) provide the guidelines for safety, health and welfare of workers (GoK, 2007). The (WIBA, 2007) and the (NHIF, 2007) act provides for leaves transformational and recreational facilities for the employees.

According to (Kenyatta University, 1995) development plan, staff welfare includes housing, medical services, insurances, pension schemes, loans, restaurants, banks and multi- purpose halls. A study by (Akala, 2012) on factors that influence employee's retention among the non-teaching staff at the university of Nairobi, classified employee's welfare into physical and emotional welfare. Physical welfare include health, safety, paid holidays and reduced working hours while emotional welfare include counseling services. According to (CUNY, 2009) employee welfare initiatives include basic health plans such as prescription drug plans, dental plan, hearing aid benefit, disability benefits, extended medical benefit, retirement benefits, health benefits, leaves and free interest loans. A study by (Bosibori, Nyakundi,

Munene and Walter, 2012) demonstrated that, employee welfare secures labour and include housing, medical, canteen and recreational facilities. According to (Dennis, 2012), welfare policy stem from measures to improve health and safety, paid holidays, reduced working hours and mental well- being of employees.

Roles of Employee's Welfare Initiatives on Job Stability

Welfare initiatives and an employee sense of being valued.

Owence, Pinagase and Mercy (2014), who stated that, employees valued benefit, encourages job stability. Omonijo, Oludayo, Eche, Uche, Ohunakin (2015) noted that, workers management policies relating to poor fringe benefits and lack of rewards affects job stability, especially in work environments where employees feel undervalued or ignored, or where they feel helpless or unimportant.

Welfare initiatives and a feeling of being attached to an organization

Employees feels and have an opinion that, it is the work of an employer to provide welfare initiatives to them. According to (Mitchell, Holtom and Lee, 2001), the closer the employees person views, values, and goals are to the organizational culture, the better the fit, and the "higher the likelihood that an employee will feel attached to the organization. Job embeddedness is a broad constellation of psychological, social and financial influences on employee's retention. These influences are present on the job as well as outside the employee's immediate working environment, and, are likened to strands in a "web" in which a person can become stuck to a job. Such social and financial influences includes monetary and non-monetary welfare initiatives availed by the employer within and outside the working environment.

Welfare initiatives and a sense of working hard and better

According to (Beheshtifar and Mojtaba, 2013), in (Brunneto, 2013), when the organization treats employees well, they reciprocate with hard work. According to (Beheshtifar and Mojtaba, 2013), commitment of employees can be increased by giving them fringe benefits. Wambui, Cherotich, Emily and Dave (2017) studied the effects of work life balances on employee's performance of Kabarak University in Nakuru County, Kenya. The findings demonstrated that, presence of financial arrangements with financial institutions makes them more committed to their work. A study by (Rawat et al, 2016) on labour welfare schemes and their impacts on job satisfaction that was carried out in Dehradun in India, found out that, employees welfare initiatives increases the commitment of workers. According to (Amirnejad and Asploor, 2016), when employees understand that, the organization is concerned to their happiness and supports them, they assign themselves as part of the organization considering it their representation, thereby, having a sense of adherence and allegiance to the organization.

Welfare initiatives and employee' commitment

Employee's commitment is the degree to which an employee identifies with the organization and wants to continue participating in it. The commitment may be affective, continuance or normative (Akeke, Akeke and Awolusi, 2015). Affective commitment is the tendency of an employee to remain in an organization due to his emotional attachment and strong identification with objectives and the mission of an organization. Continuance commitment is where an employee commits to an organization for fear of social economic loses which includes; pension accruals and social cost, friendship with other workers and organizational memberships. Normative commitment is where an employee commits to and remains in an organization because of feelings of obligation. Committed employees have a stronger sense of belonging, and remains being part of the organization.

Khademi (2014) studied the effect of welfare services on organizational commitment of staff in Meymeh. The study demonstrated that, when initiatives are implemented in organizations they positively impact employee's happiness and job security. According to the study by (Shefali and Shikha, 2017), employees welfare activities assist the employees to develop a sense of belonging towards organization. Nazeri, Meftahi and Kianipour (2012), analyzed the role of staffs well-being as independent variable and the work locus of control as the moderate factor associated with the organizational commitment. The results suggested that, the staffs well-being could have a negative relationship with the continuance commitment and a positive relationships with normative commitments.

Welfare initiatives and their role on attracting and retaining talents

Every education institution wants to have a competitive edge in order to attract more students and potential employees (Naris and Ukpere, 2010). According to (Smith, 2015), employees often find reasons to stay with an employer who cares for their personal and professional welfare. Therefore, any organization that aims to be an attractive employer need to strive to create a supportive and a caring work environment for its employees. Eaton, Marx and Bowie, (2007) studied employee's wellness programmes in the United States of America institutions and its impact on health behaviour and status of faculty and staff. The findings indicated that, health promotions attract and retain skilled staff.

Grawitch, Trales and Kohler, (2007) examined the affiliation between safety health practices and turnover intention in universities. The findings indicated that, health and safety practices are positively related to turnover intentions. The Tehran University study by (Azam, 2012) on the level of employee's satisfaction with the availability of welfare facilities among the staff working in the headquarters of Tehran University established that, non-cash facilities attract and retain high skilled employees. Manzine and Gwandure (2011) studied the employees welfare used by organizations as a strategy of arousing productivity of

employees, and found out that, employees welfare initiatives secures labour force. According to (Keitany, 2014) employee's welfare programs retain and improve employee's conditions.

Welfare initiatives and employees satisfaction

A management research report by (Saji, Tarek, and Mohammad, I.T., 2013), on employees satisfaction among the non-teaching staff in Higher Educational Institution in Saudi Arabia, found out that, most staff members were dissatisfied with the level of facilities (transportation, medical, vacation) provided to them and to their families. A study by (Rawat et al, 2016) on labour welfare schemes and their impacts on job satisfaction that was carried out in Dehradun in India, found out that, employees welfare initiatives improves morale and loyalty of workers. Bharti, Parul and Ashok Kumar (2013) studied the provision of the employee's welfare initiatives under the factories act and their impacts on employees. They also reviewed the information on welfare provisions and employees satisfaction. The findings indicated that, there is a relationship between the provision of welfare initiatives and employees satisfaction.

Azem and Quddus (2014) studied the job satisfaction among the non-teaching employees of Central Universities in India, Hyderabad (University of Hyderabad and Maulana Azad National Urdu University). The results found out that, creches, construction of working women's hostels on the campus, incentive for working long hours and on holidays, reimbursement of medical bills and the reimbursement of tuition fees are welfare measures that leds to employee's job satisfaction. Khademi (2014) studied the effect of welfare services on organizational commitment of staff in Meymeh. The study demonstrated that, when welfare initiatives are implemented in organizations they positively impact the performance of such organizations in terms of

happiness and job security.

Welfare initiatives and job stability

According to (Owence, Pinagase and Mercy, 2014), employees valued benefit encourages job stability. They combine innovativeness and job stability as demostrated by (Lamba and Choudhary, 2013). According to (Amirnejad and Asploor, 2016), lack of attention to the needs of the employees and neglecting the provision of efficient facilities have a negative and irreversible impacts on the staffs altitude. Rao, Patro and Raghuath (2015) studied the impact of welfare measures on employee's performance in both public and private education institutions of higher learning, medical centres and banks of Visakhapatnam district India. The study demonstrated that, welfare measures (intra-mural and extra-mural) should be provided by organizations whether public or private as they eliminates turnover and increases productivity.

According to (Amirnejad and Asploor, 2016), when employees understand that, the organization is concerned to their happiness and supports them, they assign themselves as part of the organization considering it their representation, thereby, having a sense of adherence and allegience to the organization. Manzine and Gwandure (2011) studied the employees welfare used by organizations as a strategy of arousing productivity of employees, and found out that, "Welfare services can be used to secure workforce by providing proper human conditions of work".

Statement of the Problem

A management research report by (Saji, Tarek, and Mohammad, I.T., 2013); found out that, most staff members were dissatisfied with the level of facilities (transportation, medical, vacation) provided to them and to their families. This means that, they are inadequate (Ngaruiya, Nyandega, Origa and Ondundo, 2015), one of the challenges brought by massification of universities are inadequate staff welfare and inadequate staffs. The current welfare initiatives are selective as demostrated by (Odeku and Odeku, 2014) who demonstrated that, managers increase their welfare at the expense of their subordinates. It is also clear that, the current welfare initiatives do not address the real needs of employees and are not determined with the active participation of employees. This negates the principles of employee's welfare service as demonstrated by (Ananthi, Narmatha, Murukesh and Periasamy, 2016) that, employee's welfare services should satisfy the real needs of employees and they should be determined with the active participation of all the workers.

Research Hypotheses

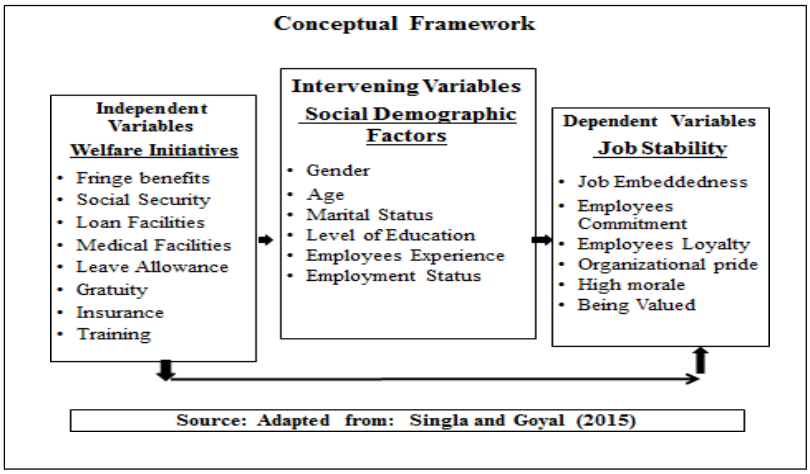
H1: Welfare initiatives are not used by catering employees in selected Universities in Nairobi City County, Kenya.

H2: Welfare initiatives have no significant role on job stability of catering employees in selected Universities in Nairobi City County, Kenya.

The Conceptual Framework

The conceptual framework shows the relationship between the independent variables(welfare initiatives); fringe benefits, social security, loan facilities, medical facilities, leave allowance, gratuity, insurance and training and the dependent variables (Job stability) as represented on its key facets of; employees commitment, job embeddedness or attachment, organizational pride, high morale and being valued. Intervening variables were the social demographic factors (Gender, Age, Marital status, Employees experience and Employment status).

Figure 1.1: Conceptual Frame work



LITERATURE REVIEW

Introduction

This chapter reviewed literature on welfare initiatives and their roles on job stability of university catering employees. The research evaluated the constructs of the Psychological contract theory.

Welfare Initiatives and their Roles on Job Stability of Catering Employees

A study by (Omonijo, Oludayo, Eche, Uche, Ohunakin, 2015) at a private based institution of higher learning in South-West Nigeria, demonstrated that, majority of the respondents (86.6%) were not comfortable working in an institution of higher learning without adequate fringe benefits. Thus, there is a need to improve the current welfare initiatives so as to align them with employee's real needs. This is not only to make them comfortable but also to improve their standards of living. According to (Amirnejad and Asploor, 2016) effective provision of staff

welfare facilities is hindered by many different needs of employees. Thus there was a need to know these welfare initiatives and classify them according to different cadres of employees and into different university staff categories. This is to make them play their roles effectively.

According to a report by the (University of Sussex, 2012) welfare initiatives includes; safety advice, private medical insurance, sporting facilities, a supermarket, staff library facilities and the on-campus health center, child cares, campus cafes, on-campus banks and staffs accommodation. The Nigerian study by (Omonijo, Oludayo, Eche, Uche, Ohunakin, 2015) in a faith- based institution of higher learning in South-West Nigeria found out that the following welfare initiatives are offered; house allowance, medical allowance, paid holidays, pension scheme, subsidized meal, transportation, annual salary increment, time off, on-campus accommodation, in service training and sick leave.

Kenya legislations provide for employee's welfare in (KEA, 2007) cap 226 on rights and duties in employment. It provides for hours of work, annual, maternity and sick leaves, housing, water, food and medical attention. A study by (Akala et al., 2012) on factors that influence employee's retention among the non-teaching staff at the university of Nairobi, classified employee's welfare into physical and emotional welfare. Physical welfare include health, safety, paid holidays and reduced working hours while emotional welfare include counseling services. According to (Owence, Pinagase and Mercy, 2014), employees valued benefit encourages job stability. According to (Beheshtifar and Mojtaba, 2013), commitment of employees can be increased by giving them fringe benefits.

The Psychological Contract Theory

The theory is based on employee's sense of fairness, trust and belief between the employer and the employee that each is fulfilling his part of the bargain. Each of the party is obligated to fulfill his role to ensure continuity of the exchange relationship between the two parties. In this theory, the employer has a role to provide social emotional rewards while the employee on the other hand has a responsibility to provide his skills, efforts and commitments towards accomplishment of the organizational goals. Psychological contract can be redefined to mean a mental agreement of what each party is to provide, and is categorized into transactional, relational and balanced contracts. Transactional contract is based on monetary exchanges such as bonus while the relational contract is based on non-monetary and social emotional factors such as employee's welfare initiatives. Meanwhile, balanced psychological contract is based open ended time flame and mutual concern of relational agreement with the performance demand and renegotiation of transactional contracts (Wangithi and Muceke, 2012).

Summary of the Literature Review and the Research Gap

Past studies evidenced that, employees are not comfortable working in organizations that do not provide adequate welfare initiatives such as fringe benefits as demonstrated by (Omonijo, Oludayo, Eche, Uche, Ohunakin, 2015). Therefore there is a need to make them adequate and to align them to different occupations. Earlier studies are not clear on how to make welfare

initiatives comfortable and adequate. According to (Amirnejad and Asploor, 2016) effective provision of staff welfare facilities is hindered by many different needs of employees. Thus there was a need to know these welfare initiatives and classify them according to different cadres of employees and into different university staff categories. This is to make them play their roles effectively. The literature review has revealed that, the current welfare initiatives are not regularly revised and there is a need to do so (Ndila, 2010). It is therefore evident that, the current welfare initiatives are not updated and are no in a position to address the current needs of university catering employees.

METHODOLOGY

The research study used the descriptive research design to find out welfare initiatives used in universities and their roles on job stability. The design has quantitative and qualitative approach methods which established welfare initiatives and their roles on job stability of catering employees working in universities in Nairobi City County, Kenya. The study was carried out in catering departments of 5 out of 46 university campuses in Nairobi City County Kenya (Commission for the University Education, July, 2016). The target population comprised of 300 university catering employees within the area of the study. The population was heterogeneous, thus, stratified sampling was done in selecting the respondents of the study and simple random sampling was used to select university campuses of the study.

Table 1.1: Summary of Sampling Technique

Technique	Area applied	Justification
Simple Random Sampling	Selected University Campuses from in Nairobi City County	Equal chance of being selected to represent the sample
Stratified Sampling	Selected individual respondents	Equal representation of catering employees working in university catering departments

Sample Size

A total of 189 respondents participated in the study as shown on summary distribution of the respondents.

Table 1.2: Sample Size

Participants	Population		Sample Size
University Catering Employees	300	63%	189
Total	300		189

The sample size of university catering employees was determined using Israel's (1992) sample size calculation formulae as shown;

Equation 1:	
$n = \frac{N}{1+N(e)2}$	**Where : N** = population **e** = precision rate at 5% (0.05) **n** = sample size

The study used both primary and secondary data collection methods to collect data. Primary data was collected by means of self-administered questionnaires and an interview guide. Secondary data was collected from journals, annual reports, websites and publications.

Pretesting

All the instruments of data collection were pretested in one university not included in the actual study findings. The pre-test assisted the researcher to ensure clarity of items in the instrument of study. It also aided the researcher to identify the similarity of meanings, and the actual time needed to administer the actual data collection process.

Instruments Validity and Reliability

The instruments of this study were questionnaires and interview guide questions which were validated by the use of content analysis. Content analysis was done by cross-checking responses against the study objectives, hypotheses and against the conceptual framework. The content validity of questionnaires was ensured through consultation with the supervisors. Test-re test method was used to establish the reliability of the questionnaires. A cronbach alpha was used to test the consistency of variables. A cronbach alpha test results were interpreted according to (Gliem, 2003), who stated that, the closer the cronbach alpha coefficient is to 1.0, the higher the internal consistency of the study variables. The same is supported by (Brotherton, 2012) study which stated that, a reliable scale should have an alpha value of at least 0.7, or higher. The results of pretest were analyzed to identify the errors. The results of the individual welfare initiatives were between 0.800 to 0.822, meaning, the data collection instruments were reliable as they were higher than 0.7 as suggested by (Brotherton, 2012).

Data analysis technique

Quantitative and qualitative data analysis techniques were used in the study as the data collected were both numerical and narrative. Descriptive statistics (means and standard deviations) was used by the researcher.

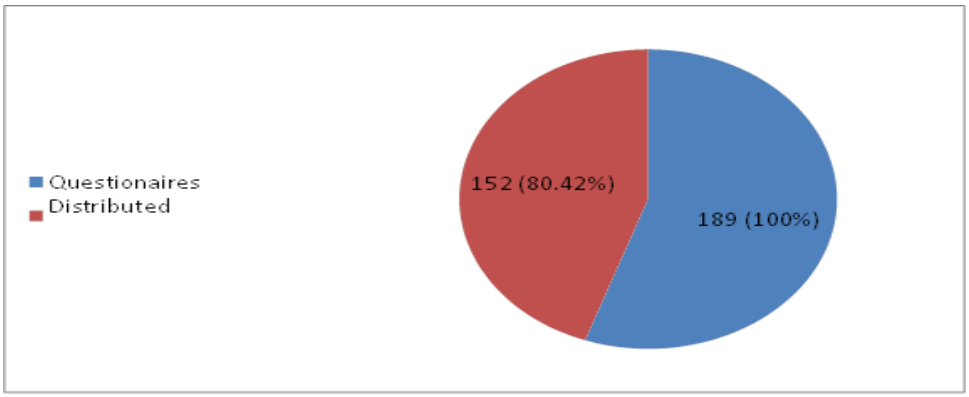
RESULTS AND DISCUSSIONS

Introduction

This section represents the analysis, findings and discussions of the study. The main objective was to explore welfare initiatives and their roles on job stability of university catering employees in Nairobi City County, Kenya. The findings presented include; response rate, demographic profiles, welfare initiatives and their roles on job stability. The study targeted a total of 189 respondents who were the catering employees of selected universities in Nairobi City County, Kenya.

Response Rate

A high response rate was obtained; this reduced the chances of getting biased statistics. As such, the findings were reliable as shown on the figure below;

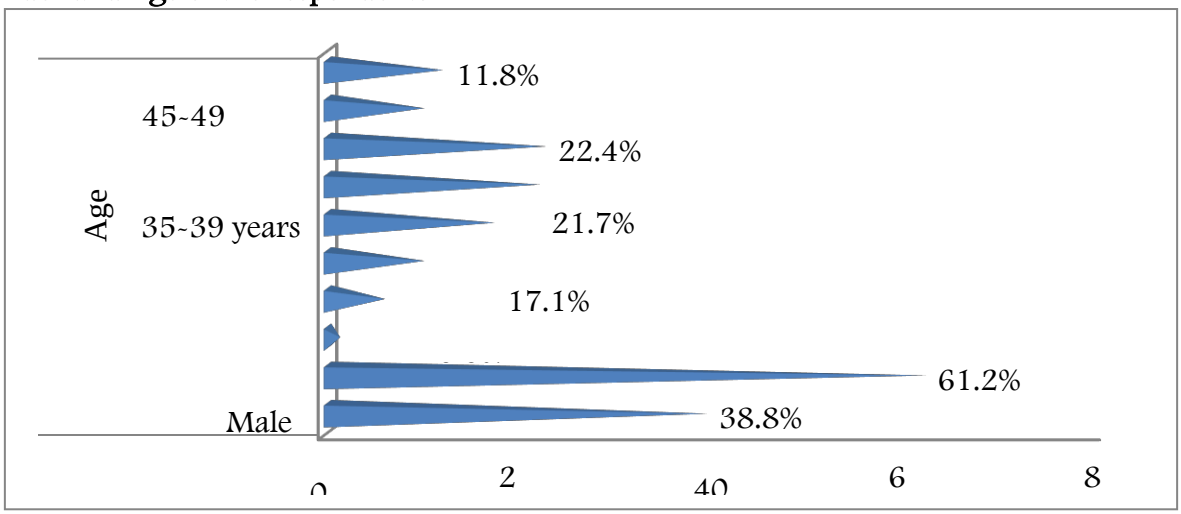


A response rate of 80.42%; this is adequate for analysis, as it conforms to to Mugenda and Mugenda, 1999 (as cited in Keitany, 2014, p. 30) that "a response rate of 70% and over is excellent" for analysis. A non-response rate of 19.58% of university catering employee's questionnaires was due to time constraints especially near the meal times and at the meal times

Demographic Characteristics of the respondents

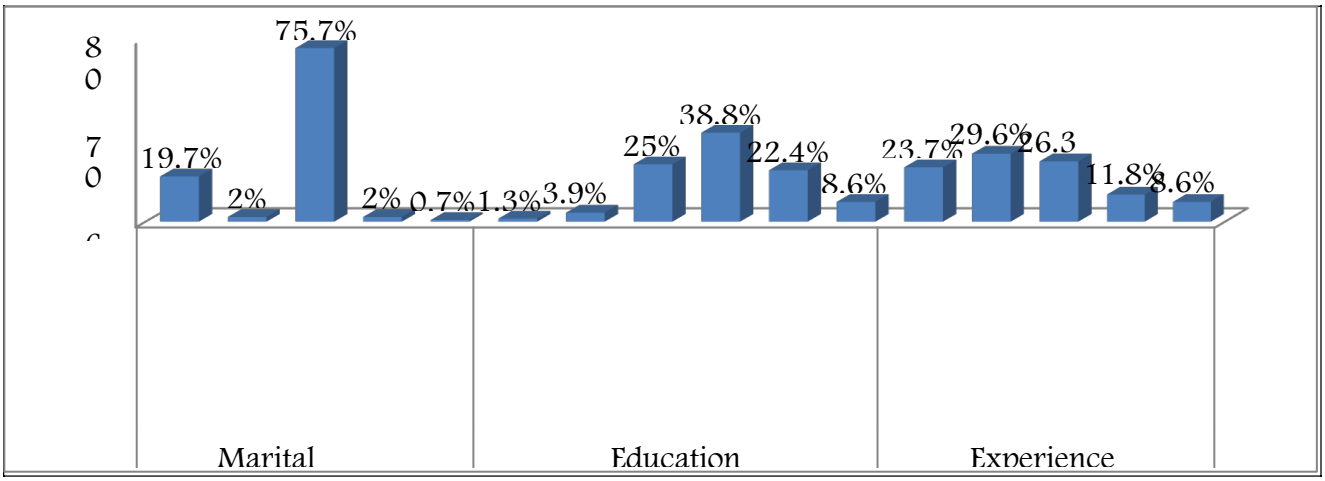
The study sought employee's demographics and the findings were presented as shown;

Gender and Age of the respondents



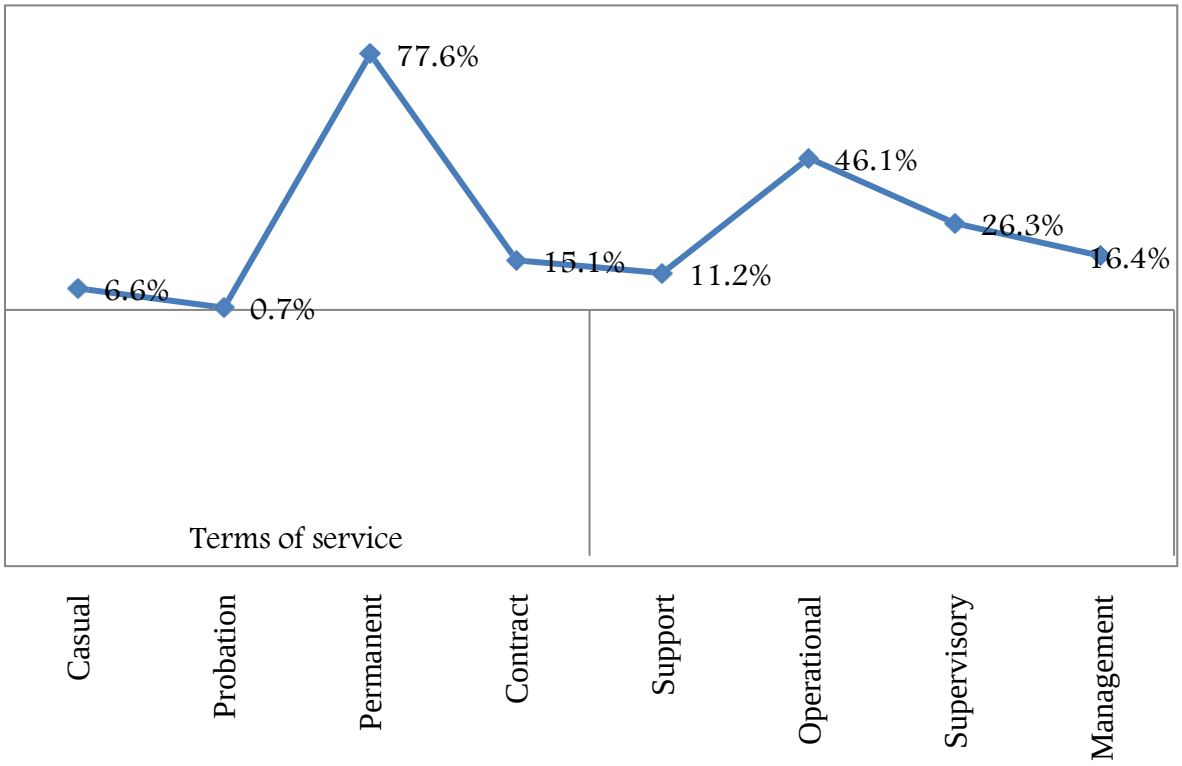
According to the findings, 38.8% were male and 61.2% were female. This contrasts (Azeem and Quddus, 2014) study conducted in Maulna Azad National University which found out that, majority (71.4%) was males. Most of the respondents 22.4% were aged between 40-44 years while the minority 1.3% had an age of below 20 years.

Marital Status, Education level and Employees Experience



The majority of the respondents (75.7%) were married while minority 0.7% was of the opinion that, marriage is not applicable. This concur with (Kosgey, Mutai and Lagat, 2018) where 89% of the respondents were married. Meanwhile, majority (38.8%) had a diploma as the highest level of education while the minority (1.3%) held a primary level certificate. The study revealed that, majority (29.6%) had an experience of between 5-9 years while the minority (8.6%) had an experience of >20 years of age

Terms of Service and Level of Employee in Organization Structure



Majority of the respondents (77.6%) were employed on permanent terms of service while the minority (0.7%) was on probation. In terms of their levels in organizational structure, majority (46.1%) described themselves as operational while minority (11.2%) described themselves as support staffs.

Table 1.3: Welfare Initiatives.

	Mean	Std.Deviation
My organization has a high satisfactory leave policy	3.14	1.53
Sporting Facilities are provided for employees	3.22	1.24
Regular salary increment is offered to employees	3.03	1.37
My establishment has a comprehensive pension policy	3.73	1.35
Sufficient number of toilets are provided for the employees	2.57	1.08
Meals allowance is provided to the employees in your establishment	4.02	1.22
Long service grants are provided to the employees	3.97	1.14
My establishment provide canteen facilities to employees	2.62	1.04
Counseling services are provided by my establishment	2.72	1.12
Housing facilities are provided by the establishment	2.57	0.99
My establishment offer paid holidays to the employees	3.97	1.30
Recreation facilities are provided in my establishment	3.61	1.09
There are well maintained rest rooms in my organization	3.01	1.13
My establishment offer medical facilities to the employees	2.28	1.02
My establishment provide us with uniforms	1.86	1.00
My working station is safe and clean	1.84	0.94
Employees are assisted when their family members pass away	2.68	1.32
Employees on transfer are facilitated to settle down	3.07	1.37

The respondents agreed with the provision of uniforms, medical facilities, clean safe working station and employee's assistance with means of between 1.5 to 2.5. However, with a mean of between 3.5 to 4.5, they strongly disagreed that, they are provided with welfare initiatives; meals allowance, long service grants, paid holidays and recreational facilities. Moreover, with a mean of 2.57, the respondents were neutral with the provision of; sufficient number of toilets (2.57) and housing facilities (2.57). The results of standard deviations were as follows; leave policy (1.53), sporting facilities(1.24), regular salary increment (1.37), comprehensive pension policy (1.35), sufficient number of toilets (1.08), meals allowance (1.25), long service grants (1.15), canteen facilities (1.04), counseling service (1.12), paid holidays (1.30), recreational facilities (1.09), well maintained restrooms (1.13), medical facilities (1.02), employee's funeral assistance (1.32) and transfer assistance (1.37) had a standard deviation >1, implying that, there was a significance variance. Housing facilities (0.99), uniforms (1.00) and a clean station (0.94), had a standard deviation <1, meaning, there was no significance variance and hence consensus in responses.

Role of employee's welfare on job stability of university catering employees

The study sought to find out the role of welfare initiatives on job stability of university catering employees. The respondents were asked to rate the elements on a scale of 1 to 5 ranging as 1=strongly agree, 2=agree, 3=neutral, 4=disagree and 5= strongly disagree. A likert scale with five points was used to capture and interpret the responses. Those elements those were not

considered to have any role on job stability were awarded number 5 while those which had a strong significant role were awarded number 1, those which had a fairly significant role were awarded number 2 while 3 was awarded neutral. Meanwhile, those awarded 4 had no role on job stability while those awarded 5 had no role at all. The summary of the elements tested was as shown on the table below;

Table 1.4: Role of Welfare Initiatives on Job Stability of University Catering Employees

	Mean	S.Deviation
Welfare makes me feel valued by the organization	1.86	0.979
Being valued makes me more attached to the organization	1.82	0.887
Welfare inspires employees to work better and harder	1.84	0.839
Fringe benefits enhances employees commitment	1.82	0.921
Welfare attracts and retains talent in the organization	2.50	1.483
Welfare inspires hard work and competency	3.68	2.712
Welfare enhances employees satisfaction	2.39	1.557
Welfare allows employees to take pride in their organization	1.32	0.769
Welfare allows employees loyalty	1.13	0.339
Welfare enable employees to work with passion and fulfillment	1.93	0.716
Welfare enables me to continue working with the organization	1.81	0.820
Welfare inspires me to work hard	1.78	0.745
Welfare enables me to work with passion and fulfillment	1.88	0.848
Valid N (listwise)		

Means were established and interpreted as follows; Means >4.5 implied strongly agreed, 3.5-4.5 implied disagreed; 2.5-3.5 implied neutral, 1.5-2.5 implied agreed, <1 implied strongly agreed. Standard deviations were also obtained and interpreted as follows; >1 implied: significance variance and lack of consensus while <1 implied, lack of significance variance in responses, 1, implied that, the responses were further spread out, >0.5 and <1, implied that, the responses were moderately distributed, while < 0.5 implied that, the responses were concentrated around the mean. From the findings, the respondents disagreed that, welfare initiatives inspires hard work and competency. The results indicated that, the respondents agreed that; welfare initiatives make them; feel valued (1.86), attached to their organizations (1.82), inspires them to work better and harder (1.84), enhances their commitment (1.82), attracts and retains talent (2.50), enhances employees satisfaction (2.39), enables employees to work with passion and fulfillment (1.93), enables them to continue working in their universities

(1.81),inspires them to work hard (1.78) and enables them to work with passion and fulfillment (1.88). However, with means of 1.32 and 1.13 respectively, the respondents agreed that, welfare initiatives enables them to have pride in their organization and allows employees loyalty. The study findings concur with (Owence, Pinagase and Mercy, 2014), who stated that, employees valued benefit, encourages job stability. The findings also concur with (Mitchell, Holtom and Lee, 2001), who stated that, the closer the employees person views, values, and goals are to the organizational culture, the better the fit, and the "higher the likelihood that an employee will feel attached to the organization.The standard deviation results revealed that, apart from three elements (attracts and retains talent, (1.483), inspires hard work and competency (2.712) and enhances employees satisfaction (1.557) the other ten elements had a standard deviation of <1. This means that, a part from the mentioned three, there was no significance variance in responses, an indication of a general consensus among the study respondents.

Hypothesis: Welfare initiatives and their roles on job stability

The study determined the relationship between welfare initiatives and their roles on stability. The study tested the following hypotheses stated in null and alternative forms.

HO1: Welfare initiatives have no significant role on job stability of university catering employees in selected Universities in Nairobi City County, Kenya.

H11: Welfare initiatives have a significant role on job stability of university catering employees in selected Universities in Nairobi City County, Kenya.

To test the hypotheses, welfare initiatives were analyzed against their roles on job stability of university catering employees using the chi-square analysis. The chi-square was done to establish whether they have a significant role on job stability of catering employees in selected universities in Nairobi City County, Kenya. A p-value of <5 was considered as significant and the results were as shown on table 1.5.

The findings presented an x2=8.855, df*=4 and the p=0.065 which is >0.05. With a significance level>0.05 (0.65), the alternative hypothesis (H1) was rejected. The results showed that there was no significant relationship between employee welfare initiative A and its role on job stability of university catering employees. The implication of x2 test result is that, a satisfactory leave policy cannot be attributed to its role on job stability of university catering employees.

In welfare initiative B, the results were X2=14.118, df*=4 and the p=0.007 which is <0.05, the significance level being <0.05 (0.007), the HO1was rejected. As a result the alternative hypothesis (H1) was accepted. This result showed that, there is a significant relationship between the employee welfare initiative B and its role on job stability of university catering employees. Here, the implication of x2 test result is that, sporting facilities are attributed to their roles on job stability of university catering employees. The same can be said on other welfare initiatives and their roles; in D to P whose results=0.000 and by default <0.005 and as a result their HO1

being rejected and by implication their H11 being accepted. Meaning, there is a significant relationship between welfare initiatives D to P and their roles on job stability of university catering employees.

Table 1.5: Hypothesis: Welfare initiatives and their roles on job stability

	Test Statistics	Chi- Square	value
A	My organization has a high satisfactory leave policy	8.855	.065
B	Sporting Facilities are provided for employees	14.118	.007
C	Regular salary increment is offered to	5.039	.283
D	My establishment has a comprehensive pension policy	47.276	.000
E	Sufficient number of toilets are provided for the	68.592	.000
F	Meals allowance is provided to the employees	98.789	.000
G	Long service grants are provided to the employees	82.671	.000
H	My establishment provide canteen facilities	70.895	.000
I	Counseling services are provided by my establishment	49.053	.000
J	Housing facilities are provided by the establishment	77.408	.000
K	My establishment offer paid holidays to the employees	98.592	.000
L	Recreation facilities are provided in my establishment	46.092	.000
M	There are well maintained restrooms in my establishment	71.355	.000
N	My establishment offer medical facilities to the employees	78.395	.000
O	My establishment provide us with uniforms	118.789	.000
P	My working station is safe and clean	123.921	.000
Q	Employees are assisted when their families pass away	9.645	.047
R	Employees on transfer are facilitated to settle	4.908	.297
S	Welfare enables me to continue working	150.566	.000
T	welfare makes me feel valued by the organization	128.855	.000
U	being valued makes me more attached to the	137.803	.000
V	Welfare inspires employees to work better and harder	141.553	.000
W	Fringe benefits enhances employees commitment	136.750	.000
X	Welfare attracts and retains talent in the organization	136.395	.000
Y	Welfare inspires hard work and competency	86.224	.000
Z	Welfare enhances employees satisfaction	194.684	.000
A2	Welfare allows employees to take pride in their	347.211	.000
B2	Welfare allows employees loyalty	82.526d	.000
C2	Welfare enable employees to work with passion and fulfillment	97.895e	.000

The implication of x2 test result is that, a comprehensive pension policy, sufficient number of toilets, meals allowance, long service grants, canteen facilities, counseling services, housing facilities, paid holidays, recreational facilities, well maintained restrooms, medical facilities, staff uniforms, a safe and a clean working environments are attributed to their roles on job stability of university catering employees. Their roles are shown on capital letters S to C2. This concurs with (Azem and Quddus, 2014) study on job satisfaction among the non-teaching employees of Central Universities in India, Hyderabad (University of Hyderabad and Maulana Azad National

Urdu University), which found out that, welfare initiatives such as creches, construction of working women's hostels on the campus, incentive for working long hours and on holidays, reimbursement of medical bills and the reimbursement of tuition fees led to employees job satisfaction. On welfare initiative Q, X2=9.645, df*=4 and the p=0.047 which is equals to 0.05 when converted into 2 decimal places. Since this is not > or <0.05 (In 2 decimal places), the study can only attributed Q (employees assistance when their family members pass away) with job stability of university catering employees

SUMMARY, CONCLUSIONS AND RECOMMEDATIONS

Introduction

The study sought to determine welfare initiatives and their roles on job stability of catering employees in selected universities in Nairobi City County, Kenya. The following conclusions, summary and recommendations were made from the study findings based on the study objectives.

Summary

This section presents the summary of findings in line with objectives of the study

Welfare initiatives used in university catering

The objective sought to establish welfare initiatives used in university catering departments in Nairobi City County, Kenya. The findings revealed that, with means of between 1.5 to 2.5, the respondents agreed that they are provided with welfare initiatives; staff uniforms, medical facilities, clean safe working environment and employees assistance. It is evident from the study that, with a mean of between 3.5 to 4.5, the respondents strongly disagreed that, they are provided with welfare initiatives; meals allowance, long service grants, paid holidays and recreational facilities. Moreover, with a mean of 2.57, the respondents were neutral with the provision of; sufficient number of toilets (2.57) and housing facilities (2.57).

Role of welfare initiatives on job stability of university catering employees

The objective sought to find out the role of welfare initiatives on job stability of university catering employees in selected universities in Nairobi City, County, Kenya. The findings revealed that, the respondents disagreed that, welfare initiatives inspires hard work and competency. The results indicated that, the respondents agreed that; welfare initiatives make them; feel valued (1.86), attached to their organizations (1.82), inspires them to work better and harder (1.84), enhances their commitment (1.82), attracts and retains talent (2.50), enhances employees satisfaction (2.39), enables employees to work with passion and fulfillment (1.93), enables them to continue working in their universities (1.81),inspires them to work hard (1.78) and enables them to work with passion and fulfillment (1.88). However, with means of 1.32 and 1.13 respectively, the respondents agreed that, welfare initiatives enables them to have pride in their

organization and allows employees loyalty. The findings revealed that, there is a significant relationship between welfare initiatives D to P and their roles on job stability of university catering employees. The implication of x2 test result is that, a comprehensive pension policy, sufficient number of toilets, meals allowance, long service grants, canteen facilities, counseling services, housing facilities, paid holidays, recreational facilities, well maintained restrooms, medical facilities, staff uniforms, a safe and a clean working environments are attributed to their roles on job stability of university catering employees.

Recommendations

Based on the study findings, the following recommendations were made;

Universities management should provide welfare initiatives; meals allowance, long service grants, paid holidays and recreational facilities to university catering employees.

To ensure job stability of university catering employees, universities management should provide free interest loans to cater for welfare initiatives which may not be provided by the universities.

A similar study should be carried out in universities outside Nairobi locality and a sound decision be made to ensure a uniformed provision of welfare initiatives to catering employees in Kenya.

REFRENCES

Akala. (2012). *Factors Influencing Employees Retention among the Non- Teaching Staff at the University of Nairobi, Kenya.* Nairobi: University of Nairobi.

Amirnejad & Asploor . (2016). Effect of Employees Welfare on Job Performance of the Staff at the Islamic Azad University, Abadan and Khorramshahr Branches. *Journal Article Supplimentary Issue*.

Ananthi, Narmantha, Murkesh & Periasamy (2016). An Analysis of Employee's welfare.

International Journal of Research in Business, Management and Accounting, ISSN 2455-6114 United Kingdom.

Azam (2012). A Study on the Headquarters Staff Satisfaction with the availability of the welfare Facilities in Tehran University of Medical Sciences. J*ournal of Heath Policy and Sustainable Health*

Azem, Dr. M.A & Quddus, Dr. M.A. (2014). Job Satisfaction among the Non-Teaching Employees of Universities in India - A Comparative Study. *European Journal of Business and Management.* ISSN 2222-1905 (Paper).

Bagudu, Usman & Ibrahim. (2013). Employees Turnover and its Effects on Organization Productivity of State Owned Institutions in Niger State: An Impediment to achieving vision 2020 in Niger State. *Journal of Business and organizational development*, 2277- 0070.

Beheshtifar & Mojtaba. (2013). Hr Maintainance: A Vital Factor to Promote Job Commitiment. *International Journal of Academic Research in Business and Social Sciences*, 2222- 6990.

Bhatt, P., Parul, F., & Ashokakumar (2013). Provision of Welfare under Factories Act and its Impacts on Employees. *Journal of Business Management and Social Sciences Research, 2 (2).*

Bosibori, Nyakundi, Munene & Walter. (2012). Role of Employees Welfare Services on Performance of the National Police Service in Kenya. A Case of Kisii Central District. *International Journal of Arts and Commerce*, 1, 73-94.

Brotherton, B. (2012). *Researching in Hospitality and Tourism.*

Cuny. (2009). *Summary of Benefits, Full Time Instructional (Teaching and Non- Teaching) staffs Manual.* Newyork: Cuony.

Dennis. (2012). *Human Resource Management for Hospitality and Tourism.* London: Elsevier Publications.

Eisenberger, Humtington, Hutchson & Sowa. (1986). Perceived Organizational Support. *Journal of Applied Psychology*, 500-507.

Eaton, Marxie &. Bowie. (2007). Faculty and Staff Health Promotions. Results from School Health Policies and Programs Study. *A Journal of School Health*, 557-566.

Grawitch, Trales & Kohler. (2007). Health Work Place Practices and Employees Outcomes.

International Journal of Stress Management, 275-293.

Insurance Act. (1948). *Insurance Act.* Nairobi: Gok.

KEA, G. (2007). *Kenya Employment Act Cap 226.* Nairobi: Gok.

Keitany. (2014). *Perceived Relationship between Employee Welfare Programs and Employees Perfomance in Kenya.* Nairobi: University of Nairobi.

Kenyatta University. (1995). *The Six Year Development Plan 1994-2000, The Catering and Hostel Staff.* Nairobi: Kenyatta University.

Khademi, T. (2014). Examining Effects of Welfare Services on Organizational Commitment of Staff at Education Department in Meymeh? *Reef Resources Assessment and Management Technical Paper,* 40, (1), pp. 1607-7393

Khan. (2014). The Factors Affecting Employees Turnover in Organization: The Case of Overseas Pakistanis Foundation. *African Journal of Business Management*, 25-34.

Lamba & Choudhary (2013). Impact of Hr practices on Organizational Commitiment of the Employees. *International Journal of Research and Advancements in Technology*, 2278- 7763.

Manzine & Gwandure (2011), A Study of Employee's Welfare Initiatives as a strategy to arouse arouse Productivity of Employees in Organizations. Research Review. 3 (11) Pg.41. *International Journal of Business and Administration*

Mitchell, Holtom & Lee. (2001). "How to Keep Your Best Employees: Developing an Effective Retention Policy". *Academy of The Management Executive*, 95-109.

Ngunjiri, B., Nyandega, I., Origa. J & Ondundo. P.A. (2015) *Effect of Mass University Enrolment on Non - Academic activities*: The Case of the University of Nairobi. *Educational Journal*, 4 (2), 51-59.

Nhif. (2007). *National Hospital Insurance Act.* Nairobi: Gok.

Njeru L., Moguche. A.M. & Mutea. F.M., (2017). An Exploratory Study of the Relationship between Non-Monetary Welfare Programs and Employees Performance among the Non-Teaching Staff in Institutions of Higher Learning in Kenya. *European Journal of Social Science Studies*, (2), 2501-8590.

Odeku & Odeku (2014). *In Persuit of Employees Welfare in the Workplace: Issues in Perspective.* Nairobi.

Omonijo, D.O., Oludayo, O.A., Eche, G.A., Uche, .O.O., Ohunakin, F. (2015). Intentional Turnover of Administrative Staff in a Private Faith-Based Higher Institution, South-West Nigeria. *Mediterranean Journal of Social Sciences,* 2039-2117

Osha. (2007). *Occupational Health And Safety Act.* Nairobi: Gok.

Owence, Pinagase & Mercy. (2014). Causes and Effects of Staff Turnover in the Academic Development Development Centre. A Case of a Historically Black University in South Africa. *Mediterranean Journal of Social Sciences*, 5 (11), 2039 - 2117.

Patro, C.S, & Raghunath, K.M.K (2015). Employee Welfare is Key: An Insight. *International Journal of Business and Administration research review*, 3(11), 2347-856X.

Ravindra. (2013). Labour Welfare Practices and Social Security in Industries. *International Journal of Research in Commerce, Economics & Management, A Monthly Double- Blind Peer Reviewed (Refereed, Juried) Open Access International E-Journal*, 2231-4245

Rawat, D.S. & Chaubey, B. (2016). An Analysis of Labour Welfare Schemes and its Impact on Job Satisfaction: An Empirical Study. Uttarachal University: Denhadrum.

Ruby. (2012). *The Impact of Indirect Compensation on Employee Productivity. A Case of Central University College, Ghana. A Master's Thesis.*

Saji, G., Tarek, A., & Mohammad, I.T. (2013). Employees Satisfaction among Non-Teaching Staff in Higher Educational Institution in Saudi Arabia. MAGNT Research Report, ISSN, 1444-8939.

Shefali, M. & Shikha, K. (2017). Non-Monetary Employees Welfare Activities (Strategic Move towards Changing Dynamics of Organization). *Proceedings of International Conference on Strategies in Volatile and Uncertain Environment for Emerging Markets*, pp. 170-189: Indian Institute of Technology Delhi, New Delhi.

Smith. (2015). *Motivation and its Impact on Employee Loyalty and Commitment: A Quantitative Analysis.* Washington: Trinity Washington University.

U.O.N. (2013). *Annual Report.* Nairobi: Uon.

University of Sussex (2012, July 14). *Www.Sussex.Ac.Uk*. Retrieved December 14, 2017, From Www.Sussex.Ac.Uk: Http://Www.Sussex.Ac.UK

Wca Act, W. (1923). *Work Compensation Act.* Nairobi: Gok. Wiba. (2007). *Work Injury Benefits AcT:Nairobi*

Tourism Product Innovation: Positioning Meetings, Incentives, Conferences And Exhibitions, As A Strategy For Product Diversification In Beach Hotels of Mombasa County, Kenya

Presenter

Dr. Alice Nzioka Phd

Abstract

The study purposed to investigate Meetings, incentives, conventions and exhibitions, abbreviated "MICE" as an important element of tourism product innovation and diversification in Kenya. This paper had specific reference to the Beach Hotels in Mombasa County in the Kenyan Coast, which has traditionally offered vacation and leisure tourism product. As one of the major sectors within the global tourism industry, MICE have long been recognized as a sector that gives direct and indirect revenue for host destinations, creates employment opportunities and generates foreign exchange. As a consequence of all these major characteristics, the number of destinations vying for this industry is increasing (UNWTO, 2014). This study adopted a census approach while data collection took a two pronged approach. A validated questionnaire was administered to the respondents while a focus group discussion was held with selected hotel owners from the county. Results from this study indicate that during the period of focus 50% of the study hotels offered incentive tours while 33% offered exhibitions and trade fairs. The proportion of MICE earning compared to the total earning in the beach hotels grew from 21% in 2013 to 51% in 2017. The study found that 38% of the hotels are increasing their marketing targeting MICE, 31% are investing in developing their facilities. Seventy percent of the respondents said that the MICE product need diversification as an opportunity for growth as well as income to cushion the hotels during the seasonal fluctuations of the leisure tourism. Results showed that 60% of the hotels have not exploited their advantage of being on the beach to offer more incentive tours. The study recommends that beach hotels address **new** and **existing** innovations and technological solutions to diversify their businesses by offering products that incorporate business with leisure packages to be able to maximize on their revenue all year round.

Keywords: MICE, Tourism product, innovations, Destination, Diversification, Beach Hotel., Revenue

INTRODUCTION

BACKGROUND OF THE STUDY

Tourism has an economic relevance hence captivating attention from policy makers, researchers, business sphere of the tourism sector. It is one of the biggest and fastest growing industries in the world with international tourist arrivals reaching 1,135 million in 2014 (United Nations World Tourism Organization,2014).

A report from the Kenya Tourism Board (2015) indicates that the tourism economy represents 5% of global Gross Domestic Product (GDP). International tourism ranks fourth (after fuels, chemicals and automotive products) in global exports, with an industry value of US$1 trillion a year, accounting for 30 % of the world's exports of commercial services or 6 % of total exports (UNWTO & International Labour Organization, 2014).

In Kenya, tourism has been the cornerstone of the economy, and a leading foreign exchange earner. The country earned Kshs 96 billion in 2013 while attracting more than 1.5 million tourists (Kenya National Bureau of Statistics, 2014). The high tourism earning can be attributed to diverse strategies adopted by the tourism industry which include seeking alternative tourism products (Kenya Tourism Board, 2016).

A report from the Kenya National Bureau of Statistics (KNBS) 2016 "Economic Survey", the number of international arrivals to Kenya fell every year from 2011, when it stood at 1.8m, through to 2015, when the figure was at 1.18m, before bouncing back to 1.3m in 2016. Tourism earnings followed the same trajectory, falling from KSh97.9bn ($955.2m) in 2011 to KSh84.6bn ($825.4m) in 2015.

According to the Kenya Tourism Board, (2016), this contraction was the result of perceived insecurity in the region, noting that arrivals to Mombasa had suffered the most in 2015: international arrivals fell by 41.1% to 59,194 between January and October 2015, down from 101,073 during the same period in 2014. The trend was further exacerbated by travel advisories announced throughout 2015, which included the key tourist centers. This study therefore explored innovations in MICE tourism as an alternative tourism product.

1.1 STATEMENT OF THE PROBLEM

Tourism in Kenya concentrates on traditional products of Wildlife (Safari) and Beach Tourism (sun, sand and sea). A World Bank Report "*Polishing the Jewel*" (2010), observes that tourism in the coast region Kenya constitutes the highest bed-night stays within the tourism sector, and has had several years of consistent growth however the sector was negatively affected by post-election violence of 2007/2008, charter flight cancellations, and a continuing drop in arrivals as global financial markets faltered.

According to *Kenya Vision 2030* a blue print for development in the country, there is need to diversify Kenya's tourism product in order to remain competitive. Various policy documents have advocated the need for tourism product diversification. With the challenges facing beach tourism, there is a need to look for other alternatives to attract and retain the tourists. This paper explored technological solutions and innovations that could enhance attendee experiences and make (MICE) tourism a potentially strong product line within the tourism sector in the coast region of Kenya.

1.2 PURPOSE OF STUDY

To examine MICE as an innovative tourism product that may be used to mitigate seasonality in beach hotels within Mombasa County.

1.3 OBJECTIVE OF THE STUDY

To investigate the available technological solutions and innovations in MICE tourism that may be used to create alternative business to leisure tourism for the beach hotels in Mombasa County

1.3.1 Specific objectives

To identify the MICE tourism activities available in beach hotels in Mombasa County.

To examine the MICE tourism economic performance in beach hotels in Mombasa county.

To find out various tourism innovative strategies that may be put in place to help mitigate the effects of seasonality in beach hotels within Mombasa County.

LITERATURE REVIEW

2.1 INTRODUCTION

The literature reviewed concentrated on MICE as a tourism product, the economic importance of MICE tourism in hotels, and technological innovations in MICE tourism.

2.2 THE MICE TOURISM PRODUCT

Global tourism industry is categorized as leisure tourism and business tourism (Swarbrooke and Horner, 2007). However, the two categories require the same infrastructures in terms of transport, accommodation, communication, entertainment, and information services (Cooper, Fletcher, Fyall, Gilbert, and Wanhill, 2008). The main difference between the two sub-sectors depends on the "type of services rendered the level of transport and accommodation" (Lickorish and Jenkins, 1999).

Business tourism quires special facilities and services such as a conference centres specialist contractors as reported by Swarbrooke and Horner, (2007). This sub-sector is also linked to leisure tourism as in some conferences social programmes of leisure activities are included (Swarbrooke and Horner, 2001). Dwyer and Forsyth (2008) asserts that MICE is one of the fastest growing sectors of the global tourism industry and generates millions in revenue annually for host destinations while creating a positive impact on the city image.

In Kenya, MICE tourism has been identified as one of the priority sectors and economic pillars that contribute towards the realization of Vision 2030 (National MICE committee & secretariat 2011). According to the Kenya Tourism Master Plan (GoK, 2005a), Kenya boasts of world class meeting places in addition to the traditional wildlife and beach attractions.

2.3 ECONOMIC IMPORTANCE OF MICE TOURISM TO HOTELS

Hotels are perhaps the best known venues for meetings and conferences. They are especially popular when a residential venue is required. According to (Maingi, Odunga, Belsoy, & Nthinga, 2011) during the tourism slump of the 1990's, conference service suppliers especially hotels and resorts strategically positioned themselves to take advantage of this money spinning

business. The boom from this complimentary revenue source was perceived as the *'Goose that lays the golden egg, when the hen was not producing'*.

Hotels may supplement their role as accommodation and catering providers with that of suppliers for rooms where meetings are held. The attraction of offering conference facilities ranging from a single seminar room to a whole conference wing is easily explained since it often represents the opportunity to take advantage of underutilized resources and infrastructure. The National MICE Committee & Secretariat (2016) reported that residential conference increases occupancy and generates higher room rates than leisure tourism market.

Grass and Root (2011) reports that incentive tours have significantly grown with an increasing proportion of corporate clients utilizing within their incentive packages in addition Davidson and Cope, (2003) found that a significant number of hotels by their very design are well suited to responding to the need for incentive trips"

The MICE sector alone in the United States of America generated $ 122.31 billion in total direct spending in 2004, making it the 29th largest contributor to the Gross National Product. These statistics were released by the Convention industry council's 2004, Economic impact study and cited by Maingi, Odunga, Belsoy, & Nthinga, (2011).

The National MICE committee & secretariat (2011) reports that Tourism in Kenya and in particular the MICE sub- sector has been identified as one of the priority sectors and economic pillar that contribute to the achievements of the goals contained in the Kenya Government's Vision 2030

Recent report by the Kenya Tourism Board (2017) indicates that Kenya has recorded steady growth in the Meetings, Conference, and Incentives industry. The MICE sub- sector welcomed 117,630 tourists to Kenya in 2015 indicating a remarkable 14% increase and giving a total contribution of 15.6% of the country's total international tourist arrivals. In 2016 alone, according to the report the MICE industry accounted for 13% of total international tourism arrivals; a large number consisted of business travelers.

MICE tourism spending in Kenya contributed 32.5% of the total revenue and predictions by World Travel and Tourism Council (2017) shows a steady rise by 5.9% pa to Ksh 242.6 Billion by 2026.

TECHNOLOGICAL INNOVATIONS IN MICE TOURISM

Age - established methods of working may collide with innovations and new ideas. It is therefore important to overcome the hurdles of conducting business the traditional way in order for existing business to be innovative and push boundaries. The MICE industry is where old is meeting new (Nyameino, Bonuke, & Cheruiyot, 2015).

MICE tourism has proved to be less susceptible to peaks and troughs of demand as the one experienced in leisure tourism. The spending is more evenly spread throughout the year. This has made it an attractive venture for hotels and destinations. It is evident that events have the capacity to be scheduled in periods of low tourism demand. According to Besteiro, (2003) "… Conference tourism has been an important factor for out of season diversification of tourism and economic development in Galicia, Spain.

Stevens and Wootton, (1995) found that MICE can boost a declining destination as is the case for Wales, which has been dependent on declining seaside holiday market and has chosen MICE as the more sustainable choice. A number of African countries have committed massive resources to construct conference rooms and exhibition facilities especially in the recent past. As reported by the World Tourism Organization (2014), MICE facility development is seen as an important way to attract much needed jobs and income to a number of areas outside urban centers.

Several MICE destinations including Asia and Vietnam have since become the favorite among business travelers because of their world class convention centers that offer state –of –the-art facilities and exceptional services (World Travel and Tourism Council 2017).

Currently, the catalyst for advancement in business is technology. Sirirak, Islam and Khang (2011) found that Technology, such as artificial intelligence and virtual assistants are important for guest experiences and are increasingly becoming important for event venues as they are regarded as cultural shifts on consumer preferences.

Technology is indeed changing both how events are planned and how attendees participate in the action. Facial recognition technologies for MICE tourism are faster, safer and also more unforgettable systems, because they make people remember any event (Shaham and Sajjad-ul-Aziz. (2012). Additionally the utization of augmented reality allows the projection of project data and images about things seen through a smart device, such as Google Glass or the screen on smart phones.

World Travel and Tourism Council (2016) indicate that well-equipped conference centers and high adaptation of technology has come in handy; to supplement the growing number of hotel conferencing facilities. The proposed a state-of-the-art Bomas International Conference and Exhibition Center in Nairobi with a capacity for 10,000, exhibition hall to hold 15,000 will go a long way in pushing Kenya as the continent's unrivalled MICE destination.

Reports by Euro monitor international (2015) showed that terrorist threats had adversely affected Kenya's tourism industry. Repeated travel advisory against visiting the Kenyan coast has drastically reduced the number of tourists who have traditionally visited the region which is a popular destination.

Technology makes services efficient, and while this is clearly a positive change, advancement has marked a point of no return. Any business that doesn't utilize technology to provide efficient and easy service, risks becoming old-fashioned and obsolete (World Travel and Tourism Council 2017). **It is therefore necessary for hotels to keep up with global trends that will assist in setting in creativity and innovation in the industry.**

This study investigated the available technological solutions and innovations in MICE tourism that may be used to create alternative business product to leisure tourism for the beach hotels in Mombasa County

3.0 METHODOLOGY

The population for this study comprised 29 resorts on the beaches of Bamburi, Nyali, and Shanzu which fall under the administrative boundaries of the Mombasa County. These are facilities that have direct access to the beach. Therefore the most important criterion in selecting this area was that it is a good representation of the leisure tourism in Kenya. The resort managers were the respondents for this study.

A survey questionnaire that consisted of a set of Likert-type scales multiple-choice items was developed. It included a grid to evaluate performance in terms of guest numbers and revenue trends of MICE activities and two open ended questions.

To test the questionnaire for reliability, a pre-test of 3 resorts that represented 10% of the total resorts was performed. Cronbach's alpha was calculated by Statistical Package for Social Science (SPSS) version 18.0 software. The result showed the questions was reliable (alpha= 0.76). The sample size for this study was therefore 26 resorts.

Data collection took a two-pronged approach. First, questionnaires were administered to the general managers in the study resorts, secondly a focus group discussion was held. Descriptive statistics and content analysis were used for data analysis.

4.0. FINDINGS AND DISCUSSIONS

4.1Demographic Characteristics

The first part of survey questionnaire gathered information about demographic information of the survey resorts that included hotel star rating/classification, years in operation, and bed capacity. Of the 26 study resorts 69.2% were unclassified, 15.0% was 4 star , 13.0 % was 3 star while 3.8 was 1 star. These results indicated that most of the beach hotels in the Mombasa County are not classified.

The average years of operation were 15 years with 75% of the facilities having been in operation for more than 16 years. The smallest hotel had 66 beds while the largest hotel had a bed capacity of 700 beds (range is 634) while 33.3% of the hotels interviewed had less than 100 beds.

4.2 MICE TOURISM PRODUCT IN HOTELS

Respondents in this study listed the MICE activities held in their hotels during 2013 – 2017. Results indicate that in the period of focus, 2013 -2017 all hotels in this study held meetings and conferences. The meetings were organized as either galas or cocktails. This reflects an attempt to integrate business tourism within a primarily leisure environment. Conventions were the least MICE activities hosted by the hotels at 32%.

These findings are consistent with previous research by Swarbrooke and Horner (2001), that found hotels to be the best known venues for meetings and conferences. Results indicate that 50% of the hotels hosted Incentive travel. Studies by Davidson and Cope, (2003) found that many hotels by their very design are well suited to responding to the need for a fantasy or exotic element in incentive trips.

Hotels in this study were placed in into three categories according to bed capacity, those with less than 200 beds were regarded as small , those with not more than 400 beds big and those with more than 400 beds large. Results showed that meetings were the most popular activity

during the period in focus where beach hotels in the small category hosted 50% of all the meetings, big beach hotels hosted 35% while large beach hotels hosted 28% of the meetings. Incentives, exhibitions / trade fairs were the least popular MICE activities to be hosted in small hotels between 2013 to 2017.

4.3 MICE TOURISM ECONOMIC PERFORMANCE IN BEACH HOTELS IN MOMBASA COUNTY

Capacity to Host MICE Activities, Bed Capacity against Number of Conference Rooms Length of Stay of MICE Clients and MICE Earnings as a Proportion of Total Revenue were used as indicators for MICE Tourism Economic Performance in Beach Hotels.

4. 3 .1 Capacity to Host MICE Activities

Hotels reported their respective capability to host MICE activities based on various indicators including, availability of seminar rooms, seating capacity of meeting rooms, size of largest meeting room in meters squared, availability of exhibition tents/kiosks, availability of flip charts, internet access, PowerPoint projector and public address systems in their respective meeting and conference venues.

Results indicated that all beach hotels had at least one seminar room while the hotels with the most number of rooms had seven (7) meeting rooms. Meeting rooms capacity for the beach hotels studied ranged from a minimum of 60 people to a maximum of 1,700 people with the largest hall reported measuring 500m^2. Only 8.3% of the hotels had their own tents /exhibition kiosks available to MICE participants corroborating the earlier result that in the period considered, exhibitions and trade fairs were the least popular MICE activities in beach hotels.

On the other hand, all hotels reported availability of flip charts, internet access, public address systems and PowerPoint projectors in their meeting rooms. An indication that they could host meetings and seminar as observed in earlier results. However, 66.7% of all the hotels lacked video conferencing facilities.

4.3.2 Bed Capacity against Number of Conference Rooms.

This study sought to find out if there existed a relationship between hotel bed capacity (size) and the capacity to host MICE activities. The analysis considered bed capacity against number of seminar rooms and seating capacity for seminar and meeting rooms. Cross tabulations and

4.1: Cross tabulation of Bed Capacity against Number of Conference Rooms.

	No of Conference Rooms						
Bed Capacity		1	2	3	5	6	7
	Less than 200 beds (Small)	25.0%	50.0%	25.0%	0%	0%	0%
	201-400 beds (Big)	40.0%	0%	0%	20%	40%	0%
	> 400 beds (Large)	0%	0%	0%	0%	0%	100%

Results from table 4.1 above indicate that beach hotels with less than 200 beds, had between 1 to 3 meeting rooms while the big hotels with less than 400 beds had 5 to 6 meeting rooms. On the other hand, larger beach hotels with higher bed capacity above 600 had more than six conference rooms.

These results pointed to an existence of a positive association between hotel bed size; its accommodation capacity and the capacity to host MICE activities, particularly meetings as indicated by number of conference rooms (r = 0.652. *sig*.0.030).

4.3.3 LENGTH OF STAY OF MICE CLIENTS IN BEACH HOTELS IN MOMBASA COUNTY

Respondents were asked to report mean length of stay by Meetings, Incentives, and Conference and Exhibitions participants staying at their hotels between the years 2013 -2017. Table 4.4 below presents mean length of stay computed for the various MICE products in the beach hotels studied. Standard deviations are shown in parenthesis.

Meetings participants stay ranged from 5.4 days to 6 days over the period, while conference participants stayed for 6.8 days in 2013 to 7.3 days in 2017. Incentive and exhibitions were held for less than three days in each of the five year period under consideration. Both meeting and conferences mean length of stay indicated a slight growth trend.

Table 4.2 Mean of length of stay of MICE Clients in Beach Hotels of Mombasa County 2013-2017.

	Mean Length of Stay (Days)			
Year	Meetings	Conferences	Incentives	Exhibitions
	5.4	6.8	2.2	2.0
2013	(1.90)	(4.72)	(2.04)	(2.12)
	6.6	9.1	1.86	2.6
2014	(3.89)	(8.55)	(1.86)	(2.6)
	5.4	7.4	2.6	1
2015	(1.51)	(7.19)	(2.30)	(1.50)
	7.0	8.6	2.4	3
2016	(3.48)	(9.16)	(3.05)	(3.32)
	6.0	7.3	1	3.2
2017	(1.00)	(6.56)	(0.95)	(3.42)

The slight growth observed (Table 4.2) in mean length of stay for Meetings, conferences and exhibitions in the Beach hotels corresponds to a period of significant improvements in the holiday and leisure tourism market. The Statistical abstract 2015 reports that 2014 recorded a marked 13.3% increase in international arrivals at all ports of entry compared to the previous year GOK, (2015).

The national average length of stay for the disaggregated business tourism market which includes the MICE segment was reported at 19.3 days over the five year period from 2013-2017 (GOK,2018). The national average includes other segments that make up business tourism such as business travelers; a direct comparison with the disaggregated MICE activities in Mombasa beach hotels was not in the mandate of this study. However it was observed that MICE average length of stay for Mombasa beach hotels for the five year period was less than 8 days;

4.3.4 MICE Earnings as a Proportion of Total Revenue (2013 -2017)

Individual respondents were then asked to provide data on the Proportions of MICE activity revenues in relation to the total revenue for the Beach Hotels in Mombasa County - 2013-2017

Table 4.3: Modal Class of Proportion of MICE Revenues for the Beach Hotels in Mombasa County - 2013-2017

Year	Proportion (%) of respondents	Class of proportion of MICE revenues over total revenues
2013	44.4	21- 40%
2014	44.4	41 -50%
2015	40.0	41-50%
2016	30.0	> 51%
2017	60.0	> 51%

Results in table 4.3 above shows the modal classes of the proportion of MICE revenues over total hotel revenues for surveyed beach hotels in the five-year period. Findings indicate that there were increases in MICE activity revenue from 21- 40% in 2013 to over 51% of total revenues in 2017 indicating a progression of the significance of MICE activities contribution to beach hotel revenues over the five-year period. Studies by Besteiro, (2003) showed that Conference tourism was an important factor of promotion of out of season diversification of tourism and economic development in Galicia, Spain

4.0 INNOVATIVE STRATEGIES TO DRIVE THE MICE SUB SECTOR IN BEACH HOTELS MOMBASA COUNTY

Data on innovative strategies that are likely to enhance the growth of the MICE activities in the beach hotel were analyzed using content analysis. The participants of the focus group discussion were selected event planners and owners of hotels with a beach front or their appointees

The focus group discussion concentrated on the innovative strategies for MICE tourism particularly in beach hotels. All the participants were in agreement that hotels in Mombasa County have heavily dependent on the declining seaside holiday market and that hotels with a beach front were also at an advantage of hosting events since the hotels may combine business travel with leisure.

According to Dwyer, (2002).) "… Conference tourism has been an important factor for out of season diversification of tourism and economic development in Galicia, Spain.

Over 80% of the participants said that events generate revenue and also provide an opportunity for growth as well as tourism products diversification. One of the event planners commented "it is not enough to have a hotel on the beach; hotels need to understand and move with the prevailing global event trends."

Various themes were identified from the discussion including insecurity Facial recognition technologies, utilization of conference apps, development of convention facilities in hotels and attendee experiences.

The first item on the discussion was attendee security. Travel advisories due to insecurity in the region were identified as the major cause of reduced business in hotels. One hotel owner said "the hotels are on their knees due to insecurity". Ninety percent of the participants said that attendee security is an important issue for both meeting planners and venue owners.

Security determines the mode of transportation, destination, and MICE activities for the attendees. Concerns about security and political stability of the destination influences meetings and event decisions (American Express Meetings & Events global meetings forecast (2016).

The discussion centered on various innovative opportunities that hotels and event planners can leverage on to maximize revenue and economic sustainability. Findings showed that there is need to inculcate new and existing innovations and technological solutions to help the hotels in enhancing efficiency and attendee experiences in the meetings industry.

There is a growing expectation among the attendees that event planners and managers need to create higher levels of engagement and involvement so that the attendees can participate in the event conversation. UNWTO, (2014) reports that the younger generation tend to be less keen on traditional speakers and prefer engagement to instruction. Conference rooms in hotels should be equipped with facilities to encourage audience participation, convention apps may be used for a range of activities including attendee registration, checking event schedules, and submitting questions to speakers during the live events.

The participants were in agreement that there was a growing demand for "uniqueness." hotel should move away from traditional ways of event management. Findings from this study are consistent with a report by World Travel and Tourism Council 2017) pointing that several MICE destinations including Asia and Vietnam have since become the favorite among business travelers because of their world class convention centers that offer state –of –the-art facilities and exceptional services.

Ninety percent of the participants were in agreement that "gone are the days where venues were only expected to be equipped with high speed internet connection a registration desk and an overhead projector'. It is therefore necessary that event planners and venues provide broadband internet access

Marketing is important for event organizers to increase the visibility of events in hotels. A participant from one of the beach hotels commented on the importance of using social media accounts for event marketing. Payment challenges were discussed and the participants recommended that new technology should be innovated that would make payments easier especially for global events.

The FGD Participants were on the opinion that Kenya through the Ministry of Tourism should benchmark with leading MICE countries. Importance of tourism research was discussed and recommendations given.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The study concluded that Beach Hotels in Mombasa County have embraced the meetings and conference side of business and are focusing on not only marketing it more but also investing in facilities to increase their capacities. However the hotels have not exploited their capacity and advantage of being on the beach to offer more MICE products which they could most successfully perform since they already have a leisure component in their facilities. The importance of technological innovation for the sector is crucial if the hotels wish to match the global competition in services provision.

This study has the following recommendations.

The Beach Hotels should be given security support so that they could then diversify their businesses by offering products that incorporate business with leisure packages to be able to maximize on their revenue all year round.

The destination managers should to focus on positioning and marketing Mombasa as destination that incorporates business with leisure.

Come up with innovations that would make payments easier especially for global events.

There is need for the hotels to keep up with competition and global trends to enhance creativity and innovativeness, but it is most important that the main focus of the industry remain. "provision of unmatched "Guest experience"

REFERENCES

Butler, R.W (2001) Seasonality in tourism: "issues and implications" in T. Baum and S. Lundtorp (eds) Seasonality in tourism. Pergamon , Amsterdam

Cooper, C., Fletcher, J., Fyall, A., Gilbert, D. and Wanhill, S., (2008). *Tourism Principles and Practice.* 4th ed. Harlow: Financial Times Prentice Hall

Davidson and Cope, (2003 Business Travel: Conferences, Incentive Travel, Exhibitions, Corporate Hospitality and Corporate Travel Prentice Hall, 2003

Davidson, R. (2003). *Business Travel,* Pearson Education, London.

5. Dominic M. and Loeschke, R. (2018) American Express Meeting & Events' 2018 Global Meetings and Events Forecast

Dwyer, L. and Forsyth, P., (2008). Economic measures of tourism yield: what markets to target? *International Journal of Tourism Research*, 10 (2), 155-168

Dwyer, L., (2002). Economic contribution of convention tourism: conceptual and empirical issues. *In:* Chon, K. and Weber, K, eds. *Convention tourism: international research and industry perspectives.* Binghamton, N.Y.: Haworth

Nedda, A. (2015). Euros Monitor Research Reports. Georgia State University gsu.edu. Media Industries Journal ISSN 2373-9037.

GOK (2016) K.T.B Annual financial statements june 2016. Government Printer. Available on www. Magicalkenya.com/ktb. (Retrieved 12th Feb. 2017)

G.O.K, (2016). The Statistical abstract 2016 Kenya Kenya National Bureau of Statistics (KNBS) 2016 Government Printer

G.O.K (2015). The Statistical abstract 2015 Kenya National Bureau of Statistics, 2014, Government Printer Nairobi

G.O.K (2014). The Statistical abstract 2014 Kenya National Bureau of Statistics, 2014, Government Printer Nairobi

G.O.K, (2014). Economic Survey 2014; Kenya National Bureau of Statistics, 2014, Government Printer Nairobi

G.O.K (2015a). Kenya Tourism Master Plan 2005 Kenya Ministry of Tourism and Wildlife, Nairobi. Government Printer, Nairobi

Issah J. (2016) American Express Meetings & Events global meetings forecast reports

International Labour Organization, 2014 https://www.e-unwto.org/doi/pdf/10.18111/9789284416905

Kenya Vision 2030 (2011), Available from http://www.vision2030.go.ke/index.php/pillars[Accessed on 14th Jan 2013]

Kenya Tourism Board (2016) Latest tourism statistics from Kenya Tourism Board alarm stakeholders http://ktb.go.ke/news-events/major-initiatives-and-achievements-of-the-tourism-sector-2013-2016/

G.O.K (2017) Kenya Tourism Board annual reports for 2017.Government Printer, Nairobi

Lickorish, L. J. and Jenkins, C. L. (1999). An introduction to tourism. London: Butterworth-Heinemann. M

Maingi, S. W., Odunga, P. O., Belsoy, S. J., & Nthinga R, W. (2011*), Conference tourism in Kenya: towards tourism product development, diversification and extension.* Available from http://irlibrary.ku.ac.ke/ir/handle/123456789/1463

National M.I.C.E Committee & Secretariat (2011); A Baseline Survey On Mice Tourism In Kenya: Developing A National Promotional Strategy, Samcotech (E.A.) Limited, Nairobi, Kenya.

National MICE Committee & Secretariat (2016) Kenya's MICE tourism segment on the rise Avaiable https://oxfordbusinessgroup.com/news/kenya%E2%80%99s-mice-tourism-segment-rise

Nyameino, C. B., Bonuke, R., & Cheruiyot, T. K. (2015). Moderating Effect of Information Technology Utilization on The Relationship Between Communication and Customer Satisfaction. *British Journal of Marketing Studies*

Rogers, T., (2003), *Conferences and Conventions – A Global Industry.* Oxford: Butterworth-Heinemann.

Swarbrooke, J. and Horner, S., (2001). *Business Travel and Tourism*. Oxford: Butterworth Heinemann.

Shaham, B. M., & Sajjad-ul-Aziz. (2012). The Impact of Information Technology & Hospitality Services on Customer Satisfaction- A Case Study of Fast Food Industry in Pakistan. *Interdisciplinary Journal of Contemporary Research in Business,*

Sirirak, S., Islam, N., & Khang, D. (2011). Does ICT adoption enhance hotel performance? *Journal of Hospitality and Tourism Technology,*

Swarbrooke, J. and Horner, S., (2007). *Consumer Behaviour in Tourism*. 2nd ed. Oxford: Butterworth Heinemann. (Swarbrooke and Horner, 2007).

World Bank. (2010). *Kenya's Tourism: Polishing the Jewel.* New York: World Bank, Finance and Private Sector Development

UNWTO. (2014). *UNWTO Tourism Highlights.* Madrid, Spain: World Tourism Organisation

United Nations World Tourism Organization,2014

UNWTO, 2008. *Tourist Arrivals by Purpose of Visit 2008.* Madrid: UNWTO. Available from: http://www.unwto.org/facts/menu.html

World Travel and Tourism Council Country reports. S2017 http://statistics.unwto.org/

World Travel and Tourism Council 2016 https://www.wttc.org/

World Tourism Organization (2014) Annual Report available http://www2.unwto.org/annualreport2014

How Much Does Labour Turnover Cost? A Case Study of Kenyan Small and Medium Tour Operators

Dr. Angeline Wambui Wambugu

Management University of Africa

P.O. Box 44 – 00502 Nairobi

Email: angiekinuthia@yahoo.com

Telephone/Mobile No. 0720754262

Abstract

The hospitality industry is a service-based industry, which is highly dependent on a customer-focused approach, and a motivated and knowledgeable workforce. Any shift in human capital therefore is viewed as detrimental as its long term success. Research postulates that employee mobility is a major cost and leakage of human capital. In addition, studies have shown that labour turnover affects organizational performance, customer quality and employee productivity. Despite the adverse effect of labour turnover on growth, survival and sustainability of organizations in the hospitality industry, there is limited research on turnover costs. This paper provides an understanding of the turnover rates and direct financial costs of labour turnover in small and medium tour operators. A descriptive research design was used. Primary data was collected using a self- administered questionnaire. Stratified sampling and simple random sampling technique were used to select 30 respondents. The target populations comprised of human resource managers and owner/managers of small and medium tour operators, which are registered with the Kenya Association of Tour Operators and operating in Nairobi and its environs. The study findings indicated that tour operators experienced acute turnover rates, which are much higher than the average turnover rate in service industries. The study findings also revealed substantial replacement costs are attributed to labour turnover in small and medium tour operators. The implications of these findings for managerial practice and suggestions for further research are discussed.

Keywords:-Labour turnover, turnover costs, tour operators, SMEs, Kenya

INTRODUCTION

The hospitality industry is a service-based industry, which is highly dependent on a customer-focused approach, and a motivated and knowledgeable workforce (Choi & Dickson, 2009). The industry relies heavily on employees in order to achieve its competitive advantage, and any shift in human capital can be detrimental as its long term success (Ton & Huckman, 2008; Chand & Katou, 2007; Harris, Tang & Tseng, 2002). Thus, labour turnover is considered a hindrance to competitiveness and efficiency in business operations (Long, Perumal & Ajagbe, 2012).

Research suggests that found that labour turnover increases economic losses and reduces job efficiency due to loss of valuable skills, experience, knowledge and "corporate memory" (Sut & Chad, 2011; Deery & Iverson, 1996). Furthermore, studies show that labour turnover compromises the quality and high standards of customer service, which negatively impacts on an organization's profitability and long term sustainability (Tracey & Hinkin, 2008). High labour turnover in the hospitality industry, if not addressed can be detrimental to an organization (). The study seeks to focus on labour turnover on small and medium tour operators. According to the stakeholders and HR managers, filling vacant positions in the hospitality industry is quite difficult due to insufficient supply of staff and high rate of their turnover costs (Birdir, 2002). The findings of this study will provide for determining the financial resources of labour turnover which is critical in shaping HRM practices and the management of labour retention in the hospitality industry. The research findings will also contribute to the development of a policy agenda of the tour and travel operators and the overall Kenyan hospitality industry.

Hospitality Industry in Kenya

The Kenyan hospitality industry is a bustling industry comprised of private and public players in various sub-sectors which ensure that tourists' needs are catered to in a holistic manner. These sub-sectors include: food and beverage services, transportation, accommodation (hotels), tourist attractions and luxury services. All these sectors are connected by the tour operators and travel agents (Bennett & Schoeman, 2005). Thus, tour operators influence tourist flows to Kenya from different destinations (Saffery, Morgan, Tulga & Warren, 2007). The main tasks of tour operators include: negotiation of rates with suppliers, booking accommodation for tourist, assisting in itinerary planning and providing local tour services (Bennett & Schoeman, 2005). Tour operators in Kenya are classified according to their owners, that is, foreign owned, locally owned by Kenyans of foreign origins and locally owned by indigenous entrepreneurs. Majority of tour operators are SMEs, earning less than $140,000 per annum (UNCTAD, 2008).

The hospitality industry has experienced significant growth since independence. In 2009, the industry recorded the highest growth rate of 18.6% (ROK, 2009).The continued growth of the hospitality industry is attributed to strong participation and encouragement in commercial ventures, pursuit of policy objectives and attention to non-economic ramifications of tourism and the innovations in major source markets by individual tour operators (Dieke, 1992). Various policy initiatives have been formulated in an effort to actualize flagship projects under Vision 2030. Vision 2030 identifies the hospitality industry as one of the top priority sectors with the tasks of making Kenya one of the top ten long-haul tourist destinations globally (ROK, 2008). Apart from developing the Sessional Paper No. 1 of 2010 on Enhancing Sustainable Tourism in Kenya, the Kenyan government has also developed the Tourism Act 2011 which provides for development, management, marketing and regulation of sustainable tourism and tourism related services.

Statement of the Problem

The National Tourism Strategy 2013 -2018 posits that the hospitality industry which is dominated by SMEs experiences acute labour turnover (ROK, 2013). If high labour turnover is allowed to continue, it will negatively impact SMEs through loss of highly skilled workforce, and ultimately widespread skill gaps among existing staff (Kuria, Wanderi & Ondigi, 2011). This not only results in additional direct and intangible costs for the employer, but also negatively affects the service quality, reputation and the long term survival of SMEs in the hospitality industry (Wafula, Ondari & Lumumba, 2017). The critical shortage of high qualified staff

resulting from high labour turnover has prompted considerable research on the causes of high labour turnover and possible solutions for retaining skilled workers (Kuria & Ondigi, 2012; Cheruiyot, Kimutai & Kemboi , 2017; Korir, 2018; Kuria & Ondigi, 2012) Studies on labour turnover costs are limited, and most of these studies in the hospitality industry have been conducted in the accommodation sector, specifically, hotels, resorts and restaurants (Hinkin & Tracey, 2006; Derry and Iverson, 1996; Wasmuth & Davis, 1983; Kuria, Ondigi & Wanderi, 2012). The purpose of this study was therefore to establish the direct costs of labour turnover amongst small and medium tour operators in Kenya.

Specific Objectives of the Study

The specific objectives of this study were to:

Assess the extent of labour turnover rate in small and medium tour operators in Kenya.

Establish the direct costs of labour turnover in small and medium tour operators in Kenya.

LITERATURE REVIEW

Concept of Labour Turnover

Labour turnover is defined as "the movement of people into and out of employment within an organization" (Denvir & McMahon, 1992). Labour turnover refers to the proportion of employees who leave an organization over a set period, expressed as a percentage of total workforce numbers (CIPD, 2014). The term " turnover" is defined by Price (1977) as the ratio of the number of organizational members who have left during the period in consideration divided by the average number of people in that organization during the period. Human resource (HR) manager tend to link the term turnover to the process of filing a job vacancy, that is, the process of recruitment, selection and training (Wood, 1995).

Labour turnover rate is therefore an excellent indicator of organizational health and wellbeing, job satisfaction, employee morale and productivity (Nankervis, Compton & McCarthy, 1996). A zero percent labour turnover rate in any industry is rare, and it should not be the priority of management (Reigel, 1995). Researchers argue that regardless of good retention strategies, organizations cannot retain 'all their employees, all the time' due to death, ill health, changes in an employee's personal circumstances or for other reasons that have little to do with the employer organization. A low turnover may suggest organizational stability (Mitrovska & Eftimov, 2016). A high labour turnover, however, may be detrimental to the survival and long term sustainability of an organization (Armstrong, 2009).

Labour turnover in the hospitality industry is mainly voluntary where employees leave employment at their will (Wright & Bonett, 2007). Voluntary turnover is either functional or dysfunctional. Functional turnover occurs when non-performers, relatively expensive employees and those with obsolete skills quit the organization. Some level of functional turnover is desirable as it allows organizations to bring in "new blood" with new innovative ideas and knowledge. In addition, labour turnover creates opportunities for career advancement for existing employees as they grow into roles of greater responsibilities. Dysfunctional turnover, on the other hand, represents an exodus of human capital investment from the organizations as it

refers to the exit of effective performers, key individuals, innovators and individuals whose skills are difficult to fill with new hires (Walsh & Taylor, 2007).

The rate of turnover is a calculated by dividing the number of employees who have left the organization by the average number of employees in the organization in the accounting period. The average number of employees is achieved by adding the number of employees at the beginning and end of period and dividing the total number by two.

$$\text{Fluctuation rate} = \frac{\text{number of leavers during the calculation period}}{\text{Average number of employees}} \times 100$$

Labour turnover "culture" in the Hospitality Industry

The hospitality industry is labour intensive, and around the world, the industry is characterized by high labour turnover (Birdir, 2002). The industry experiences a disproportionate amount of turnover in part-time employees and management ranks when compared with other service industries (Dipietro & Condly, 2007). For example, management turnover is lower than that of operational employees (Carbery, Garavan, O'Brien & McDonnell, 2003). A study by Gautam (2005) found that the average turnover rate of non-management horel employees in the US was 50% and 25% for management staff. Several studies have investigated labour turnover levels in the hospitality industry. According to the United States Bureau of Labour Statistics (2006), turnover rates in the hospitality industry was 52.2% compared to an average turnover of 23.4% across all other industries. A study by Denvir and McMahon (1992) found that the turnover levels in London hotels showed annual rates up to 200 or 300 per cent per annum depending on location, HR practices and organization culture. Kuria, Odingi and Wanderi (2012) in their study on the assessment of causes of labour turnover in three and five star rated in Kenya found that labour turnover was 68% in three star-rated hotels compared to 13% in five star-rated hotels.

Tangible and Intangible Costs of Turnover

Labour turnover represents an expense in both large and small enterprises (Davidson, Timo & Wang, 2009). The typical turnover cost per employee is almost the same as an employee's annual salary. These costs can sometimes reach up to 150% of annual earnings and up to 250% for employees in managerial positions (Bliss, 2004; Tziner & Birati, 1996). Empirical studies on the turnover cost can unambiguously reduce profits if not managed properly (Kersley and Martin, 1997; Denvir & Mcmahon, 1992). Abel-Hamid (1989) found that labour turnover can extend a project's cost and duration by as much as 60 per cent. Hinkin and Tracey (2008) found that lost productivity resulting from labour turnover may account for more than two-thirds of the total turnover cost. The cost of labour turnover varies based on complexity of the jobs, experience, skills, location of the organization, employee relations, HR practices and organizational culture (Fair, 1992). Every time an employee leaves and has to be replaced, an organization incurs a number of direct and indirect costs: costs of separation, cost of replacement staffing, hiring costs, lost sales, low employee morale, pressure on remaining staff and loss of social capital (Hinkin & Traacey, 2006; Dess & Shaw, 2001). In addition to these costs, the organization incurs intangible costs associated with productivity costs (Lashley & Chaplain, 1999). Productivity costs are more difficult to quantify and usually account for more than two-thirds of the total turnover cost (Hinkin & Tracey, 2008).

The conceptual framework as shown in Figure 1 was based on the turnover costs components model adapted from Cascio (2000). The theoretical model distributes the cost of turnover into several categories: costs of the employees leaving the organization, costs of replacement and costs for employee training and development. Separation costs included administration costs associated with processing resignations, and dismissals, time taken up with conducting exit interviews, severance pay, benefits and gratuities. Recruitment costs constituted the cost of advertising, employment of job search agencies, time and resources spent in processing applications, staff time, travel costs and re-location for successful applicants; training and start-up costs (Cascio, 2000). Selection costs included HR interview, medical examination, applicant's travel, background and reference checks. Hiring costs included costs of induction, relocation, orientation, training, uniforms, security, information and literature necessary for new applicant. Productivity costs are defined as costs incurred when "the replacement worker has a lower skill level or needs to learn the job in order to reach the level of productivity of the original worker". Indirect costs or productivity costs include peer disruption, errors and waste, vacancy costs, pre-departure productivity costs and supervisory costs (Cascio, 2000).

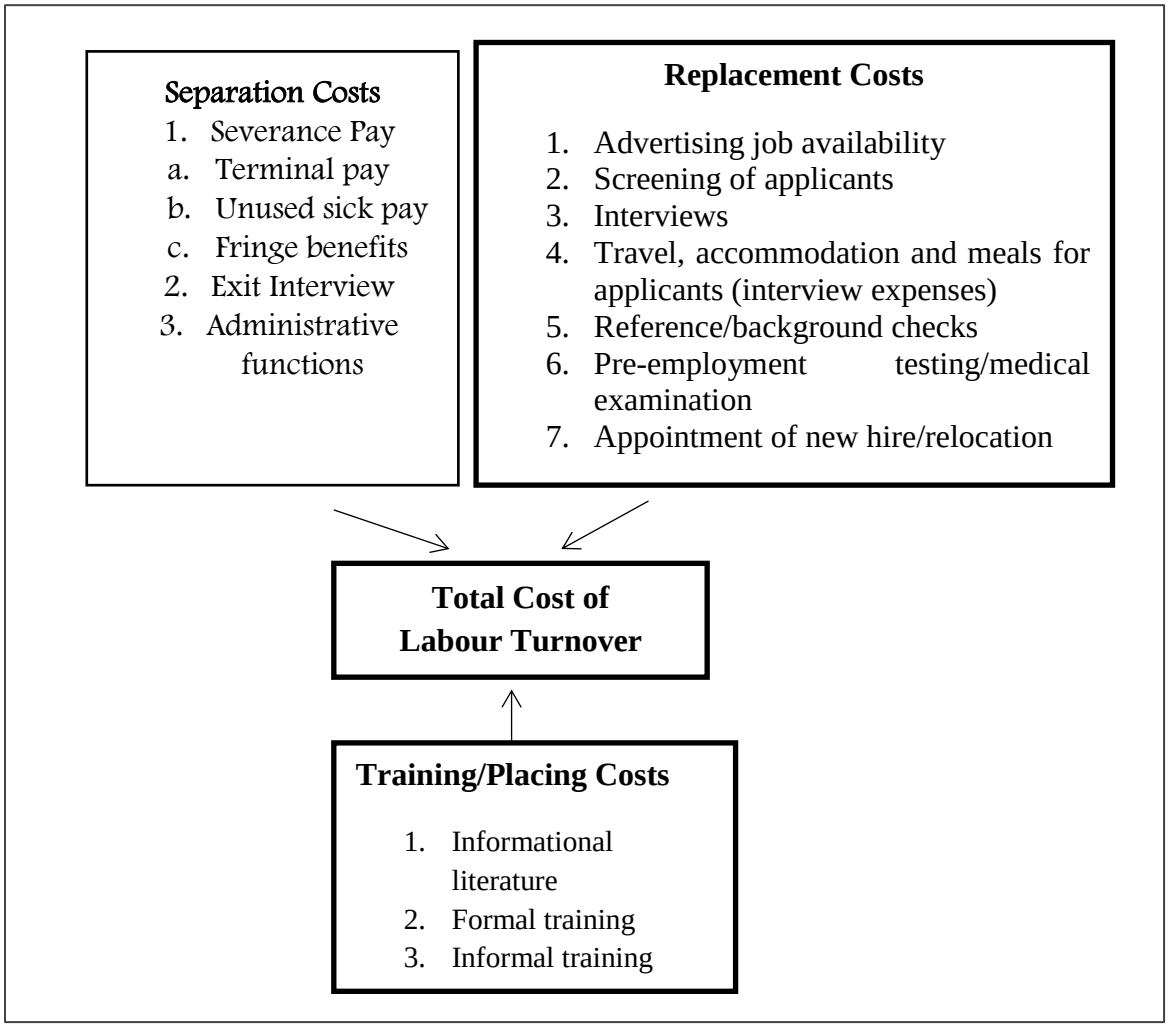


Figure 1: Conceptual Framework. Adapted from Cascio (2000). Costing Model of Employee Turnover

RESEARCH METHODOLOGY

For purposes of this study, tour operators are defined as intermediaries who organize and put together holiday packages which include: arranging travel services, transport and accommodation booking (Bennett & Schoeman, 2005). The study considered both voluntary turnover and involuntary turnover of employees who left during the period of one year. The study adopted the definition of turnover by Mobley (1982) as a phenomenon where the employee terminated its membership in the organization from which he/she earns monetary compensation.

The study adopted a descriptive research design. The target population included owner/managers and HR managers of small and medium tour operators registered with Kenya Association of Tour Operators (KATO) operating within Nairobi and its environs. Stratified sampling and simple random sampling were used in the study. Stratified sampling and simple random sampling was used to select a representative sample of 30 respondents.

Primary data was collected by means of a self – administered, semi structured questionnaire. The respondents were assured of utmost confidentiality of their responses and anonymity of the source of the information (Kothari, 2004). The questionnaires were pre-tested on 10 enterprises through convenience sampling technique. After the pre-test, any items in the questionnaire that could cause bias were modified or omitted (Mugenda & Mugenda, 2003). The study employed descriptive statistics to analyze the data. Primary data was coded, edited and then analyzed using the Statistical Package for Social Sciences (SPSS) version 20. The findings were presented in form of frequency tables and percentages.

DATA FINDINGS AND DISCUSSIONS

The study findings indicated that majority of the respondents (67.7%) were male while the minority (33.3%) were female. The majority of the respondents (48.2%) were married, another (37%) were single and yet another 14.8% were divorced. Finally, the majority (33.3%) of the respondents were university degree holders, while 29.6% were diploma holder, another 18.6% were certificate holders while 18.5% were postgraduate degree holders.

Assessment of the labour turnover rates in small and medium tour operators

The study sought to find out the labour turnover rate in small and medium tour operators in Kenya for a period covering 12 months. The study findings revealed that the majority (63%) of the respondents had experienced high levels of labour turnover, while 27% had experienced medium levels of turnover, another 10% had low levels of labour turnover. The study findings also indicated the average labour turnover rate of 60.8 % for employees at operational level and a rate of 32.3% for employees at managerial level. The study findings demonstrated that most of the small and medium tour operators in Kenya experienced high labour turnover. In addition, that the turnover rate of employees at operational level was higher than the turnover rate of employees at managerial level. The result is in agreement with the findings in a study by

Davidson, Timo and Wang (2009) which found that labour turnover rate of 50.74% in Australian accommodation industry was higher than expected, and that the turnover rate was lower amongst executives, supervisors and departmental managers than in other employment categories.

Employee Turnover Cost Analysis

The study sought to establish the direct costs (replacement costs, separation costs, training costs) of the small and medium tour operators within a period of one year. The study findings as shown in Table 1 revealed that replacement costs constituted 57.8% of the total turnover cost compared to separation costs which constituted 22.4% of the total turnover costs. Training costs comprised only 19.8% of the total turnover costs. The study findings showed that the average total cost of turnover was Kshs 57,710,000/=. Finally, the study findings indicate significant difference in two costs: screening and entrance interviewing (17.4%) and formal training (5.2%).

The findings revealed that the average direct cost of labour turnover was substantial which may lead to an increase in administrative costs of small and medium tour operators in Kenya. In addition, the results revealed that small and medium tour operators were spending more money in testing the knowledge, skills and abilities of employees to ensure that a qualified candidate was hired and less money is being invested in formal training of newly hired employees. The study results are inconsistent with the findings of a study by McKinney, Bartlett and Mulvaney (2007) which found that separation costs were higher than replacement costs of employees in Illinois Public Park and recreation offices.

Table 1: Average cost of replacing employees per annum

Type	Expense	Costs per annum in KES	Percentage
Replacement costs	Advertisement	6,000,000	10.4
	Screening and entrance interviewing	10, 050,000	17.4
	Interview expenses	4,700,000	8.1
	Reference/background checks	3,450,000	6.0
	Pre-employment testing	5,575,000	9.7
	Appointment procedures for new hires	3,585,000	6.2
Separation costs	Severance pay	5,300,000	9.2
	Exit interview costs	3,400,000	5.9
	Administrative costs	4,200,000	7.3
Training costs	Informative literature	3,600,000	6.2
	Formal training	3,000,000	5.2
	Informal training	4,850,000	8.4
	Total	**57,710,000**	**100**

Conclusion and Recommendation

From the study findings, it can be concluded that the direct costs of labour turnover small and medium tour operators are substantially high. It can also be concluded that employees in the operational level are more likely to quit their organizations than employees in the managerial

level. Finally, it can be concluded that high replacement costs are attributed to labour turnover in small and medium tour operators in Kenya. It is recommended that small and medium tour operators need to seriously address wastage levels through reforming internal HR practices.

Suggestions for Further Research

The present study has a number of limitations that need to be addressed in further research studies. First, the study focused on direct turnover costs of Kenya's small and medium tour operators operating in Nairobi and its environs, which affect generalization of the study findings to other services industries and regions in Kenya. There is need for research in other sub-sectors of the hospitality industry before establishing a general theory on the labour turnover in the hospitality industry. Secondly, whilst this study focused on tangible costs of turnover, there is a need examine both tangible and intangible costs of turnover which will provide a better picture of the total costs of labour turnover. Finally, future research should seek to employ longitudinal research design to track turnover costs in the hospitality industry.

REFERENCES

Armstrong, M. (2009). A handbook of human resource management practices. (11th ed.). London: Kogan Page.

Bartlett, K. R., & McKinney, W. R. (2004). A study of the role of professional development, job attitudes, and turnover among public park and recreation employees. *Journal of Park and Recreation Administration, 22*(4), 62-80.

Bennett, J.A. & Schoeman, L. (2005). *The tourism system and major role-players involved in managing tourism services.* (3rd Ed). Pretoria: Van Schaik Publishers.

Birdir, K. (2002). General manager turnover and root causes. *International Journal of Contemporary Hospitality Management*, *14* (1), 43-47.

Carbery, R., Garavan, T. N., O'Brien, F. & Mc Donnell, J. (2003) Predicting hotel manager turnover cognitions. *Journal of Managerial Psychology, 18(*7), 649-679.

Cavagnaro, E., Staffieri, S., & Ngesa, F. (2015). Looking from a local lens: Inbound tour operators and sustainable tourism in Kenya. *Research in Hospitality Management, 5*(2), 135-145.

Chan, S.H., & Kuok, O.M. (2011). A study of Human resources recruitment, selection, and retention issues in the Hospitality and tourism industry in Macau, *Journal Human Resources in Hospitality & Tourism, 10*(4), 421-441.

Chand, M., & Katou, A. A. (2007). The impact of HRM practices on organizational performance in the Indian hotel industry, *Employee Relations, 29* (6), 576-594.

Chartered Institute of Personnel and Development. (2014). Employee turnover and retention 2014 CIPD, London. (Online)Available from:http://www.cipd.co.uk/hr-resources/factsheets/ employee - turnover-retention.aspx (Accessed 27th February 2017)

Cheruiyot, J. K ., Kimutai, G., & Kemboi, A. (2017). Effects of employees engagement factors on staff turnover in the hospitality industry: A survey of rated hotels in Uasin Gishu county. *International Journal of Academic Research and Reflection, 5*(6), 27 -36).

Choi. Y., & Dickson, D. R. (2009). A Case Study into the benefits of management training programs: impacts on hotel employee turnover and satisfaction level, *Journal of Human Resources in Hospitality & Tourism, 9*(1), 103-116.

Cascio, W.F. (2000). *Costing Human Resources*. 4th Ed. Boston: Kent Publishing Company.

Chipunza, C. S. (2009). Employee retention and turnover: Using motivational variables as a panacea. *African Journal of Business Management, 3*(8), 410-415.

Davidson, M.M Timo, N., & Wang, Y. (2009). Putting a cost on labour turnover in the Australian accommodation industry. Proceedings of the 18t CAUTHE Conference. Griffith University. http://hdl.handle.net/10072/31846.

Deery, M. (2002).Labour turnover in international hospitality and tourism in N D'Annunzio – Green, G. Maxwell. *Human resources management: international perspectives in hospitality and tourism continuum.* London.

Deery, M., & Shaw, R. (1999). An investigation of the relationship between employee turnover and organizational culture. *Journal of Hospitality and Tourism Research*, *23*(4), 387-400.

Dess, G. G., & Shaw, J. D. (2001). Voluntary turnover, social capital, and organizational performance. *Academy of Management Review*, *26*(3), 446 – 456.

Denvir, A., & McMahon, F. (1992). "Labour turnover in London hotels and the cost effectiveness of preventative measures", International Journal of Hospitality Management, 11 (2), 143-154.

Korir, J.C. (2018). Expected outcomes of human resource practices on labour turnover in restaurants in Kenya. Kabarak Jouranl of Research & Innovation 30(30), 20 - 35.

Kothari, C. (2004). *Research Methodology; Methods and Techniques*. New Delhi, India: New Age International (P) Ltd.

Kuria, S., Ondigi, A., & Wanderi, P. (2012). Assessment of causes of Labour Turnover in Three and five Star-Rated Hotel in Kenya. *International Journal of Business and Social Science, 3*(15), 311 - 317.

Kuria, S., & Ondigi, A. (2012). Assessment of causes of labour turnover in three and five star rated hotels in Kenya, 3(15) 311 - 318.

Lashley, C., & Chaplain, A. (1999). Labour turnover: hidden problem –hidden costs, *The Hospitality Review*, 1(1), 49-54.

Long, S., Perumal, P., & Ajagbe, M. (2012). The impact of human resource management practices on employees' turnover intention: a conceptual model. *Interdisciplinary Journal of Contemporary Research in Business, 4*(2), 629-641.

McKinney, W. R., Bartlett, K. R., & Mulvaney, M. A. (2007). Measuring the costs of employee turnover in illinois public park and recreation agencies: an exploratory study. *Faculty Research and Creative Activity*, 2, http://thekeep.eiu.edu/recadmin_fac/2

Mobley, W. H. (1982). *Employee Turnover: Causes, Consequences, and Control.* Philippines: Addison-Wesley Publishing.

Mugenda, M. O., & Mugenda, A. G. (2003). *Research Method: Quantitative and Qualitative Approaches.* Nairobi: ACTS Press.

Nankervis, A. L., Compton, R. L., & McCarthy, T. E. (1996). *Strategic Human Resource Management*. South Melbourne: Thomas Nelson.

Cavagnaro, E., Staffieri, S., & Ngesa, F. (2015). Looking from a local lens: Inbound tour operators and sustainable tourism in Kenya. *Research in Hospitality Management, 5*(2), 135-145.

Ongori, H. (2007). A review of the literature on employee turnover. *African Journal of Business Management,* 049-054.

Price, J.L. (1977).*The Study Of Turnover,* Iowa State University Press: Ames.

Reigel, C.D. (1995). *Turnover: Conceptual model. In D.G. Rutherfold (Ed),Hotel management and operations.* 2nd Ed. New York: Van Nostrand Reinhold.

Saffery, A., Morgan, M., Tulga, O., & Warren, T. (2007). *The Business of Inbound*

Tour Operators. USAID.

Sut , W., & Chad, H. P. (2011). Employee empowerment, job satisfaction and organizational commitment: An in-depth empirical investigation. *Chinese Management Studies*, 5(3), 325 – 344.

Ton, Z., & Huckman, R. S. (2008). Managing the impact of employee turnover on performance: The role of process conformance. *Organization Science, 19*(1), 56-68.

UNCTAD. (2008). *FDI and Tourism: The Development Dimension East and Southern Africa.* Geneva: United Nations Conference on Trade and Development

Wafula, M., Ondari, J.K., & Lumumba, E. (2017). Factors affecting employee turnover in hospitality establishments in Kisii Town, Kenya. *Merit Research Journal of Business and Management, 5*(1), 030-040.

Walsh, K., & Taylor, M. S. (2007). Developing in-house careers and retaining management talent: What hospitality professionals want from their jobs?. *Cornell Hotel and Restaurant Administration Quarterly,* 48(2), 163-182.

Wasmuth, W.J., & Davis, S.W. (1983). Managing employee turnover. *Cornell Hotel and Restaurant Administration Quarterly, 24*(1), 15-22.

Woods, R. H. (1992). *Managing hospitality human resources*. East Lansingmi: Educational institute of the American Hotel and motel Association.

Wright, T. A., & Bonett, D. G. (2007). Job satisfaction and psychological wellbeing as non-additive predictors of workplace turnover. *Journal of Management, 33*(2), 141-60

Improving Health Care Delivery by Community Health Workers Through Mobile Phones

By

Khisa Kevin Nandasaba

Bsc.Biomed,MPH

Part time Lecturer, Kisii University

Faculty of Health Science

Eldoret Campus.

Paper presented at Machakos University, 2nd annual international conference

(ORAL PRESENTATION)

ABSTRACT

Community health workers (CHWs) play a critical role in delivery of basic health care especially in rural communities where access to health care is a challenge. Most of these "first line" health care workers are ill equipped and do not have much support in their role. Majority of Community health workers are low skilled and operate far from formal health care system.

Mobile phones have provided a unique opportunity for Community health workers. This technology has allowed access of health information through the internet to facilitate their work. They are able to acquire updated information on how to deal with certain ailments, protocols to be followed and even consult with medical practitioners. It has improved the attendance to clinics immensely through reminders sent to patients in the form of text messages. Adherence to medication has also been enhanced through the same approach. It has made the collection and transmission of information to relevant authorities easier, faster and efficient.

This paper presents the application of mobile phone technology specifically among community health workers. A review of literature available on chwcentral.org, a platform devoted to research linked to community health work, forms the core of this paper. It delves into the opportunity that this technology provides for improvement of health care delivery to communities. It provides evidence that indeed mobile phones can contribute immensely to improving health care delivery through community health workers to communities in dire need of these services.

Key Words: Community Health Workers, health care delivery, Mobile phones, improving

INTRODUCTION

The Umbrella term "community health worker" embraces a variety of community health aides selected, trained and working in the communities from which they come. A widely accepted definition was proposed by World Health Organization. A Community health worker should be a member of the community where they work, should be selected by the community, should be answerable to the community for their activities, should be supported by the health system but not necessarily a part of its organization, and have shorter training than professional workers (WHO, 2007).

Community health workers (CHWs) play a critical role in the delivery of health services in areas with limited health infrastructure or workforce. They provide basic health and health-promotion services regarding hygiene and sanitation, immunizations, growth monitoring, antenatal care, family planning and disease surveillance (Dahn et al., 2015).

In low- and middle income countries, many of those who do seek health care see a community health worker, the lowest cadre of health provider. Typically, CHWs are lower-skilled members of the community and are not based at a health facility. Research shows that, despite heavy reliance on CHWs in places like sub-Saharan Africa and South Asia, CHWs are not effectively trained, remunerated, or retained (Redick et al., 2014).

Supervision of CHWs by qualified health professionals is the main link between this lay workforce and the formal health system. The quality of services provided by lay health workers is dependent on adequate supportive supervision. It is however one of the weakest links in CHW programs due to logistical and resource constraints (Laktabai et al., 2018).

Widespread use of mobile phones in low income countries has created momentum to use these devices to strengthen supervisory systems for CHWs (Crigler et al., 2014). Mobile devices may enable supervisors to overcome resource constraints and geographical distances to monitor CHW activity in real time, provide remote guidance, deliver timely feedback, or send automated motivational messages or reminders (Callan et al., 2011). Campbell et al., (2014) demonstrate that use of mobile phones, accompanied by provision of good technical content, can markedly strengthen the role that CHWs play in delivering health services.

More mobile and electronic information tools have been developed, tested and implemented with CHWs to support their work roles. The tools help the CHVs in surmounting challenges such as lack of appropriate work tools and inadequate supportive supervision and training (Braun et al, (2013). These tools have been instrumental in improving access to care by marginalized population groups subjected to stigma and those in hard-to-reach areas by reducing both time and cost of travel (Bakibinga et al., 2017).

TYPES OF MOBILE PHONES USED TO IMPROVE HEALTH SERVICE DELIVERY BY COMMUNITY HEALTH WORKERS

Agarwal et al., (2016) examined active programs that use mobile phones and tablets to support front line health workers (including CHWs). Nearly 60% of the phones used by CHWs were smart phones, followed by feature phones (14%).

Experts were asked about the type of mobile devices that are currently being used by Frontline health workers. 35% reported the use of only one type of device (e.g. feature phone only) and 65% reported the use of two or more type of devices being used by different types of providers

within the same project (e.g. CHW use feature phones to report to their supervisors, and supervisors use tablets to monitor all CHW activities as part of the same intervention). This might suggest how within the health system, type of devices are being tailored to the type of user and their expertise, as well as the unique needs of the procedures that are conducted at that level of the health system. Simple phones (i.e. SMS and call functions only) and feature phones are less frequently used at 7% (data repositories) and 27% (Agarwal et al., 2016).

The types of phones used for health programs involving Community health workers are determined by a set of criteria related to their usability. Some of the usability metrics include (Grevendonk, 2013):

Transmit information in a language (script or voice) that is understood by the user population

Emphasize ease of use and learnability to reduce training costs

Allow users to find features in two clicks or less

Easy end-user interactions
Ease of use can refer to use by the end user (the FHW), but can also refer to use by the data users and the project managers.

MOBILE PHONE FUNCTIONALITIES USED IN IMPROVING HEALTH SERVICE DELIVERY BY COMMUNITY HEALTH WORKERS

Short Message Service (SMS)

This is one of the most basic functionalities found on even the simplest of phones. It allows for the user to send and receive text messages. The cost of sending these messages is usually relatively cheaper compared to making a call, especially across different network providers. It does not require internet connection and can be used in remote areas without complications.

Most mobile health projects for CHWs employ SMS-based strategies involving 1- or 2-way interaction, whereas few projects have adopted multi-way communication strategies to promote health priorities (Kallander, 2013).

A study conducted by Mushamiri, et al., (2015) in Western Kenya to investigate the use of mobile phones and mobile technology to enhance PMTCT efforts established that Using any standard mobile phone, readily available in Sub-Saharan Africa, CHWs are able to use SMS to register patients during ANC and report their health status to a central system that provides a real-time view of the health of a community. Paper-based methods of data recording, the national norm in Kenya, proved to be laborious and prone to error. CHWs would often either forget to remind women of their upcoming ANC appointments or not be aware of the next appointment. The ANC/PMTCT Adherence System (APAS, informally referred to as “PMTCT Module”), which is a mobile Health (mHealth) tool that uses text messages (SMS) to facilitate and coordinate CHW activities around ANC and PMTCT, was implemented in the MVP cluster in October 2010 to help alleviate some of the issues

In Malawi, SMS messaging for pregnant women and caregivers of children under 1, often sent through CHWs as intermediaries, was effective in improving both the knowledge and intended positive behavior of clients (Crawford et al., 2014).

In another study conducted by Campbell et al., (2014) in Malawi, the mobile phones linked CHWs with each other and with district supervisors/coordinators through an SMS hub located at the 2 District Hospitals. The CHWs cited their ability to get immediate help for their clients by sending a message to the Hub and getting a rapid response. CHWs explained that timely responses from district hospital staff to CHWs' requests for important technical information resulted in gains in expertise.

They also described the reduction in stockouts that resulted from expediting the timely reporting of family planning/reproductive health and HIV/AIDS commodity shortages. There was an increase in prompt responses to emergencies (obstetric) and outbreaks (measles) and to queries from CHWs to their supervisors. CHWs reported a wider service coverage accompanied by lower costs.

WhatsApp

Henry et al.,(2016) conducted a study on enhancing supervision of community health workers using whatsapp in Kenya. Group of Kenyan CHWs and their supervisors used the WhatsApp mobile messaging platform for supervision and professional development over a 6-month period. Choice of WhatsApp reflected existing patterns of technology use in Kenya, where an estimated 49% of mobile phone users use WhatsApp as their preferred mobile messaging tool (Adika, 2014). This cross-platform application for basic, feature, and smart phones requires a mobile Internet connection to operate, allowing users to send and receive text messages, photos, videos, and audio recordings.

CHWs posted 48% (n = 872) of all messages, with 1 CHW alone posting 12% (n = 218) of these messages. One supervisor posted 15% (n = 270) of all messages, with the remaining supervisors posting 11% (n = 198) of messages, for a combined total of 26% (n = 468). The NGO and academic partners each posted roughly 7% of the total number of messages each (n = 130 and n = 132, respectively), while other MOH representatives at the district and local level posted 10% (n = 179) of messages and the local CHC leader 3% (n = 49) of messages. Interviews suggested that in general the use of WhatsApp was viewed very positively and was taken up very easily by participants (Henry et al., 2016)

One supervisor in the study explained: I think it has been a platform for us to communicate, and actually I can say it has reduced some costs when it comes to communicating with the community health volunteers because if I know people are in the [WhatsApp] group, I don't have to SMS everyone because the SMSs have a cost So the communication is good between us [the supervisors] and the community health workers. We really communicate and in case there is any problem, like when there was this outbreak of cholera, we really shared a lot. You give the information you know, they [the CHWs] give you what they know, and [you] can advise "do this, do this, concentrate on this area," so that that thing [cholera] can end. This [is] through the WhatsApp (Henry et al., 2016).

WhatsApp capability to allow capturing and sharing of videos and photos greatly contributes to document the work of community health workers. Henry et al., (2016) reports that Supervisors

posted photos of supervisory visits, meetings, and training sessions that had taken place that day, followed by words of praise, motivation, and appreciation. CHWs posted photos to document the quality of services they delivered, with posted messages often referring to the photos as "evidence" of CHW work practices in the community: They used captions to describe the content of the photos. Supervisors followed up with guidance, encouragement, and/or thanks while fellow CHWs added words of praise and encouragement (Henry et al., 2016).

Phone Calls

The mobile phone was an absolute upgrade to the traditional telephone that was dependent on wire connections from one point to the other. These phones were stationed at a fixed point. Mobile phones allow for movement of the user due to their wireless connection. Community health workers are able to make calls to health staff at the facility from the homes of their clients, as long as there is adequate network. They are able to consult their supervisors and other health professionals in the management of the health conditions of their clients. They can make real time requests to the health facility especially in the case of emergencies, where an ambulance may be required.

A study conducted in Uganda by Ayiasi et al.,(2015) to investigate the use of mobile phone consultations during community health worker visits for maternal and newborn care explored this functionality. In this setting, community health workers are reffered to as village health teams (VHTs). They were of the opinion that phone calls have contributed to reduced incidences of maternal complications like miscarriages in their community because of the prompt attention that the women received. Sometimes health workers provided instructions to the VHTs on phone. Most VHTs perceived that the feedback that they received through phone calls improved the accuracy of information and were reassuring for the women and their families (Ayiasi et al., 2015).

Instructions given on phone from professional health workers to VHTs saved the women and their families of the long distance, the time and finances needed to reach the health centre. Nearly all VHTs (15/16) said that direct consultations through the use of mobile phones has helped them to reduce on the turnaround time needed to receive feedback since some of the consultations do not require physical movements of women to the health centre (Ayiasi et al.,2015).

In Kenya, Henry et al., (2016) reports that supervisors regularly used voice calls and WhatsApp in general to communicate one-on one with individual CHWs to understand more about the services provided to households.

Program specific Applications

Mobile phones have greatly evolved. New applications are often developed to meet the various needs of their users. These applications are commonly found on smart phones, tablets and other mobile devices. They can be downloaded from app stores located in the devices or pre installed by the manufacturer. Community health programs have developed unique applications to cater for their specific projects. These applications can deliver educational information to the

community health workers. They provide a platform for input of information in the field and reduce the paperwork that the community health workers have to deal with.

A project conducted in Benin by Centre for Human Services (CHS, 2013), funded by USAID utilized the use of a mobile application designed to assist community health workers in delivery of family planning information to the community. The project only worked with female CHWs due to the sensitivity of the family planning subject matter, which is often considered taboo in Beninese households.

The application was based on Dimagi's Commcare (Dimagi, Inc., Charlestown, MA), an easy-to-configure data management and work flow application, with functionality for both data collection and case management. Commcare can adapt traditional health communication tools (visual aids, counseling cards, etc.) with the possibility of adding additional pictures and audio or video illustrations, as needed. Another useful feature allows for automatic data recovery in close to real time after the user has completed data entry. The application developed under PRISE-C (Partnership for the community management of child health) can be used on cellular phones, Android, tablets or Smart phones (CHS, 2013).

The application for community health workers is comprised of the following modules (CHS, 2013):

Registration, which enables the CHW to register women as FP clients.

Advice is used for counseling clients, using a combination of images and audio messages in the local language.

Choosing a method registers the specific method chosen by the client after counseling. Monitoring FP methods allows for recording of possible side effects noted by clients after the adoption of a method.

Product sales helps CHWs record any FP products that they sell.

In rural Zambia, Schuttner et al.,(2014) assessed a mobile-based community health worker program for referral, follow up and service outreach. CHWs captured data using survey instruments programmed onto a mobile phone provided by the project. The surveys were created with existing free, open-source software called CommCare (Dimagi, Inc., Charlestown, MA) that runs on Java enabled phones (Mhila, 2009). Four surveys were developed: a household visit, patient follow-up, referral, and monthly activity summary. The surveys collected data on demographics, disease symptoms and severity, and care-seeking behaviors and correlated with the patient clinic visit forms (Schuttner et al., 2014)

In the field, CHWs entered surveys on mobile phones in "real time" to document the client interview. Completed surveys were submitted if cellular network coverage was available. If not, or if the phone was powered off, the data were temporarily stored on the phone until network coverage became available and then removed after submission. Data were transmitted to the central server via GPRS and then back to the district servers (Schuttner, 2014).

In Kenya, Bakibinga et al.,(2017) explored the role of a decision-support smart phone application in enhancing Community Health Volunteers effectiveness to improve maternal and

newborn outcomes in Nairobi. The project sought to strengthen the healthcare delivery system in the urban informal settlements to be more responsive to the health needs of mothers and their children through enhanced service delivery public–private partnerships (Bakibinga et al., 2017).

The mobile PAMANECH (mPAMANECH) application was developed as an integrated data capture tool running as a mobile app with selected reporting forms for CHVs in Kenya. The mobile decision-support tool/ system (mDST/S) mobile application (app) is an Android app that installs from the phone and runs as an application. The application was hosted at Google store and accessed for download via the internet automatically to the user handset. The CHVs were provided with a mobile phone running the mHealth app for data collection which was then relayed to the head office (Bakibinga et al., 2017).

Schoen et al, (2017) also report on the effectiveness of mobile phone applications among community health workers in Brazil. CHWs believed that the mobile application helped make their work more efficient. They appreciated the Geohealth mobile application for the ease with which it let them access information from previous visits. The application helped them keep track of which families they needed to visit in a given month. Finally, the mobile application eliminated the amount of paper CHWs had to work with and lightened the load that they had to carry on a daily basis (Schoen et al., 2017).

CHALLENGES IN USING MOBILE PHONES TO IMPROVE COMMUNITY HEALTH WORKERS DELIVERY OF HEALTH SERVICES

There have been several challenges associated with the use of mobile phones to improve health service delivery by community health workers. Limited availability of Electricity to charge the device has been highlighted by Ayiasi et al (2017). The problem of limited electricity for regular battery charging is important in a rural setting where adequate infrastructure is lacking.

Not all phone calls made by VHTs were attended to by professional health workers because they were either out-of-station, or their phones were not available on the network, or they were overloaded with extra work. When VHTs calls were not attended to, women and newborns could not receive the needed professional attention (Ayiasi et al., 2017).

In two group discussions VHTs reported that their calls to professional health workers were received with anger and this caused them to become reluctant to make future consultations with health workers (Ayiasi et al., 2017).

Schoen et al.,(2017) reported Social barriers among community member's especially their perception of the mobile application and safety concerns among the community health workers about carrying around an expensive smart phone. The application took a long time to load, froze frequently and shut down without warning. Thus, they concluded that they could write paper notes faster than using the application. The CHWs mentioned that data were frequently lost from the system when the application froze (Schoen et al., 2017).

Many Community Health Workers mentioned that poor cell phone service was a barrier to using the mobile application. They also commented on the keyboard size, battery life, and lack of access to someone to fix the phone if it was broken. Using the application changed the nature of the home visit; it required that the CHW concentrate on typing and prevented them from

maintaining eye contact with community members. Many community members, especially the elderly, felt that the application interfered with social interaction (Schoen et al., 2017).

CONCLUSIONS

The literature reviewed reveals the viability of mobile phones in improving health service delivery by community health workers. Smart phones are widely used in most programs due to their vast applications.

Short Message Service (SMS) functionality is found in all phones including basic phones. Community health workers can send text messages and make inquiries from their supervisors using this functionality. It can also be used to send reminders to community health workers and their clients about clinic appointments.

WhatsApp features present a greater advantage to the community health workers. They are able to take photos and videos and share them through the application. These can act as evidence of their activities in the field. They can get feedback from other community health workers and their supervisors on how to deal with cases in the field.

Phone calls provide immediate feedback to the community health workers. They are able to consult health professionals in the health facility regarding challenges they experience when delivering health services to the community.

Program Specific applications are very efficient. They allow the community health workers to fill in the information from their clients directly into the platform. This cuts down on the tedious process of carrying papers and filling them in and in putting them into a computer. The automatic update of the system and links to program servers allow the information to be retrieved by supervisors at the health facilities. These applications also provide an interface that can be used to educate the clients served by community health workers as well as prompts that inform them on what to do when dealing with specific cases.

RECOMMENDATIONS

Affordable smart phones should be made available to community health workers to enhance their service delivery.

The cost of solar chargers should be reduced to enable community health workers charge their phones in the rural settings where they operate.

Mobile phone network connectivity should be enhanced in the rural areas to facilitate the work done by community health workers.

Community health workers should be trained on the dynamics involved in interviewing the clients and filling out information on the mobile phone applications.

Health Professionals at the health centre should improve on their responses to calls by community health workers.

REFERENCES

Adika O. *49% of Kenyan mobile users are on WhatsApp.* Techweez [Internet]. 2014 Mar 5 [cited 2015 Jul 21]. Available from: http://www.techweez.com/2014/03/05/49-ofkenyansmobile-users-on-whatsapp/

Agarwal S., Rosenblum L., Goldschmidt T., Carras M. Goal N., Labrique A.B.,(2016) Mobile technology in support of frontline health workers. A comprehensive overview of the landscape, knowledge, gaps, and future directions.john Hopkins university global mhealth initiative, 2016.

Ayiasi R.M., Atuyambe L.M., Kiguli J., Orach C.G., Kolsteren P., criel B. (2015).*Use of mobile phone consultations during home visits by Community Health Workers for maternal and newborn care: community experiences from Masindi and Kiryandongo districts, Uganda.* BMC Public Health (2015) 15:560 DOI 10.1186/s12889-015-1939-3

Bakibinga P, Kamande E, Omuya M,(2017). *The role of a decision-support smartphone application in enhancing community health volunteers' effectiveness to improve maternal and newborn outcomes in Nairobi, Kenya: quasi-experimental research protocol.* BMJOpen 2017;7:e014896. doi:10.1136/bmjopen-2016-014896

Braun R, Catalani C, Wimbush J,(2013).*Community health workers and mobile technology: a systematic review of the literature.* *PLoSOne* 2013;8:e65772

Callan P, Miller R, Sithole R, Daggett M, Altman D., (2011). *mHealth education: harnessing the mobile revolution to bridge the health education and training gap in developing countries.* Cork (Ireland): iheed Institute; 2011. Available from: http://www.himss.org/ResourceLibrary/ResourceDetail.aspx?ItemNumber=10586

Campbell N, Schiffer E, Buxbaum A, McLean E, Perry C, Sullivan TM., (2014). *Taking knowledge for health the extra mile: participatory evaluation of a mobile phone intervention for community health workers in Malawi.* Glob Health Sci Pract. 2014;2(1):23–34. CrossRef

CHS, (2013*).*"*Texting for Maternal Wellbeing" Use of mobile phones by CHWs to offer family planning services.* Centre for Human services. https://www.urc-chs.com/resources/texting-maternal-wellbeing-use-mobile-phones-chws-offer-family-planning-services

Crawford J, Larsen-Cooper E, Jezman Z, Cunningham SC, Bancroft E.(2014). *SMS versus voice messaging to deliver MNCH communication in rural Malawi: assessment of delivery success and user experience.* Glob Health Sci Pract. 2014;2(1):35–46. CrossRef

Crigler L, Gergen J, Perry H.,(2014). *Supervision of community health workers.* In: Perry H,Crigler L, editors. Developing and strengthening community health worker programs at scale: a reference guide and case studies for program managers and policymakers. Baltimore (MD): Jhpiego; 2014. p. 10.1–10.26. Available from: http://www.mchip.net/sites/default/files/MCHIP_CHW%20Ref%20Guide.pdf

Dahn B, Woldemariam AT, Perry H, (2015).*Strengthening primary health care through community health workers: investment case and financing recommendations.* 2015. Available from: http://www.who.int/hrh/news/2015/chw_financing/en/

Henry J.V., Winters N., Lakati A., Oliver M., Geniets A., Mbae S.M., Wanjiru H.,(2016). *Enhancing the Supervision of Community Health Workers With WhatsApp Mobile Messaging: Qualitative Findings From 2 Low-Resource Settings in Kenya*. Global Health: Science and Practice 2016 Vol 4 No. 2

Grevendonk, J., & Brigden, D. (2013). Planning an information systems project.

Källander K, Tibenderana JK, Akpogheneta OJ,(2013). *Mobile health (mHealth) approaches and lessons for increased performance and retention of community health workers in low- and middle-income countries:* a review. J Med Internet Res 2013;15:e17.

Laktabai J, Platt A, Menya D, Turner EL, Aswa D, Kinoti S, et al. (2018) *A mobile health technology platform for quality assurance and quality improvement of malaria diagnosis by community health workers.* PLoS ONE 13(2): e0191968.Available from: https://doi.org/10.1371/journal.pone.0191968

Mhila G, DeRenzi B, Mushi C, Wakabi T, Steele M, Dhadialla P.(2009). *Using mobile applications for community-based social support for chronic patients*. 6th Health Informatics in Africa Conference (HELINA). Pan Africa Health Informatics Association, Abidjan, Cote d'Ivoire, 2009.

Mushamiri I., Luo C., Liams-Hauser C., Ben Amor Y.,(2015). *Evaluation of the impact of a mobile health system on adherence to antenatal and postnatal care and prevention of mother-to-child transmission of HIV programs in Kenya.*BMC Public Health (2015) 15:102 DOI 10.1186/s12889-015-1358-5

Redick C., Dini H.S.F., Long L.,(2014). *The current state of CHW training programs in Sub-Saharan Africa and South Asia: What we know, what we don't know, and what we need to do.*One Million Community Health Workers Campaign. mPowering Frontline Health Workers. Intel,USAID.Availablefrom: http://1millionhealthworkers.org/files/2013/01/1mCHW_mpowering_Litreview_Formatted.compressed.pdf

Schoen J., Mallet J.W., Grossman-Kahn R., Brentani A., Kaselitz E., Heisler M., (2017). *Perspectives and experiences of community health workers in Brazilian primary care centers using m-health tools in home visits with community members*. Human Resources for Health (2017) 15:71 DOI 10.1186/s12960-017-0245-9

Schuttner L., Sindano N., Theis M., Zue C., Joseph J., Chilengi R., Chi B.H., Stringer J.S.A., Chintu N.,A (2014). *Mobile Phone-Based, Community Health Worker Program for Referral, Follow-Up, and Service Outreach in Rural Zambia: Outcomes and Overview.* MARY ANN L IEBERT, INC.VOL.20 NO. 8 AUGUST 2014.DOI: 10.1089/tmj.2013.0240

WHO, (2007).*Community health workers: What do we know about them? The state of the evidence on programmes, activities, costs and impact on health outcomes of using community health workers*. Geneva, January 2007. Available from: https://www.who.int/hrh/documents/community_health_workers_brief.pdf

SUB-THEME 3: - LANGUAGE, CULTURE, SOCIAL EQUITY AND GOVERNANCE

Effects Of Gender Stereotyping On Women's Social Development: A Case Of Urbanized Turkana Women In Eldoret Town-Kenya

[1]Odette Nahayo [2]Billiah Gisore [3]Aloys Ojore

[1]Tangaza University College [2]Kisii University [3]Tangaza University College

Corresponding email: nyamogisore@gmail.com

Abstract

This study investigated the effects of gender stereotyping on urbanized Turkana women's social development in Eldoret, Kenya. It identified the cultural factors that influence their involvement in social development. It also examined the role of local leaders in addressing gender stereotyping, while suggesting strategies that would address it and improve urbanized Turkana women's participation in social development. The study utilized the Convergent Parallel Research Design. Consciousness Raising and Radical Feminist theories guided the study. The sample size was 549 respondents. Questionnaires, interviews and focus group discussions were used to collect data. Findings revealed that gender stereotyping has a negative moderate relationship with women's social development with "r" value of -0.337. Results also demonstrate that there is a negative weak relationship between cultural factors and women's social development with "r" = -0.131, and statistically influence it since "p" = 0.015, less than 0.05. Similarly, findings indicate that there is a negative weak relationship between local leaders and women's social development with "r" = -0.201, and that they have a statistical influence on women's social development since "p" = 0.000 which was less than the ideal value. Based on these results, the researcher proposes an action plan as a way forward. One of the proposed activities is the sensitization of Eldoret local leaders and the community on effects of gender stereotyping, creation of support groups for women to helps them to work together and have their voices heard. The researcher believes that the findings in this study will contribute to the fight against gender stereotyping and have more inclusiveness.

Key words: gender stereotyping, women's social development, urbanized Turkana women

Introduction

Gender stereotyping is seen as overgeneralization of characteristics, differences and

attributes of a certain group based on their gender. It creates a widely accepted judgment or bias about certain characteristics or traits that apply to each gender (Werner, 2016). Gender

bias is one of more varieties of stereotyping and discrimination. It stigmatizes the individual being discriminated against. Stereotyping can be descriptive which consists of beliefs about characteristics that each gender possesses (e.g. all women are emotional) or prescriptive

whereby there are beliefs about characteristics that each gender should possess (e.g. all women should be submissive).

According to Matsumoto (2001), there are four basic common categories of gender

stereotypes. The first is personality traits in which women are supposed to be shy, passive,

submissive, clean and organized, while men are expected to be tough, aggressive, dominant and self-confident. The second is domestic behaviour which states that women are supposed to cook and do house work, that they are better at raising children. For this type, it is said that "Stay-at home mothers" are better than working mothers. This type highlights that men are better at household repairs; they cannot cook, nor care for their children. Domestic behaviour dictates that men should tell women what to do, how and when to do it. The third type is the occupational category, where women are supposed to have clean jobs such as teaching, nursing, secretariat and librarianship. This category confirms that women are not good at technical things and that they are supposed to make less money than men. They should not, for example, be politicians and competing with men. The fourth and last kind is the physical appearance whereby women are perceived to be short and slender, small and delicate, while men are tall and have broad shoulders. This type states that women are weaker, less competitive and adaptable to harsh environment than men.

In almost every society, boys are encouraged to venture outside while young girls are encouraged to stay home and do chores (Oldfield, 2013). While there is nothing wrong with protecting young girls or encouraging boys to be brave, these expectations become restrictive gender constraints that can have negative consequences, particularly on girls. What starts as "protection" becomes an expectation that girls should accede to the demands of others rather than making their own choices or taking risks. In China for instance, women assumed a relatively subordinate position to men. The Global Gender Gap Report (2017) women were refused jobs simply for being women. Such gender discrimination was widespread and typical of stereotypical views on gender roles which often permeated the workplace. In Bolivia, Cook and Cusack (2011) concluded that adolescence expands the world for boys and shrinks it for girls. Children grow up knowing that women are inferior to men. According to Lombard (2013), countries with strong patriarchal cultures subordinate girls and women. Boys expand their social space and are given much more freedom and independence while girls are encouraged to remain in the house in order to make good wives in the future excluding them participating in public life. Nugent (2013) opines that the thing about gender stereotypes is that they create justification for gender discrimination in the owner's mind, taking root so firmly as to make women and girls unlikely to perceive the discrimination in the context.

Nauert (2011) observes that inequalities undermine effectiveness of development policies in fundamental ways. The Kenya constitution 2010 is clear about equality and non-discrimination. Article 27 states that there should be equality and freedom from discrimination and every person is equal before the law and has the right to equal protection and equal benefit of the law. It further states that women and men have the right to equal treatment, including the right to equal opportunities in political, economic, cultural and social spheres.

Akoth (2004) adds that gender stereotypes have been passed on from one generation to the next and women have since been excluded, ignored and made invisible.

However, according to UNDHR (1989), our society needs to respect human dignity as one of human basic needs and some countries are already making efforts to make this a reality.

According to The Global Gender Gap Report (2017), Rwanda is ahead of many developed countries. It has the highest rates of female labour force participation in the world at 86 % while in the United States that figure stands at 56%. Its wage gap is also narrower than most countries. Women earn 88 cents for every dollar men sign while it is 74 cents in the US.

Although Article 81(b) of the Kenyan Constitution (2010) states that not more than two thirds of the members of elective public bodies shall be of the same gender, the reality is far different.

Ndeda (2010) suggests that Kenya needs to put more efforts on women's right of equality and

freedom from discrimination in order to apply that rule. The challenge is to ensure that

improving the status of women in both social and economic terms is harmonized across country programs. It should be aligned with the development strategies of recipients, and closely monitored. For more effective poverty reduction, differential gender impacts should be considered in the entire package of development activities to enhance women's opportunities.

Nyanchoga and Amutabi (2014) confirm that some professions in Kenya are still classified as masculine or feminine oriented. On the one hand, mechanics, technicians, masons, public transportation drivers, and occupations involving science, technology and political leadership, among others, are considered as masculine. On the other hand, feminine occupations typically include nurses, childcare workers, hair stylists, secretaries, administrative assistants and office receptionists.

The study focused on urbanized Turkana women living in Eldoret. They are called urbanized because the common definition of rural and urban relies on residence outside or inside metropolitan statistical areas. Historically, Turkana men went to Eldoret in 1918, and brought with them their animals and their wives and both are qualified as properties (Lokuruka & Lokuruka, 1918). Men care for the animals while women take care of domestic activities. According to Kenya National Bureau of Statistics (2009), the last census that was done in Kenya indicates that the population of Turkana in Eldoret town is 386, with 174 men and 212 women. Among these, only those whose age is 18 years and above were part of the study as respondents because they are old enough to understand the concept of stereotyping better than the young ones. According to Good (1998), Turkanas' incursions into their neighbours' land were no more than a peaceful penetration of pastoralists looking for food and water for their animals. However, an aggressive spirit was a dominant factor. They are assumed aggressors and this made them to be feared and hated by the surrounding tribes.

Turkana people do not only live in difficult conditions, but also many of their children are

not in school. Cook and Cusack (2011) inform us that Turkana people were affected negatively as any other colonized people. According to Mattern (2014), the most significant negative effect on the social structure would be the treatment of the indigenous people. Most of them were treated inequitably. In Turkana County, women were often denied education and were forced to get married at an early age according to Awuondo (1990).

Development in Turkana District has been slow. During the 1970s, major efforts were made to

integrate the Turkana with its neighbours, and by the early 1980s the entire district was considered highly insecure. Insecurity combined with two severe droughts in the early 1980s slowed down development efforts and increased the exodus to other towns such as Eldoret town. Despite the growth of settlements, the area remained remote, insecure, and relatively underdeveloped. Oral sources highlight that some of the Turkanas arrived in Eldoret while pursuing disobedient bulls. Like in any other African culture, Turkana women go through a lot of stereotyping both from their own families and their neighbourhood and their social development is limited (Sand, 2001).

Barrow (1996) points out the difference between rural Turkana women and urbanized

Turkana women. For him, women living in rural areas have lower levels of educational

attainment and higher levels of poverty than urban women. They carried this status with them

and did not improve their condition due to gender stereotyping. In terms of decision making at the household level, important decisions such affecting the family can only be made by men. In order to abolish all forms of discrimination against women, priority needs to be given to the elimination of gender stereotypes.

There are negative effects that gender stereotyping causes in people, such as low self-esteem, hatred, conflicts, poor performance in various activities and even health problem. There must be gender balance in leadership in order to support and empower the often-marginalized groups (women, youths, and children). This also includes monitoring and evaluating projects for proper implementation, and raising funds. This is where citizens are most likely to come into contact with services and support mechanisms to improve their lives. There is enormous potential, therefore, for local authorities to influence the wellbeing of its population. In most cases, policies and programs are made, but their implementation and enactment are limited. To address this, study was anchored on the Consciousness raising theory and the Radical Feminist Theory.

Materials and Methods

The research was based on a mixed methods approach, which is a procedure to inquiry

involving both qualitative and quantitative data. Greene, Caracelli and Graham (2008) describe mixed methods as a research plan where the researcher includes at least one quantitative method to gather numbers and one qualitative method to collect words. Data were collected by means of questionnaires, interview guides and focused group discussion group guides. The population of the study consisted of 54 212 participants who included Turkana and non-Turkanas in Eldoret town. Purposive sampling was used to select all the 150 urbanized Turkana men and women adults. Cluster sampling was use to select 399 Non-Turkana people living in Eldoret town. The items were validated after piloting was done using five Turkana and to five non- Turkana women and their reliability index ascertained by the use of the Cronbach alpha. Descriptive statistics were used to summarize the quantitative data while qualitative data were coded, categories generated and then thematic analysis done.

Results

The first research question sought to establish the effects of gender stereotyping on urbanized Turkana women's social development in Eldoret town. Table 1 shows the responses given.

Table 1: Effects of gender stereotyping

statement	Frequency	Percent
Urbanized Turkana women have low self – Esteem	343	98.8
Urbanized Turkana women lack freedom of expression	344	99.1
Urbanized Turkana women have poor Health	342	98.5
Urbanized Turkana women live in Isolation	342	98.5

Data on Table 1 shows that the Turkana women lack freedom of expression which could be leading to low self-esteem. This might be causing them to live in isolation as well as struggle with poor health.

Research question two looked at the cultural factors that influence the involvement of the urbanized Turkana women in social development in Eldoret town. Three hundred and thirty-eight (97.4 %) participants indicated that the patriarchal systems hindered women from participating. One hundred and eighty-eight (54.2 %) said that urbanized Turkana women were stereotyped due to traditional beliefs. Two hundred and six respondents (59.4%) indicated that Turkana women are unwilling to work in public places.

Research question three sought to find out how the urbanized Turkana women can influence their own social development. Respondents. He respondents indicated that Turkana women are willing to learn new skills as said by 336 (96.8 %) respondents. Three hundred and thirty-two

(95.6 %) participants said that the urbanized Turkana women can be able to work while 331 (95.3 %) indicated that the urbanized Turkana women were afraid to take risks.

An additional item sought to find out if the Turkana women preferred to be fed. The responses indicated that they could like to be fed as indicated by 347 (100 %) respondents. This they said was because the urbanized Turkana women depended totally on their husband, and therefore, they are not used to work. But on asking if they are ready to accept social change, 125 (36.0 %) of them said yes as they were aware of their responsibility both in family and society.

Research question four sought for the strategies could help address gender stereotyping and improve the lives of the urbanized Turkana women. results showed that the significant percentage of 52.1 % said that urbanized Turkana women are unaware of their rights.

Findings showed that there is no collaboration between urbanized Turkana women and local leaders, and that even the community has no collaboration with those women. There is need for sensitization for both leaders, community and urbanized Turkanas, while emphasizing on the importance of women's inclusiveness and involvement.

Conclusion

Gender stereotyping had been perceived as a temporal problem but responses exposed how harmful stereotyping can be on human growth and social development. The respondents called for the challenge of some cultural factors such as traditional beliefs and patriarchal systems that create gender imbalance. Based on the foregoing, there is need for women's support group creation; second, raising awareness of local leaders and community at large; and third, integration of gender stereotyping in schools' curriculum.

Acknowledgement: Tangaza University College

References

Awuondo, O. C. (1990). *Life in the balance: Ecological sociology of Turkana nomads.*

Hampshire: African Centre for Technology Studies Press.

Akoth, O. M. (2004). *Gender stereotypes.* Retrieved from http:// www.effects of Gender

equality on humanitarian outcomessingle.pgsweb.pdf.

Barrow, G. C. (1996). *The Dry Lands in Africa:Local Participation in Tree Managment.*

Cook, R. J., & Cusack, S. (2011.) *Stereotyping.* Retrieved fromhttp://www.upenn.edu/ Penn

press/book/14658.htmlon.

Greene, C. J., Caracelli, J. V., & Graham, F. W. (2008). Towards a conceptual framework for

mixed-method. Evaluation Designs in Clark & Creswell (eds). *The mixed methods*

reader. Los Angeles: Sage Publications.

Kenya National Bureau of Statistics (2009). *Census 2009.* Niorobi.

Kenya National Civic Education Program. National Council of Law Reporting (2010). *The Constitution of Kenya.* Nairobi: Uraia Trust.

Lokuruka. N. M., & Lokuruka P.A. (1918). Ramifications of the 1918 Turkana Patrol: Narratives by Ngturkana. Retrieved from ttp://ethnohistory.dukejournals.org/content/53/1/121.abstract.

Lombard, N. (2013). *Violence against women.* Retrieved from http://www.newstatesman.com/.../ Violence-against-women-starts-school.

Mattern, J. (2014). *Goals and Planning.* Cambridge: Polity Press.

Matsumoto, D. (2001). *The Handbook of Culture & Psychology.* Oxford: University Press.

Nauert, R. (2011) Long-Term effects of stereotypes. Retrieved from https://psychcentral.com/news/2010/08/.../long-term-effects-of-stereotyping.

Ndeda, M. A. J. (2010). Towards Gendered governance Approach in Africa: Prospects and Challenges.

Nugent, P.M.S. (2013). Negative stereotypes. Retrieved from https://psychologydictionary.org/ Negative-stereotype.

Nyanchoga, S. A., & Amutabi, M. N. (2014). *Contemporary issues in Kenya history and the challenges of Nationahood* (eds). Nairobi: Kolbe Press.

Oldfield, F. E. (2013). *Transgressing Boundaries. Gender, Identity, Culture and the other in Post colocial Women's narratives in East Africa.* Amsterdam: New York.

Sand, E. (2001). *Women ruler. Women rule.* San Jose: New York.

UNDHR, (1989). *The concept of Human Dignity.* Retrieved from http://www.tandfonline.com/doi/abs/10.1179/1743291X13Y.0000000064? src=

recsys &journalCode=yppc20

Werner, A. (2016). *Organisational Behaviour,* (4th Ed.). Pretoria: Van Schaik Publishers.

The Role Of The 'Path' And The 'Container' Image Schemas In Political Discourse In Kenya

Dr. Raphael Francis Otieno

P. O. Box 627-40600 Siaya

Telephone Number: +254 729623020

Email: otienoraphael2010@gmail.com

ABSTRACT

The study of conceptual interaction has attracted the attention of many scholars in Cognitive Linguistics. Primarily, the analysis has focused on the role of image-schemas in the construction of metaphors. This study explores the PATH and the CONTAINER image-schemas and the role they play in conceptual formation of metaphors in political discourse in Kenya. The study presents the PATH and its subsidiary image schemas of Verticality, Process and Force-Motion and the CONTAINER image-schema and the subsidiary image-schemas of Excess and In-Out. The analysis reveals that both the PATH and the CONTAINER image-schemas structure the relationship between the source domains (journey and container) and the target domain (politics) by activating subsidiary image-schemas in metaphors of politics in Kenya. The study further reveals that image-schemas provide the axiological value (positive or negative) of metaphorical expressions in political discourse. A positive political environment is a key ingredient for green growth and knowledge economy. The study contributes to the field of metaphor in political discourse by examining the politicians' conceptualization of politics as a journey, which consists of four structural elements (a source, a destination, contiguous locations which connect the source and the destination and a direction) and as a container, which consists of an interior, an exterior and a boundary. The study used the Conceptual Metaphor Theory (CMT) as a tool to establish conceptual metaphors used during the 2005 Draft Constitution referendum campaigns in Kenya and the Image-Schema Theory to account for the presence of image-schemas in political discourse in Kenya. Lakoff and Johnson's (1980) Conceptual Metaphor Theory is the locus classicus of the image schema theory.

Keywords: cognitive linguistics, image-schema, political discourse, conceptual metaphor

INTRODUCTION

The Theory of Interaction (Richards, 1936) posits that the philosophical basis of cognitive study of metaphor is experientialism, which characterizes meaning in terms of embodiment. According to experientialism, all concepts are structured on the basis of our experience, which is a product of our body or interactions between us and the physical environment or other people within our culture. Human experiences while interacting with the environment leads to the formation of image schemas (Johnson, 1987).

Image schemas represent schematic patterns arising from imagistic domains, such as containers, paths, links, forces, and balance that recur in a variety of embodied domains and structure our bodily experience (Lakoff 1987: 453; Johnson 1987: 29; Talmy 1972, 1977, 1983) and our non bodily experience via metaphor. The schemas are pre-conceptual in origin (Johnson, 1987) and recur as we construct the world, trying to get meaning as we interact with the environment. As Mandler (2004) put it, once the recurrent patterns of sensory information are extracted and stored as an image schema, sensory experiences give rise to conceptual representations. This

study gives a cognitive analytical account of the PATH and the CONTAINER image schemas in political discourse in Kenya.

OBJECTIVE OF THE STUDY

To assess the role of the PATH and the CONTAINER image schemas in political discourse in Kenya.

THEORETICAL FRAMEWORK

The study employed the Conceptual Metaphor Theory (CMT) and the Image Schemas Theory (IST).

The Image Schemas Theory

Human beings use image schemas to comprehend the world around them (Santibáñez, 2002; Evans and Green, 2006). The Image Schemas Theory, therefore, enabled the study through schematic representations of image schemas and their subsidiary image patterns to guide the comprehension of politics, an abstract phenomenon. Image schemas are known to be the basis of many metaphorical constructions. The theory, therefore, enabled the study to explain the embodiment of human experiences since human cognition is explained through their experiences. This is consistent with Richard's (1936) view that metaphor is a mode of cognition based on our experience with the environment.

The theory also assisted the researcher in determining the axiological value of the metaphors. As Krzeszowski (1993) posits, all image schemas exhibit a bipolar property of conferring positive or negative associations. Metaphor uses language to activate unconscious emotional associations and influences our values and beliefs by transferring positive or negative associations into the metaphor target (Charteris-Black, 2005).

Conceptual Metaphor Theory

Conceptual Metaphor Theory views metaphors primarily as matters of thought and action, only derivatively of language. There is a close correlation between language, metaphors and thought and whether consciously or not, people think in metaphors (Lakoff and Johnson 1980). Our conceptual system is largely metaphorical and our ordinary conceptual system in terms of which we both think and act is fundamentally metaphorical in nature. "The locus of metaphor is, not in language at all, but in the way we conceptualize one mental domain in terms of another" (Lakoff, 1993:203). CMT thus allows us to understand one domain of experience in terms of another. Thus, it is possible for us to make use of a relatively familiar, tangible domain of experience to deal with a relatively unfamiliar, less tangible domain of experience. For proponents of CMT therefore, thought has primacy over language. As Ungerer and Schmid (2001) put it, metaphor is not just a way of expressing ideas by means of language but a way of thinking about things. Cognitive linguistics thus views metaphor as a cognitive instrument.

Deignan (2005) states that CMT views metaphor as a link between the source domain which is physically experienced and the target domain which is abstract. We can only perceive and understand abstract notions through the filter of directly experienced, concrete notions. When we use metaphor, we map features from a source domain onto a target domain. To Lakoff and

Johnson (1980:246-247), "conceptual metaphor is a natural part of human thought and linguistic metaphor is a natural part of human language." A close examination of the metaphor used is, therefore, an important key to the way people have mentally constructed abstract domains like politics.

LITERATURE REVIEW

Gathigia (2014) set out to study metaphors of love in Gĩkũyũ. This study used Metaphor Identification Procedure *Vrije Universiteit* (MIPVU) to establish the metaphoricity of the lexical items collected. The study noted that embodied experience manifests itself at the cognitive level in terms of the CONTAINER, PATH, FORCE and OBJECT image schemas.

Magonya (2012) took a cognitivist viewpoint in her study and used the Relevance Theory (RT), Blending Theory (BT) and Idealized Cognitive Models (ICM) to find out whether Kenyans of dissimilar socio-cultural and educational backgrounds homogenously comprehend AIDS messages coined in English and Kiswahili languages. She affirmed the existence of a cognitive model by which people's embodied experiences with AIDS are conveyed in conceptual metaphors (such as SEX IS A GAME), similes and metonymies.

Makachanja (2006) carried out a comparative analysis of the reconstructed ontology and epistemology of the domains involved in the metaphorical expressions of English with those of Shona. The study noted that because the UP/DOWN orientations are embodied, both English and Shona conceptualize them in the same way. It thus sheds light on the UP/DOWN schema. The study also demonstrated that both English and Shona experience journeys in similar ways and therefore construe LIFE AS A JOURNEY. It, therefore, affirms that conceptual metaphors are motivated by embodied experience which is a key tenet on the conceptualization of phenomena such as politics.

The 'Yutong' bus metaphor in Ghanaian political speeches is examined by Mensah (2012) using Lakoff and Johnson's (1980) conceptual metaphor theory. The study notes that the use of metaphors can minimize direct vilification in Ghanaian political communication. The study also demonstrates that features of conceptual sources can be manipulated by politicians to achieve positive rhetorical ends. As Isabel and Velasco (2001) note, image schemas are capable of endowing an expression with a strong axiological value, either positive or negative Opeibi (2006), for instance, while studying negative political advertising, observed that many of the political office aspirants abandoned positive, issue-focused advertisement and engaged in rhetorical strategies of direct attacks on their opponents. Van Dijk (1997) stated that politicians often use metaphorical association to elicit positive self-presentation while the opponent is presented negatively. Mensah (2012) asserts that positive or negative associations of source domain over a period of time can become a natural part of it. Even though Mensah's study confines itself to the bus metaphor, it offers insights on how Lakoff and Johnson's (1980) Conceptual Metaphor Theory has been adequate in dealing with abstract phenomena such as politics.

In his study, Taiwo (2010) states that political discourse in Nigeria had centered on socio-political experiences that Nigeria had been going through. This view is supported by Wei (2001) who argues that recent social events and specific cultural contexts are responsible for the production of metaphor. This argument is consistent with the embodiment of human experience which manifests itself at the cognitive level though image schemas.

Both Charteris-Black (2004, 2005) and Deignan (2005), who have looked at political texts and speeches in British and American English, have noted extensive use of metaphor in such texts. Charteris-Black's study of metaphors in political discourse mainly focuses on press reporting and religious discourse in English. He uses corpus data to claim that metaphor use is shaped by societal and ideological factors as well as cognitive ones. Deignan (2005), on the other hand, argues that metaphor is a powerful persuasive tool in political discourse. These studies, like the current paper, focus on politics and recognize metaphor as a cognitive instrument that enhances people's understanding of abstract phenomena.

Yu (1998) investigated conceptual metaphor and its interaction between body and culture and states that while body is a potentially universal source for emerging conceptual metaphor, culture functions as a filter for selecting them. In other words, metaphors are generated from body experience but formed by culture realization and so are culture-specific. Yu (2008) also asserts that the face is the body member by which the Chinese and English make a lot of conceptual metaphors because the face is the most distinctive part of the body and we identify people by their faces.

METHODOLOGY

Data Collection Procedure

To describe the diverse set of families of metaphors in a language, the study identified the linguistic metaphors used to talk about politics in the 2005 referendum campaigns in Kenya using the Metaphor Identification Procedure developed at Vrije University, Amsterdam (MIPVU). The metaphors were obtained from the referendum campaign rhetoric in two mainstream newspapers in Kenya-the (*Daily) Nation* and *The Standard*.

Each of the four coders (two PhD Linguistics students and two secondary school teachers of English properly trained on how to use MIPVU to identify MRWs), who worked independently, was given 120 newspaper leaves that had captured the 2005 referendum campaign rhetoric. They carried out document review to look for verbatim reports of politicians' speeches relating to the referendum campaigns. Each determined the lexical units in the text identified. For each lexical unit, the coder established meaning in context. They then determined the basic meaning of the lexical unit by checking the first more concrete meaning of a lexical unit which was listed in the dictionary and adopted it as the word's basic sense. According to MIPVU, the first meaning in the dictionary is always considered the basic and concrete meaning of a word. Three dictionaries were used to define the word meanings: *The Macmillan English Dictionary for Advanced Learners* (Rundell and Fox, 2007), the *Longman Dictionary of Contemporary English* (Summers, 2005) and the Oxford English Dictionary. Each one of them decided whether the basic meaning of the lexical item was sufficiently distinct from contextual meaning and whether the contextual meaning was related to the basic meaning by some form of similarity. If the last two conditions were met, the unit was marked as metaphorical and hence the phrase or sentence. Where there was disagreement, the Longman Dictionary of Contemporary English (Summers, 2005) was consulted to get the meanings and a group discussion carried out to resolve such cases so as to reduce analyst bias.

Reliability

The reliability of coding was assessed through an inter-coder reliability check. The assessment of results from the inter-coder reliability tests consists of determining whether the score test is above or below accepted reliability standards. Cameron (2003) states that where the inter-coder reliability rate is 75% or more, the lexical unit is accepted as a metaphor. Cameron's rating was adopted by this study and each coder, therefore, represented 25%. A total of 75 instantiations of metaphors of politics were, therefore, found with varying degrees of agreements of either 75% or 100%. The instantiations obtained allowed an initial overview of the appropriate metaphorical concepts used to reflect upon politics in Kenya, among which was POLITICS IS A JOURNEY. Human experience with journeys is discussed in the PATH schema below.

Reconstruction of Metaphors

From the linguistic metaphors collected using MIPVU, underlying conceptual metaphor models, which were presumed to have motivated them, were postulated using Systematic Metaphor Analysis (SMA) procedure. Systematic Metaphor Analysis (SMA) (Schmitt, 2005) is an approach to metaphor which attempts to reconstruct models of thought, language and action, and draws on the results of Cognitive Linguistics by Lakoff and Johnson (1980).

In reconstructing metaphors, all metaphors belonging to the same image source and describing the same subject area were grouped into metaphorical concepts. The process of allocating metaphorical idioms to metaphorical concepts was continued until all metaphorical manifestations were listed under concepts. The metaphors were, therefore, analysed thematically by coding categories which were presented as different conceptual metaphors. The list obtained broadly indicated metaphorical concepts used to reflect upon politics in Kenyan political discourse.

DISCUSSION OF FINDINGS

The PATH Image Schema

One of the most common schemas that emerge from our basic body experience is the PATH schema (Yu, 1998). The PATH schema consists of four structural elements: a SOURCE (a starting point) a DESTINATION (end point), a number of contiguous locations which connect the source and the destination (PATH) and a DIRECTION (Lakoff (1989:119). The basic structure of this schema, therefore, includes the SOURCE of motion (JOURNEY), the PATH travelled and a GOAL (DESTINATION). The schematic structure of the Source-Path-Goal Schema can be represented schematically as shown below:

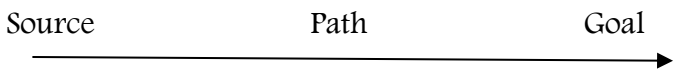


Figure 1: Schematic Structure of the PATH Image Schema

Source: https://inst.eecs.berkeley.edu>lecture 12

The arrow shows a forward movement towards a particular direction by the traveler along the PATH.

There is a vast number of "path metaphors" in which the everyday experience of movement along a path serves to conceptualize many other more abstract experiences. The study found the VERTICALITY, the PROCESS and the FORCE-MOTION subsidiary image schemas as conceptual dependencies of the basic PATH image-schema.

The VERTICALITY Subsidiary Image Schema

Human physiology ensures that our vertical axis gives rise to the VERTICALITY image subsidiary schema as a result of how we interact with our environment (Johnson, 1987). The VERTICALITY is as a result of the asymmetry of the human vertical axis which interacts with gravity. Due to the human vertical orientation, humans look downwards for fallen objects and upwards for rising objects (Lakoff, 1987). Figure 2 shows the representation of the VERTICALITY subsidiary image-schema.

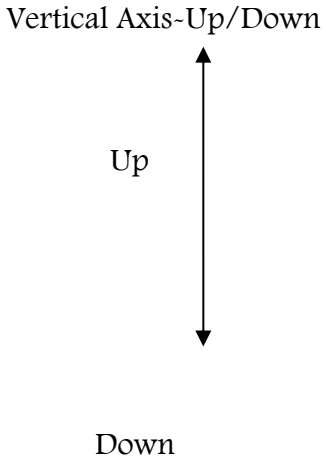


Figure 2: Schematic Structure of the VERTICALITY Subsidiary Image Schema

Source: https://inst.eecs.berkeley.edu>lecture 12

Sixteen (16) metaphors were activated by the VERTICALITY subsidiary image schema: 10) I said it is going to be a tsunami. The only way to avoid it is to *go to higher ground;* 11) Our wave is so strong and no turn coat or reject will be left *standing* in the path of the leadership of this county; 12) I warned them (yes team) to *move to higher grounds,* but those who fail to heed my advice will be swept into the ocean by the strong waves; 13) Why should we fight over this referendum? If you *fail,* wait for another chance; 14) This is a battle that I am confident the Yes team will *win* with ease…; 15) There are two arch-enemies in Kenya today: (name withheld) and (name withheld). Then he led the crowed in exorcising the two: '(name withheld) ashindwe' (*Down* with (name withheld)), '(name withheld) ashindwe' (*Down* with (name withheld)); 16) Voting for it is to *kill* democracy; 17) (Name withheld) the monster should be hit on the head and *killed* so as not to destabilize the (name withheld) government; 18) …is like a dog which *drops* its piece of meat thinking that its image in the water is another dog with a bigger piece;

19) Although I wrestled with president (name withheld) for the *top seat*, he called me into his government to neutralize and quash the plan to remove him from power; 20) They have sensed defeat and are now using youths….to cause *chaos* across the country; 21) If they stop (name withheld) pension, then the (name withheld) and the (name withheld) communities will *invade* State House; 22) People should prepare for *war* if 'NO' wins; 23) They are already sensing *defeat* and that is why they are intimidating us; 24) Even God has *disowned* them and that is why their rallies are bloody; 25) The Bible says "Thou shall not *kill*" But it does not say Thou shall not *kill* subject to a chapter in St. Luke's gospel.

The sixteen metaphors listed encode the UP/DOWN orientation which is one of the configurations of directionality of the PATH schema. Five of the sixteen metaphors: " …go to higher ground …standing …move to higher ground, …win, …top seat" encode the 'UP' side of the orientation while eleven of them: "…fail …down…kill…killed…drops…chaos …invade…war…defeat…disowned…kill" encode the 'DOWN' side of the orientation. The metaphors, therefore, fit the vertical directionality configuration of the PATH schema.

The study notes that the VERTICALITY subsidiary image schema is affected either positively or negatively. This is consistent with Kreszowski's (1993) assertion that all image-schemas exhibit a bipolar property of conferring positive or negative associations. In this paper, the eleven metaphors that encode the 'DOWN' side of the vertical orientation confer negative associations to their reference. For instance, exorcising a politician the way Christians do to the devil (metaphor15) has a negative connotation as it is meant to bring down the person, both emotionally and politically. Equally, 'killing' as brought out in metaphors (16) and (17) brings a person down. On the contrary, a 'win' in metaphor (14) makes a person happy and therefore 'high.' This is consistent with Lakoff's (1992) assertion that:

> The MORE IS UP metaphor is grounded in the experience of pouring more fluid into a container and seeing the level go up or adding more things to a pile and seeing the pile get higher. … These are experiences with a structure correspondence between the domain of quantity and the conceptual domain of verticality: MORE corresponds in such experiences to UP and LESS correspond to DOWN (Lakoff 1992:34).

The aim of any politician is to ascend to a position of power. Each side of the political divide, therefore, presents its position as the one that deserves the power. Due to this, both sides present a positive self-presentation and the negative other-presentation. These presentations correspond to the VERTICALITY image schema's UP and DOWN orientations respectively. It is the VERTICALITY schema that activates the vicious verbal attacks that politicians engage in during campaigns against their competitors and the self praise that makes them promise what they cannot offer. The attacks are a strategy meant to bring down the opponent to a horizontal (low) level and the praises to let the attacker remain vertical (high).

The PROCESS Subsidiary Image Schema

Mapped onto the PATH schema, a process has three stages: a SOURCE (beginning), a PATH and a GOAL (end-point). In this paper, the PROCESS subsidiary image-schema is instantiated by the following metaphors of politics: 26) we have *moved along way* in fighting for democracy in this country and we cannot allow one or two bad elements to derail our dream; 27) if they beat us on November, 21, it will be impossible for the (name withheld) government to *continue* operating smoothly; 28) we shall *continue fighting* for a better Kenya even if we are sacked…; 29) the Wako draft would provide Kenyans with chance to *move to* The Promised Land with no detention without trial, no more land grabbing…and tribal clashes; 30). …if he *turns back* public perception will be that …has been bought; 31) the train of change is *unstoppable* and he could be left behind; 32) we want a peaceful *path* to the achievement of a new Constitution; 33). …it should be clear to them; they are treading on a very dangerous *path.*

Metaphors activated by the PROCESS subsidiary image schema demonstrate that politics as a journey is a process riddled with turbulence. For instance, the metaphor 'We shall *continue fighting* for a better Kenya even if we are sacked…' implies that the journey is not a smooth one and entails sacrifices. The journey is also riddled with corruption (…if he *turns back* public perception will be that …has been bought), struggles ('fighting') and other obstacles ready to derail the process (…cannot allow one or two bad elements to derail our dream). However, it is an *unstoppable* process that entails hope and, therefore, should be peaceful (we want a peaceful *path…)* to enable people to reach the Promised Land (chance to *move to* The Promised Land with no more land grabbing, no political assassinations, no tribal clashes, no corruption). Without a peaceful political process, the country would be treading on a dangerous path and would, therefore, not achieve its goals. Achievement of the Big Four agenda, for instance, is threatened by theft of public funds by corrupt government officials. This has led to serious division in the government, with one wing defending corruption and the other fighting it.

The FORCE-MOTION Subsidiary Image Schema

Scholars such as Johnson (1987), Lakoff, (1987) and Talmy, (1988) have identified FORCE as one of the image schemas underlying conceptual metaphors. According to Talmy (1988), force dynamics, the interaction of entities with respect to force, includes the exertion of force, resistance to force, overcoming resistance, blockage of force and removal of blockage.

What Johnson (1987) calls *gestalts of force* and Talmy (2000) describes as *force dynamic schemas* is a key concept of cognitive linguistics. This study takes the view that the term 'force' is used metonymically to refer to a moving object, its velocity or trajectory and that no object moves along a path on its own without some force being exerted either internally or externally. The *gestalts of force* are discussed below.

Compulsion

Compulsion a situation where the force comes from somewhere, has a given magnitude, moves along a path and has a direction. This schematic gestalt can be represented with the following visual image:



Figure 3: Schematic Structure of Compulsion gestalt

Source: Wożny 2013

Arrow (B) represents an actual force vector and the broken arrow (A) denotes a potential force vector or trajectory (Johnson 1987:45). The force "moves along a path. The following metaphors instantiate compulsion in the FORCE-MOTION subsidiary image-schema: 34) we are aware that *money has been poured to woo voters;* 35) you may have defeated us in parliament under *streams of money* but …; 36) we, the orange supporters, being Kenyan patriots do hereby *swear* to ensure we have achieved a new democratic Constitution and end dictatorship. Help us, oh God; 37) It is like asking the legendary athlete (name withheld) to run 1500 metres without a competitor and later declaring he had won the race.

The metaphors above invoke compulsion in the FORCE-MOTION subsidiary image schema. In metaphors (34) and (35), which have a cognitive construct of POLITICS IS BUSINESS/FINANCIAL TRANSACTIONS, the metaphors indicate that money, power and control of resources is the force that drives politicians. The compulsion is so strong that in metaphor (36) a semblance of an oath is taken by the politicians, disguised as a fight for democracy. The comparison in metaphor (37) using a famous and fast Kenyan international athlete shows the force and the speed with which a politician needs to act to secure a position. The speed involves securing strategies that would give the competitor advantage over the opponent.

It is the 'compulsion' gestalt that explains why politicians would go to any length to ascend to power, including curving off parts of the country as 'political strongholds' or even eliminating opponents. It further shows why contest for the presidency in Kenya has been a matter of life and death and almost led to secession in 2017. The current division in the government is all about who will be in power and, therefore, control of resources in 2022 and the perception that someone is being blocked from doing so.

Blockage

The blockage gestalt can be represented as a force vector encountering a barrier and then taking any number of possible directions (Johnson, 1987). In figure 4, a force vector is shown to have encountered a barrier and, therefore, either bounced back, or hit and displaced the barrier and passed through or found its way around the barrier. This schematic gestalt can be represented with the following image:

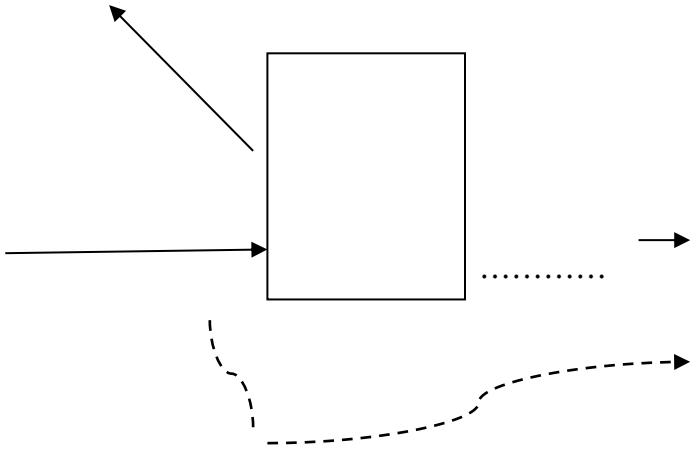


Figure 4: Schematic Structure of the Blockage gestalt

Source: Wożny 2013

Peña (2003) states that *blockage* occurs when we encounter some obstacles that prevent a moving entity from reaching a destination. The barrier exerts a force on the moving object, causing it to change its trajectory as shown in figure 4. This phenomenon is exemplified by the statements below. 38) *physically resist encroachment* by the orange team into Nyandarua; 39.) the train of change is *unstoppable* and he could be left behind; 40) our wave is so strong and *no turn coat or reject will be left standing* in the path of the leadership of this county; 41) I warned them (yes team) to move to higher grounds, but those who fail to heed my advice will be *swept into the ocean by the strong waves.*

All the metaphors in the preceding paragraph allude to resistance. The resistance is meant to curtail efforts of the competitor from making political progress. In metaphor (38), the pro draft supporters are asked to physically resist (block) any attempts by their opponents to enter 'their' region. In expressions (39-41), any obstacle on the way of the politician(s) is crashed. This is a demonstration that politicians do not allow opposition and any dissenting opinion is treated with cruelty (metaphor 38) or forcefully knocked down and swept away (metaphors 40-41). Politicians thus survive by issuing threats and causing fear to their opponents. In other words, politicians face obstacles (resistance) in their quest for power, overtly or covertly, and it is upon them to find a way to overcome them.

Counterforce

The counterforce gestalt focuses on the head-on meetings of forces. Here, two equally strong, nasty and determined force centres collide face-to-face (Johnson 1987:46). This gestalt can be represented with the following schematic image:

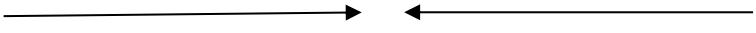


Figure 5: Schematic Structure of Counterforce gestalt

Source: Wożny 2013

The schematic representation indicates that the objects on which the forces act meet and collide. Seven (7) metaphors of politics instantiated the counterforce gestalt:42) *physically resist encroachment* by the orange team into Nyandarua; 43) "Kama ni wanaume na wanajaribu tutawaonyesha" (*If they are real men let them try; we will show them);* 44) the results of the referendum were compared to the Biblical *David and Goliath War*... 45) I tell…to bring those councilors who look like street children to Kapenguria and *he will understand why donkeys have no horns*; 46) I urge you all to maintain peace. We are in the Super League and we do not want any division, *violence and chaos*…; 47) any attempts to frustrate aspirations of the people will be met with popular *revolt* against the authority of the court; 48) they should wait for the 2007 general election and *fight* for their parliamentary seats first.

The metaphorical expressions for counterforce cue confrontation. Metaphor (42) cautions the opponent of the confrontation they stood to encounter had they gone to Nyandarua, a region considered the opponents' zone during the 2005 constitutional referendum campaigns. Metaphor (43) dares the opponent to carry out their 'threat' 'if they are real men.' Metaphor (45) is used to threaten the opponent of dire consequences while metaphor (44) of the Biblical David and Goliath confrontation brings out the resistance that the advocates of the draft constitution (with more resources) got from the 'no' camp (with less resources). This metaphor demonstrates a scenario in politics where 'small and unknown' politicians confront and beat those with more resources and, therefore, more powerful. Metaphor (46) is consistent with Johnson's (1987) postulation of "two strong, nasty and determined force centres colliding face-to-face" since this is experienced in sport as opponents collide fighting for the ball. Any fallout within the 'team' (political camp) is always disastrous. Political opponents always have to face-off (cf. metaphor 48) but intelligently and cunningly to avoid being beaten in the political match.

In the COUNTERFORCE gestalt POLITICS IS WAR, the 'Mapambano' song in Kiswahili, a Kenyan national language ("Vijana msilale bado mapambano") translated as 'the youth do not relax; the fight is still on' shows that the 'war' is far from over and therefore the battle continues. The 'counterforce' that is witnessed between supporters of various politicians in Kenya, has led to human deaths during elections.

Removal of Restraint

The Removal of Restraint gestalt is one that suggests an open way or path, which makes possible an exertion of force. […] in the diagram is meant to suggest that either because some actual barrier is removed by another force or because the potential barrier is not actually present, the force F1 can be exerted (that is, there is nothing blocking it) (Johnson 1987: 46). The gestalt can be represented by figure 7.

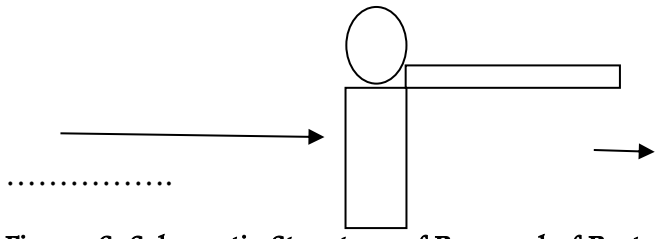


Figure 6: Schematic Structure of Removal of Restraint gestalt

Source: Wożny 2013

According to Hurtienne and Blessing (2007), the Removal of Restraint schema involves the physical or metaphorical removal of a barrier to the action of a force, or the absence of a barrier that is potentially present. The phenomenon is exemplified by the metaphorical expressions: 49) we shall continue *fighting* for a better Kenya even if we are sacked….; 50) we have moved along way in *fighting* for democracy in this country and we cannot allow one or two bad elements to derail our dream; 51) do not expect any easy *battle*; real men and women capable of putting up a brave *fight* for the presidency come 2007 were still taking it easy; 52) I will continue *fighting* for the silent majority to ensure that their interests are catered for all the time; 53) the song "Vijana msilale bado mapambano" (The youth do not relax, *the struggle continues*); 54) there are two arch-enemies in Kenya today: (name withheld) and (name withheld). Then the crowd was led in exorcising the two: (name withheld) 'ashindwe' (*down* with (name withheld)), (name withheld) 'ashindwe' (*down* with (name withheld)); 55) we warned them that a political *tsunami* will come if they do not give people a good Constitution. It has now swept them; 56) I said it is going to be with *tsunami*; the only way to avoid it is to go higher ground; 57) She is welcome to the home of orange campaigners and she has taken a clever step of decamping before the political *tsunami* makes a sweep; 58) Our wave is so strong and *no turn coat or reject will be left standing* in the path of the leadership of this county; 59) I warned them (yes team) to move to higher grounds, but those who fail to heed my advice will be *swept into the ocean by the strong waves;* 60) The train of change is *unstoppable* and he could be left behind.

Metaphors (49-54) indicate the presence of a barrier to be removed. The removal of a restraint involves a battle, which requires force (tsunami) to get the barrier out of the way (metaphors 55-60). The tsunami was expected to sweep the restraint easily. As Johnson (1987:46) points out, "Exertion of force" means motion which can only be made possible by removing the barrier. Metaphor (60) sums it all up by indicating that the removal of the barrier (opponent) is unstoppable and anybody who does not wish to be swept away (sent to political oblivion) has to come on board the 'Biblical Noah's Ark.' "Our experience of force usually involves the movement of some object (mass) through space in some direction," (Johnson, 1987:43).

The Removal of Restraint gestalt explains the existence of political machinations by politicians to get opponents out of the competition. On the path to power, any blockage, perceived or real, and counterforce, is dealt with forcefully. This is a common and fatal experience in politics in Kenya where candidates or people perceived to be a hindrance to ascension to power have disappeared or been killed, corrupted to silence or threatened with dire consequences. Despite the political fights, Kenya has remained one solid container for all Kenyans.

The CONTAINER Image Schema

The CONTAINER image schema represents the idea of containment (Johnson, 1987). Containment is viewed as a relation between the container (boundary) and its content (interior). The image schema results from our recurrent and ubiquitous experiences with containers (Lakoff, 1987). The schema fundamentally involves the IN-OUT orientation, taken to account

for various senses of IN, OUT, INTO, and OUT OF (Johnson 1987; Lakoff 1987; Lindner 1981). Peña (2000) contends that the CONTAINER schema is a basic schema that provides a blueprint for the activation of the FULL-EMPTY, the PART-WHOLE, the EXCESS and the CENTRE-PERIPHERY schemas. This paper has dealt only with the IN-OUT orientation and the EXCESS subsidiary image schema.

The EXCESS Subsidiary Image Schema

The EXCESS image schema is invoked by all those expressions which convey that something is in a larger amount than would be desirable (cf. Pena, 2000). In this paper, the EXCESS schema was instantiated by four (4) metaphors: 61) the Wako draft gives *too much* power to the presidency; 62) some of these MPs have suddenly become *very* rich and their sources of wealth are questionable; 63) we are aware that money has been *poured* to woo voters; 64). ….the Wako draft for giving *too much* power to the presidency… office holder look like the Bible's King Pharaoh.

In metaphors (61) and (64), the schema is called up by the expression "too much" which indicates that the powers given to the presidency are in a greater quantity than needed. A prerequisite for the activation of the EXCESS image schema in these metaphors is the conception of power being in a container (the Wako draft Constitution) and that too much of it has been given to the presidency, another container. Power thus resides in the Constitution and in the presidency both of which are containers.

The EXCESS image schema is usually associated with a negative axiological value. This is understood in terms of control so that in excess, the contents of a container exceed its capacity, become uncontrollable and balance is lost. As a result of the excess quantity of power being difficult to control, the holder of the office loses balance and the office is, therefore, affected negatively hence the negative axiological value of the two metaphors. The CONTAINER image schema is, therefore, needed to understand a leader as a container of power, feelings and emotions, too much of which is dangerous to the governed. It is the excess power vested in the presidency that has led to the call for another constitutional referendum to spread the powers even further to other organs.

The quantifier 'very' (metaphor 62) captures the excess nature of politicians' wealth, whose source is 'questionable.' The abundance of money, a scarce resource, is brought out by use of the term 'poured' (metaphor 63), its excess nature being negative. The expressions 'too much,' 'very rich' and 'poured' all point to the negative value of what is invoked by the metaphors. The politicians thus wield too much power, which they use to enrich themselves with public resources that they in turn use to woo the voters during elections. The process is, therefore, a vicious cycle.

The IN-OUT Subsidiary Image Schema

The IN-OUT orientation of the CONTAINER image schema takes into account the senses of IN, OUT, INTO and OUT OF. The orientation conceptualizes politics (governance and control of resources) as an entity with borders that one can get 'into' and 'out of.' Of the twenty-three (23) metaphors instantiating the CONTAINER image schema, nineteen (19) had the IN-OUT

orientation: 66) physically resist encroachment by the orange team **i***nto* Nyandarua; 67) for this nation to heal, everyone must return his or her dagger **(***in***)** to the *sheath* … ; 68) we have moved along way in fighting for democracy **i***n* this country and we cannot allow one or two bad elements to derail our dream; 69) this is just like the parable of the Prodigal Son *in* the Bible…" ; 70) it is like throwing grains to a hen so that it can be **t***rapped***;** 71) we are aware that money has been *poured* (out) to woo voters; 72) you may have defeated us *in* parliament under streams of money but the wrestling match is ***in t***he public court.; 73) like good hunters, we should scatter ourselves in all directions to **t***rap* the animal; 74) I urge you all to maintain peace. We are *in* the Super League and we do not want any division, violence and chaos…; 75) although I wrestled with president (name withheld) for the top seat, he called me *into* his government to neutralize and quash the plan to remove him from power; 76)…but now the wrestling match is *in* the public court. We will win; 77) I warned them (yes team) to move to higher grounds, but those who fail to heed my advice will be swept *into* the ocean by the strong waves; 78) some of these MPs have become "wakoras" (rascals). They are *out* to enrich themselves at the expense of other people; 79) we will continue being *in* the party…; 80) The courts must be warned that the power they exercise on the people is donated by the people themselves; 81) Church leaders are like shepherds who have forsaken their sheep when danger is approaching; 82) you should not agree to sell your right to vote by succumbing to their threats. 83) State House has been turned *into* a market for human beings …. Some are being bribed with title deeds; 84) a no vote would amount to restoring their dignity which had been wrongly thought that they could buy through relief food.

Metaphor (68) cues Kenya as a container whose content is Kenyans. There are sub-containers within this larger container, Kenya: parliament (metaphor 72), teams (metaphor 74), the government (metaphor 75), ocean (metaphor 77) and political parties (metaphor 79). The major container has a dream to fulfill (metaphor 68). Metaphor (66), however, shows a section of the container, Kenya, curved into a political stronghold where 'outsiders' are not allowed entry. The strongholds are either ethnic regions of the party kingpins or ethnic regions of the major supporters of party leaders. This promotes negative ethnicity. Metaphor (66) explains why it has been difficult to view Kenya as one cohesive container whose resources can be used for the benefit of all Kenyans.

Other sub-containers found in political discourse are the Bible, the people, the courts and State House. Metaphors (69) and (81) portray the Bible and Church leaders as containers of the word of God. The story of the Prodigal Son mentioned in metaphor (69), for instance, teaches both about respect to parents and about a benevolent father. This scenario reflects an aspect of Kenyan politics where politicians who opt out of political parties or alliances fail to get elected and have to come back to their political parties to renew their political life. Equally, when church leaders fail to tend to their flock, the flock loses direction (metaphor 84) just like when the politicians forsake or are forsaken by their parties. In both cases, normalcy is restored when they return to or when their 'fathers' show concern and call them back. The IN-OUT subsidiary image schema thus views the Bible, the people, the courts, parliament, State House among others mentioned in this section as containers holding different kinds of contents in them. All these containers need to work in harmony for the benefit of the contents of the major container, Kenyans.

The people (metaphor 80, 82, 84) are containers of power, individual rights and dignity. They donate power to constitutional offices like the courts; they have a right to vote and a right to dignity, both of which should not be interfered with. These rights, however, are normally interfered with by the occupants of political offices. State House, for instance, is perceived as a container of power that infringes on citizens' dignity and suffrage rights during elections. This

is because of the 'too much' power that it wields. Metaphor (83), therefore, has a negative axiological value.

Basically, therefore, the IN-OUT subsidiary image schema activates the production of metaphors of inclusivity and exclusivity. Kenya is viewed as the mother container, within which are sub-containers. The mother container has Kenyans as its contents. Exclusivity means other Kenyans (read regional representatives) are not involved in the running of affairs of the nation. This has been demonstrated by the winner-takes all ideology which reached its peak in 2017 when other regions almost seceded. It is this schema that activated the utterance 'tunakula nyama na wanameza mate' (we eat meat, they salivate). It is the IN-OUT schema that has made competition for the presidency in Kenya fatally competitive because of the perception that when 'our man' is IN, things are better for 'us' and it is 'our' time to eat. So many financial scandals are attributable to the IN orientation while resistance is attributable to the OUT orientation. The March 9th handshake was meant to correct this situation that had threatened the stability of Kenya. Kenyans look forward to the proposed constitutional referendum that it is hoped will make governance more inclusive.

Conclusion

From the findings of the study, both the Conceptual Metaphor Theory and the Image Schema Theory are important for the comprehension of metaphors of politics in political discourse in Kenya. They make the comprehension of politics, an abstract phenomenon, vivid and interesting.

The PATH and the CONTAINER image schemas play an important role in the conceptualization of politics in Kenya. The PATH image schema activates the production of the VERTICALITY, the PROCESS and the FORCE-MOTION subsidiary image schemas. The VERTICALITY subsidiary image schema activates the production of metaphors of the positive-self and negative-other presentation; the PROCESS image schema activates the production of metaphors that demonstrate that politics is an activity with a source and a goal and the FORCE-MOTION schema activates metaphors that portray politics as a rigorous process with a motivation (compulsion), blockage from opponents, conflict between opponents (counterforce) and strategies to achieve one's goal (removal of restraint). The CONTAINER image schema, on the other hand, activates the EXCESS and the IN-OUT subsidiary image schemas. The EXCESS schema shows the unsatiable thirst of politicians for accumulation of wealth that leads to corruption while the IN-OUT activates metaphors of inclusivity and exclusivity respectively.

REFERENCES

Cameron, L. (2003). *Metaphor in educational discourse*. London: Continuum.

Charteris, B. J. (2004). *Corpus approaches to critical metaphor analysis*. Palgrave: Macmillan.

Charteris, B. J. (2005). *Politicians and rhetoric: the persuasive power of metaphor.* Hound mills, New York: Palgrave Macmillan.

Deignan, A. (2005). *Metaphor and corpus linguistics*. Amsterdam: John Benjamins.

Evans, V. & Green, M. (2006). *Cognitive linguistics: An introduction*. Edinburg: Edinburg University Press.

Gathigia, M. (2014). *Metaphors of love in Gikũyũ: conceptual mappings, vital relations and image schemas* (Doctorate thesis), Kenyatta University: Nairobi, Kenya.

Hurtienne, J. & Blessing, L. (2007). Design for intuitive use -testing image schema theory for user interface design. In J.C. Bocquet (Ed.), *Proceedings of ICED'07386, International Conference on Engineering Design* (pp. 1-12).Paris, France: ACM.

https://inst.eecs.berkeley.edu>lecture 12 downloaded 8th August, 2016

Isabel, O. & Velasco, D. (2001). Metaphor, metonymy and image schemas: An analysis of conceptual interaction patterns. *Journal of English Studies (3)3.DOI:10.18172/jes.69*

Johnson, M. (1987). *The body in the mind: The bodily basis of meaning, imagination and reason.* Chicago: The University of Chicago Press.

Krzeszowski, T. P. (1993). The axiological parameter in preconceptual image-schemata. In R.A. Geiger & B. Rudzka-Ostyn (Eds.), *Conceptualizations and mental processing in language* (pp. 307-329). New York: Moulton de Gruyter.

Lakoff, G. (1987). *Women, fire and dangerous things: What categories reveal about the mind.* Chicago: Chicago University Press.

Lakoff, G. & Johnson M. (1980). *Metaphors we live by*. Chicago: University of Chicago Press.

Lakoff, G. (1989). Some empirical results about the nature of concepts, *Mind and Language.* 4, 103-129.

Lakoff, G. (1992/93). 'The contemporary theory of metaphor.' In Ortony, A. (Ed.) *Metaphor and Thought*, (2nd edition). New York: Cambridge University Press pp.202-251. https://philpapers.org/rec/LAKTCM.

Lindner, J.S. (1981). Lexico-semantic analysis of verb-particle constructions with UP and OUT (Doctorate thesis). Santiago: University of Carlifornia.

Magonya, L. (2012). *Pragmatic analysis of figurative language used in HIV/AIDS discourse in Kenya: A case study of the English and Kiswahili messages (*Doctorate thesis), University Of Geneva.

Machakanja, I. (2006). *Conceptual metaphors in English and Shona. A cross-linguistic and cross-cultural study*. Pretoria: University of South Africa.

Mandler, J.M. (2004). *The foundations of mind: Origins of conceptual thought.* NewYork: Oxford University Press.

Mensah, EO. (2012). *The Yutong bus*: Representations of a new Ghanaian political metaphor. *Theory and Practice in Language Studies 2(1).DOI:10.4304/tpls.2.1.118-125*

Opeibi, T. (2006). *'Political marketing or political "macheting?" A study of negative campaigning in Nigerian political discourse*.' http://www.inst.at/trans/16Nr/01-4/opeibi16.htm.

Peña, S. (2000). *A cognitive approach to image-schematic component in the metaphorical expression of emotion in English.* Logroño: Universidad de la Rioja.

Peña, S. (2003). *Topology and cognition: What image -schemas reveal about the metaphorical language of emotions.* Munich: Lincom Europa.

Richards, I.A. (1936/1965). *The philosophy of rhetoric*. New York: Oxford University Press.

Rundell, M. & Fox, G. (2007). *Macmillan English dictionary for advanced learners*. London: Macmillan.

SantibáñezF. (2002). The object image-schema and other dependent schemas. *Atlantis*, *24* (2), 183-201. https://www.researchgate.net/public

Schmitt, R. (2005). Systematic metaphor analysis as a method of qualitative research. *The Qualitative Report,* 10(2), 358-394. Retrieved from https:nsuworks.nova.edu/tqr/vol10/iss2/10

Summers, D. (Ed.). (2005).*Longman dictionary of contemporary English* (4th ed.). Harlow: Pearson Education Ltd.

Taiwo, R. (2010). *Metaphors in nigerian political discourse*. Obafemi Awololowo University, Nigeria.

Talmy, L. (1972). *Semantic structures in English and Atsugewi* (Doctoral dissertation), University of California, Berkeley.

Talmy, L. (1977). Rubber-sheet cognition in language. In XXX (eds.), Papers from the Thirteenth Regional Meeting, *Chicago Linguistic Society*. Chicago: University of Chicago Press, 612-628.

Talmy, L. (1983). How language structures space. In Pick Jr., Herbert, L. and Linda P. Acredolo (eds.), *Spatial orientation: Theory, research, and application.* New York: Plenum Press, 225-282.: https://doi.org/10.1007/978-1-4615-9325-6_11

Talmy, L. (1988). Force dynamics in language and cognition. *Cognitive Science* 12: 49–100. https://doi.org/10.1207/s15516709cog1201_2

Talmy, L. (2000). *Toward a cognitive semantics*. Cambridge (MA).

Ungerer, S. & Schmidt, H.J. (2001). *An introduction to cognitive Linguistics*. Beijing: Foreign Language Teaching and Research Press.

Van Dijk, T.A, (Ed.) (1997). *Discourse studies: A multidisciplinary introduction.* London: Sage.

Wei, J., M. (2001). 'The pragmatics of metaphor in Taiwanese politics.' In *Virtual Missiles Metaphors and Allusions in Taiwanese Political Campaigns.* United States: Lexington Books.

Woźny, J. (2013). Force-motion schemas in metaphors of motion, *Studia Linguistica Universitatis Iagellonicae Cracoviensis 130 (2013): 351–368 DOI 10.4467/20834624SL.13.024.1155* University of Wrocław

Yu, N. (1998. *The contemporary theory of metaphor: A perspective from Chinese*. Amsterdam: John Benjamins

Research and publish, publish or perish, so what?

Author: Fellis N. Mutune

Affiliation: PhD Candidate Machakos University

Email address:Senseimutune@yahoo.com

Postal Address: 2530-90100 Machakos

Mobile Number: 0721585913

Oral Presentation

Abstract

Research primarily is geared towards creation of new knowledge. Researchers in Applied Linguistics are expected to identify and solve linguistic problems in the society. For this to be realized scholars in applied linguistics should engage in research that influences policy formulation or change of policy and also engage stakeholders at the formative stages of the research process .Over the years, scholars have pursued Applied Linguistics and explored varied issues in an endeavour to acquire certificates for different motivations. In each and every institution of higher learning in Kenya, there has been a research policy that at the undergraduate level, each and every student must come up with a project before graduation. The Commission of University Education has passed that at the post graduate level, a candidate pursuing masters should publish a paper from their research project or dissertation before graduation. At the PhD level, one has to publish two papers from their research work. Of what value are these research activities? As applied linguistics researchers we need to bring the policy actors and stakeholders on board. This paper explores platforms, strategies and opportunities which an applied linguist can maximize in engaging the policy actors. Further, the paper examines the tools and skills that an applied linguist should have for effective communication with various types of stakeholders to get value for the research conducted. Also, the paper explores the tools which an applied linguist can use for mapping policy actors. It is hoped that the issues addressed in this paper will be instrumental to an applied linguist on how to engage the stakeholders in the research process and also the implementation of the research findings to facilitate formulation of policies that bring change.

Key words

Publish, perish, policy actors, stakeholders, Commission of Higher Education, Applied Linguistic

Introduction

Most scholars research and publish for different motivations. The most apparent reason for researching and publishing is a scholarly activity which has been undertaken for decades. Others do it out of the love and interest that they have for writing. This observation means that researching and publishing are out of intrinsic motivation. Other scholars will publish because it is a condition by the disciplines they are pursuing.

One such motivation is for promotion, especially if such a scholar is an academic staff. Commission for University Education (CUE) provides a publication formula which is used besides other parameters such as teaching experience, ability to attract research funds, mentorship staff that are due for promotion. The more publications a researcher or scholar has, the more the points during consideration for a promotion. Ouma (2018) notes that the standardisation of the CUE guidelines on publication may not reflect the actual contribution of authors. CUE may not reflect the real contribution of authors. Again the scholars are pressurised to publish or "perish". This pressure makes even some to publish in 'predatory' journals on a pay-as-you publish basis. From a different perspective, some individuals may also piece up unmerited work and publish as single authors. Even as other scholars such as Ouma (2018) recommend

that the CUE should adopt the internationally established standards of recognising academicians' research on other platforms such as web rankings and others provided.

Brown (2017) opines that publishing increases the credibility of the research, the practitioner and puts the knowledge in a permanent and searchable record. The practitioner can be inferred that by publishing in peer-reviewed journals, the other researchers and scholars who refer to your publication will seem to believe the contents than when referring to a blog or even another source.

The practitioner again, who publishes in a credible journal, is rated higher than those who publish in predatory journals. However, Sherman (2014) advances two apparent reasons why practitioners research; to prove to the funders that they spent the money well and show their employers that they are utilising their free time adding the prestige of the University. From this perspective, it is clear that the motivation for publishing is self-centred. Nevertheless, the scholar asserts that there are some compelling reasons to publish. These are, for the researcher to understand his or her discovery, to get reviews, especially before the paper is published and lastly to become part of the scientific community. Sherman and Brown seem to agree that a practitioner who has published is highly regarded than the one who has not. Another voice to this ongoing issue on publishing is Kramer (2012) who alludes to Sherman's perspective that publications provide recognition within the field of the author by becoming reputable as a key opinion leader. Gilles Pie (2018) reasoning on why scholars publish is similar in some way with the previously referred scholars. She notes that publishing enables the practitioner to attain avowal for their research word and also build a professional reputation. Just like other scientists, applied linguists conduct research and publish the findings for their advancement in terms of being promoted as academic staff. Lack of publication translates to stagnation in terms of their cadres as academic staff.

This situation leads to the coinage of the slogan 'publish or perish' emanates. As a scholar, I entirely agree and strive to achieve this in my entire academic life. But the question is, for whom should we publish? Bascoro and Almeida (2006) note that the use of research results for policy decision-making is gaining greater prominence in recent years. They attribute this to the outstanding processes of world change, which call for concrete evidence to support or challenge the novelty which is implemented in varied contexts. As social scientists, we should embrace this trend, which was initiated in the 20thcentury. Research findings should be used to formulate policies that bring change. It is, therefore, vital to connect researchers with policy actors and practitioners. This paper shades light on how an applied linguist, being a social scientist, can reach out to the policy actors.

The first part of the paper explores platforms, strategies and opportunities that are at an applied linguist disposal to engage the policy makers maximally. The second part examines the tools and skills that an applied linguist should possess for effective communication with various types of stakeholders. Further, the paper examines the mapping tools that can be used to grade the stakeholders.

For any research to translate to policy formulation or policy change, the policy actors should be engaged at the formative stages of the investigation. The early engagement harnesses practical information for study and also helps to create an audience for the research findings and recommendations. This engagement can be done at the development/presentation of the concept, especially with the in-charge of the institution where the research would be based. It is important to consult at the initial stages of the study with the people who 'matter' as far as one's research problem so that later one may engage them in the implementation stage of the research recommendations. For instance, if the area of research is based on clinical linguistics, it is crucial for the researcher to engage the superintendent of the specific hospital in which the investigation

will be conducted. However, some applied linguists may lack information on strategies, opportunities and platforms that they can use to engage the stakeholders. Therefore, this section explores them as follows;

2.0 Strategies for preparing for stakeholder engagement

From the onset of any research idea, an applied linguist should have highly ranked descriptions on how to approach stakeholders. There are three aspects of putting stakeholders in as far as engagement, mapping and looking for ways of defining their influences.

An applied linguist should frame their findings to appeal to the interests of their audience. The framing should happen in situations where there are no policy windows that already exist. An applied linguist should concentrate on researching issues that are current and try to look for solutions to the problems at hand. By doing so, he or she will know who to engage and why?

An applied linguist should choose the right tool and platform to reach out to the relevant stakeholder or policy actor. A decision should be made from the formative stages of the research on which policy actors to engage and how.

An applied linguist who would want to influence policy formulation should ensure that they value all the relevant policy actors and stakeholders to ensure that they own the subject under research from the initial stage and start thinking on how best it can be incorporated in the policy. An applied linguist should devise a way of engaging the relevant policymakers without taking up their time. This section highlights the strategies that an applied linguist can use.

2.1Message box

The message box captures the five areas of a research concept. These are; the problem being addressed which should be apparent and create curiosity. The researcher should pose the following questions to identify the problem: What specific problem or piece of the issue am I addressing in broad terms? What is the most critical issue? So what? Why does this matter to my audience? What happens if it is not resolved? The gain or loss of addressing the subject is also included and the benefit; which is a list of stakeholders to benefit Solutions – the question to pose is what the potential benefits of resolving this problem are? A message box captures the researchers' message (summarise the issue one is tackling, challenges, benefits and the issue at hand).

2.2. Elevator pitch

An applied linguist should be able to state his or her primary research area within one minute when asked. The name –elevator pitch- reflects the idea that it should be possible to deliver the summary of the research idea in the period of an elevator ride or approximates 30 seconds to 2 minutes. This strategy is suggested due to the limited available amount of time. This strategy enables a researcher to express the most important ideas or concepts in the shortest time possible.

The researcher should be lucid and may follow these stages; a) trigger – which is the starting point b) development – output which is a short description of a research idea that explains the concept in such a way that any listener can understand it in a short period. The development stage describes who the product is for, what it does, why it is needed, and how it will get done. For the latter, when explaining to an individual, the description generally explains one's skills and goals and why they would be a productive and beneficial person to have on a term. An elevator pitch does not necessarily include all of these components, but it usually does at least explain what the idea is and why it is valuable. Elevator pitch as a strategy is used to entice a stakeholder or describe a thought. The goal is to convey the overall concept or topple excitingly. The name –elevator pitch- reflects the idea that it should be possible to deliver the summary in

the period of an elevator ride or approximates 30 seconds to 2 minutes. It is advantageous as a strategy since it is a useful strategy which minimises on time to be use when a researcher is explaining the research concept to a potential policy actor or stakeholder.

2.4 Policy briefs

A policy brief is a concise summary of a particular issue, the policy options to deal with and some recommendations on the best option. It is aimed at government policymakers and others who are interested in formulating or influencing policy. There are two types of policy briefs. These are;

Advocacy brief – argues in favour of a particular course of action.

Objective brief – gives balanced information for the policymaker to make up his or her mind.

A policy brief should provide enough background information for the reader to understand the problem. Again, the researcher should convince the reader that the issue must be addressed urgently by providing evidence to support one alternative. A policy brief should be stimulating to prompt the policy actor to make a decision.

A policy brief should be short and to the point focusing only on meanings – what one finds out (the research findings) relate to a big picture. Most importantly, policymakers are busy people and are probably not specialist in one's area; therefore they are likely to read only something that: Looks attractive, appears unusual and is short and easy to read. A policy brief should meet this criterion.

2.3 Press release

A press release is a ticket to publicity. It a tool made to announce something newsworthy in the most objective way possible. This is a strategy that an applied linguist can maximise to reach out to policy actors. The whole purpose of a press release is to get coverage and get noticed by a target audience. The coverage, therefore, serves as a means of communication to the research findings and recommendation. As a means of communication, the press release can be written, recorded, or even shown. When writing a press release, it's essential to start with basic questions like who did what, when and where it happened, what it was for. This tool should be short and straightforward and preferably in a form that allows copying and passing because journalists are always busy. The press release should be precise and to the point. It should be written with an attention-grabbing headline in bold format. The lead sentence should be a concise summary of the subject of, and the rest of the body should capture the essential details of your research, who, what, when, why and how?

3.0 Platforms for an applied linguist

This section of the paper explores the platforms that an applied linguist can use for engagement of the stakeholders. The platforms enable policy actors to act on the research findings.

3.1 Newspapers

An applied linguist can make use of the newspaper to reach out the policy actors. A newspaper is a powerful tool, and it has broad readership. For the findings to be printed in the paper, the researcher will present an article in the opinion editorial to the editor. Once printed, it can attract relevant policy actor who in turn may contact the author. This way, the findings will affect policy change. For instance, if an applied researcher has conducted a study on "The role of an applied linguist in the preservation of the Dholuo folklore", this may interest the minister in charge of gender and culture in the Luo Nyanza County. The minister may partner with the applied linguist in ensuring that Dholuo culture does not die (culture death). Again, the applied linguist

who succeeds in having his or her findings appear in the opinion editorials column may be called upon in a radio show or television to shed more light. Weintraut (2013) notes that editorial writers build on an argument and try to influence public opinion to promote critical thinking, and sometimes cause people to take action on an issue. For these reasons, therefore, newspaper editorials can change the way things are done (policy).

3.2 Television

Television channels are good news sources. According to the Communications Authority of Kenya, the number of TV stations has risen to 66 since 2015. An applied researcher could come in contact with the host of a talk show in any of the television channels and even express interest of being a participant in such shows. Through these shows, the applied linguist can get the attention of a policy actor who may then contact him or her for more discussion. Ilie (2006) notes that talk shows are widely influential media phenomena. This observation means that it is a robust platform that can be utilised to reach out to the relevant stakeholders. According to this researcher, talk shows are geared to public debate using party conversation and that they target at the same time a multiple audiences. Again applied linguists should be part and parcel of the solution to the issues at hand. Therefore through the talk shows, an applied linguist can give insights to social or moral problems. Linguistic problems are presented in society. For instance, if an applied linguist is researching on 'the Language used in a hospital set-up and how that affects service delivery', he/she can present the findings of the research on television which may get attention of the Cabinet Secretary of Health who may later on engage the applied linguist for making the issue clearer. This move may change the way the medics communicate with the patients.

3.3 Radio

Radio stations in Kenya are an excellent means of making Kenyans, and even the world informed of the latest news and up-to-date information from Kenya and beyond. According to the Kenya Communications Authority, there are over 100 radio stations in Kenya. Lee (2002) advances that some scholars argue that talk shows can provide forums for public deliberation since they consist of persons who are invited to shed more light on the issues which are of public interest. The guests advance their circumstances and their position. Research findings which are as a result of rigorous and credible work are regarded to be factual. In this regard, an applied linguist can liaise with radio talk shows hosts to be invited in one of such programme to air out their findings and recommendations. Radio is a medium which has an extensive listenership. In this case, the talk show may catch the attention of relevant policy actors. For example, if the researcher is researching on 'how gender roles are reflected in the current Kenyan secondary school set books', such talk may be listened to by a human rights activist who may take up the discussion to a higher level primarily if the gender is represented in a biased way. This explanation implies that the radio is a platform that an applied researcher can use to reach out to the would-be policy actors for the utilisation of the research findings.

3.4 Social media platforms

There are several social media platforms that an applied linguist can maximise to reach out to the policy actors. These include the blogs, twitter, Facebook, Whatsapp, Instagram, slide share, among others. All these provide an opportunity for the researcher to discuss research findings. These forums offer the researcher to write freely the conclusions and recommendations which may get the attention of a policy actor.

4.0 Opportunities

An applied linguist researcher has several opportunities to engage policy actors that can be exploited to his/her disadvantage. These opportunities if used maximally can enhance the researcher's quest to influence policy formulation or change. Some of these opportunities are as expounded in the section that follows.

4.1 Conference Dinner

During conferences, the CEO's or the Vice Chancellor of the organisation or institution may invite the participants for a conference dinner. During such informal forums, there are free interactions, especially among all those who attend. An applied linguist should grasp such an opportunity and maximise it to his/her advantage. Introductions are part of the dinner and this means that one can easily reach out to the relevant policy actor. For instance, if the applied linguist is conducting a study on the communication strategies in a given University or organisation, he or she may approach the Vice Chancellor during the conference dinner and engage him or her armed with the findings with the aim of drafting a communication policy for the organisation or institution. Upon having the opportunity at hand, an applied linguist can pitch the results without spending much of the Vice Chancellor's time since he/she has the right strategies.

4.2 Any other business

In each and every notice of meeting, there is always a list of matters to be considered and discussed or to be transacted. Any other business is among the items on the agenda. This revelation means that during such time, members can sneak in issues that are not part of the business to be transacted. Applied linguists are affiliated to different groups and organisations which hold meetings. Therefore, such is timely avenues that he or she can raise specific findings and recommendations on an area he or she had been researching. During the meeting, there could be a relevant stakeholder whose attention can be attracted to the sentiments of the researcher. If this occurs, the applied linguist can, later on, be engaged by the policy actor during which the researcher can clarify some issues.

4.3Workshops

Workshops present possible opportunities which an applied linguist can use to reach out to the policy actors. This is so since workshops are meant for people who are working together or are working in the same field. Again, the workshops are facilitated by people who have real experience in the subject under discussion. It is, therefore, possible that some of the facilitators could be policy actors. An applied linguist can raise findings from research work that he/she has conducted, which is geared towards changing or formulating a policy. Workshops encourage the attendees to participate in a seminar actively. The workshop period is an opportunity which an applied linguist should grab and make use of so as to reach the policy actors.

4.4 Request by organisations or institutions to be Keynote speakers

Applied linguists should take advantage of any offer or opportunity for engaging in activities which are initiated by, or is in the interest of the target policy actor or stakeholder. For example, an applied linguist researching on gender issues that may hinder the proper implementation of the basic education act should attend all meetings organised by the Kenya Institute of Curriculum Development (KICD) and the non-governmental organisations that agitate for gender parity in education. Again the applied linguist should not decline any request to take up an advisory role with an NGO or even giving keynote speeches at organised conferences by professionals. Such requests present valuable opportunities which should be used to influence the mindset of the attendees on a given issue, possibly one which he/she would wish he/she has researched on.

5.0An Applied Linguist as a policy actor

It is vital all times for applied linguist researchers to ask the so what question as they conceive research ideas. This question is crucial as it enables the researchers to uncover the stakeholders in the area of research field whom they can partner with to change the society.

Research in applied linguistics should be geared towards solving linguistic problems in society. (Policy research).As applied linguists, researchers should be guided by the so what question. It is essential to list all the policy actors in one's area of research. For instance, policy actors in applied linguistics research on gender representation in English teaching and learning materials are; Publishers, Kenya Institute of Curriculum Development, Ministry of Education, authors, teachers, learners, Gender-based organisations, KNEC.

Once the policy actors are identified, their constellations should be analysed based on interest, power, influence on each other and coalitions. The analysis of actors constellations gives; a clear picture of conflicts of interest, Potential alliances, an opportunity to determine clusters of stakeholders who may inhibit different levels of interest, capacities and interest in the issue in question

In the above example, the researcher will have to engage the MOE, KICD, the publishers and the authors. The question is, how? At this point, the applied researcher will have to come up with tools which he/she will use for mapping these policy actors. Mapping the policy actors of research is a complicated and time-consuming exercise since it identifies which policy actors are in which quadrant and how to move stakeholders

Some mapping tools that can be used include;

5.1 Net maps

A net map is an interview-based mapping tool that enables people to understand, visualise, discuss and improve situations in which many different actors influence. The network map is a crucial exercise for starting to analyse the influence of policy actors and tap into previously uncovered groupings. Using this mapping tool, individuals and groups can clarify their perspective of a situation, foster discussion and develop a strategic approach to networking activities. In the earlier example where an applied linguist is researching on gender representation in English textbooks, using the net maps, gender-based NGOs, the MOE, KICD, the publishers, the authors and the teachers will present their views on gender and the current position on how the issue of gender is represented in the TLM. The presentation will foster discussion on the subject at each of the stakeholders engages the other. Ultimately each of the policy actors will develop a strategic approach on the issue of gender, and the different perspectives.Net maps help the researchers to determine; what actors are involved in a given network? How are they linked? How influential are they? What their goals are?

A net map allows researchers to be more strategic about how they act in these complex situations. This mapping tool helps researchers to answer questions on whether they should strengthen the links to influential supporters (high influence, same goals), e.g. gender-based NGOs. Would have a high influential in a study investigating gender inequalities .Whether to be aware of a prominent actor who does not share your goal is also a pertinent question. For example, publishers. Yet another question would be whether increased networking helps empower the researchers' dis-empowered beneficiaries. This tool is low-tech and low cost and can be used well with the rural community as well as policy actors.

The process of net mapping includes; Preparation-define question, links, goals and decide who is to be involved. Actor selection-write names of actors involved. Draw links- on who is linked to whom. Arrows should be drawn according to interviewee direction. The goals of each policy

actor are written and influence towers assigned to each of the policy actors. After the stipulation of the goals, there is a need to establish what the network means for the strategy of the organisation, the source of the influence and also the outcome in the case in case of conflicting interests

5.2 Participatory impact pathways analysis

PIPA is designed to help researchers to make explicit their theories of change (how they can achieve their goals and having input). This tool is drawn from program theory evaluation, social network analysis and research to reveal and foster development. Project pathways describe how the project will develop outputs and the policy actors who can be involved to achieve growth and impact positively to the project at hand. Researchers and policy actors' work together to map knowledge and research products must scale up to meet the desired change.

A crucial feature of PIPA is scaling out- building a favourable institutional environment for the emerging change process through; a positive word of mouth, organised publicity, Political lobbying, Policy change. For instance, a research project that is piloting the challenges of using mother tongue as a medium of instruction in lower primary, coming up with a project's Impact pathways may involve the Ministry of Education which will encourage broad adoption. Secure positive communication between the researcher and the MoE and strong joint implementation- increases the likelihood of the MOE effective use of the research findings. Another impact pathway might be for the researcher to use evidence from the study to influence decision-makers in the MOE services head office to support the work. PIPA encourage researchers in research for development projects to want their research to bring about development outcomes.

Impact pathways raise the profile and give legitimacy to brokering activities in which researchers are actively involved in establishing the interpersonal and organisational links, which will be needed for future impact. The impact pathways are crucial in explaining a research's rationale for it links the project goal framed in terms of a challenge or problem and what the project is going to achieve.

5.3 Problem trees

A problem tree is a useful tool for understanding the different points of view of various policy actors. Problem trees describe the main problem. Problem trees focus on issues rather than opportunities. They may appear negative and can turn the problem trees into objective trees- achieved by reframing the problem into the desired state. This is done to motivate the policy actors on the positive change to be brought about by the research.

For instance, in investigating how well mother tongue can be used as a medium of instruction in lower primary, some of the foreseen problems would be a --cosmopolitan community where different mother tongues are spoken, The TSC delocalisation policy, Town set up where children learn Kiswahili or English as their mother tongue and Intermarriages.

This tool is good at causality-only identifies what the research work is doing and what it needs to do to have the desired impact. Problem trees do not identify who needs to do what. To overcome this weakness, the tool should be combined with another one. For example network maps (identifies the policy actors responsible). A branch of a problem tree ends once it has identified a problem that the project will solve e.g. in coming up with a problem tree of the representation of gender in TLM, a branch will end when it has identified gender inequality which will be addressed by the research.

5.4 Campfire

This mapping tool involves drawing of campfires representing the stakeholders by the facilitator. The stakeholders who have the power (and so can see and talk with each other, as well as get all the heat) are close to the fire while the ones with the least power are furthest away. The Stakeholders are then depicted by different sized circles – where the diameter of the loop refers to that stakeholder's interest/dependence etc. on that resource. This representation provides a basis for discussion, argument, negotiation and eventually agreement. It can be layered in that different stakeholder groups can do their analysis first and then it can be combined. Schiffer (2008) notes that campfire is another excellent and easy tool to understand the picture, which represents the power of the various stakeholders in terms of implementing the research findings and recommendations. The process is even made more manageable by adding links between the different actors which simplifies the understanding of what happens (flows) between the stakeholders.

5.5 Alignment-Interest and Influence Matrix (AIIM)

This AIIM helps researchers to unearth the stakeholders in their area of research. It is a crucial mapping tool for it allows researchers to be in a position to answer the question so what? At the initial stages of conceiving the research idea, it's vital to list all the relevant stakeholders. The next step involves sorting out the listed stakeholders into quadrants in terms of engagements based on the degree of alignment and interest and degree of influence.

The AIIM can be represented in a table as follows:

Alignment—Interest and Influence Matrix (AIIM)

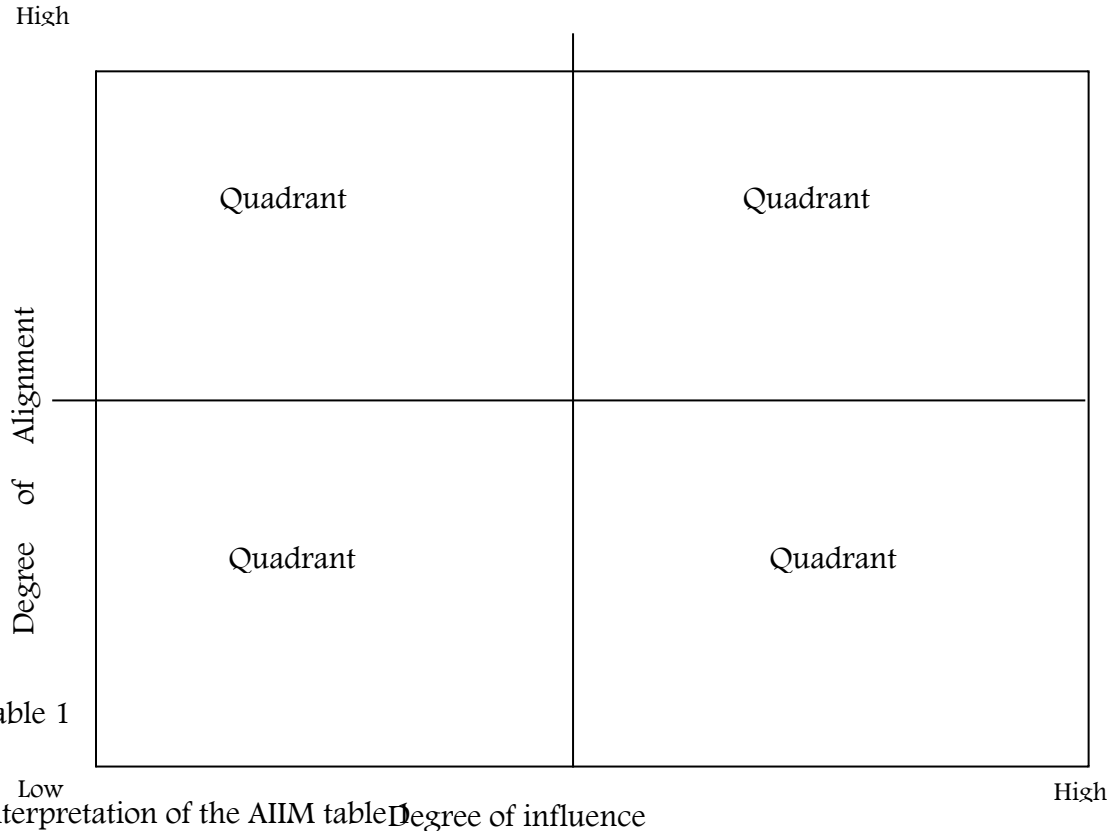


Table 1

Interpretation of the AIIM table

Those stakeholders

In quadrant 2 have both a low degree of alignment and interest and low degree of influence.

Quadrant 1 has a high degree of alignment and interest but a low degree of influence

In quadrant 3 are critical in terms of engagements since they are aligned to the researchers' objectives, and they have the influence. That is they have both a high degree of alignment and interest and degree of influence

In quadrant 4 have a high degree of influence but a low degree of alignment and interest.

Researchers should engage the stakeholders in quadrants 1, 2 and 4 by coming up with mechanisms to convince them to create interest so that they move to quadrant 3. This observation means that none of the stakeholders should be ignored in terms of engagement regardless of the quadrant they fall in since all of them are important and should be brought on board for intended change to occur.

Conclusion

Researchers should be encouraged to align their research activities to real issues in their societies to offer practical solutions and input accordingly. There is a need to publish research work for the benefits of others and researchers themselves. Indeed it is essential to engage relevant policy actors at the initial stages of our research so that we align our research to the societal needs and also fast track the implementation of the research findings. As applied linguists, we need to make use of the opportunities, strategies and platforms at our disposal to reach out to relevant policy actors.

References

Bascolo, E. and Alemida, C. (2006). Use of Research results in policy decision-making, Formulation and implementation; a review of literature in Cad. Saúde Pública Vol.22 Suppl.Rìo de Janeiro.

Brown, N. (2017) in why should practitioners publish their research in journals in 'Research for Evidence.

ILie, C. (2006), Talk Shows. In: Keith Brown, (Editor-in-chief) Encyclopaedia of Language & Linguistics, second edition, Volume 12, pp. 489-494. Oxford: Elsevier.

Kramer, C. (2012). Why do scientists publish for http://industry.jove.com?

Mitchell, J. (2003). 'Audiences talking genre: television talk shows and cultural hierarchies.' Journal of Popular Film and Television, 36-46

Sherman, D. (2014) 'Why we need to publish our work.'

The Contribution of the Bantu Mother Languages to Tanzanian Socio-economic Development through Media

Joseph Hokororo Ismail, Institute of Judicial Administration Lushoto PO BOX 20, Lushoto, Tanzania (jihokororo@yahoo.com)

Benson Boniface Kinjofu, University of Dar Es salaam, PO BOX 35040, Dar Es salaam, Tanzania (benbonkinjofu@gmail.com) and

Abstract

The study of mother language has been given much attention on the extent of which the language can be used as language of instruction in schools Qooro (2003); Simire (2004); and Rubagumya (1996) just to mention but a few. The concern relating to various aspect of mother language such as mother language in Socio-economic development through media has not well explained. This paper intends to discuss the contribution of Bantu Mother Language to Tanzanian socio-economic development through media. The objective of this paper was to show the extent of which media can use mother language to catalyze the social and economical issues in Tanzania. This study was guided by The Exploratory approach by Thornborrow (1998) as the theoretical framework. The study was a qualitative using several ethnic community languages that we refer as a Bantu Languages as the case study. There are only few countries in Africa, such as Tanzania, Ethiopia, Somalia and most of the Arabic speaking countries, which opted to develop their indigenous linguae francae to serve as national languages. If we consider the case of Tanzania, Ethiopia and Egypt, Kiswahili, Amharic and Arabic respectively, have been used as languages of education, trade and commerce. Both focus group and interview will be used as tools for data collection. The findings of this reveal that helpful in building a case to the language planner and policy maker on the necessity of officially allowing the use of mother language in broadcasting to the localities. Unless mother language is used in Radio Stations and other media, the socio-economic development in Tanzanian rural will be far from reality.

Key words: Mother language, Media, Socio-economic, Bantu language

1.0 Introduction

The government of Tanzania has been insisting the use of Kiswahili in socio-economical activities. On the other hand Bantu Mother Language has not given any much attention. It has been urged in the literatures that the use of Kiswahili can bring unit, facilitates more development and other national cultural activities. Different media decide to use two languages in providing information but the real situation in rural areas whereby the socio-economical activities take place but the majority of the village members have been using their Bantu Mother languages such as Sukuma, Sambaa, Chagga, Haya, Makonde, and Gogo, just to mention but a few. But as the paper will indicates, in Tanzanian context, the communities does not understand neither Kiswahili nor foreign language such as English and Chines are used effectively. Crystal (1971) sees language as the unique, distinctive element that differentiates man and human society from the animals. Without language, there can be no successful execution of human activity. Therefore, language could be said to be a means of communication. This paper discusses the extent of which Bantu Mother Languages can be used in different media can be used to foster the socio-economical development, that is to say, the society will get the appropriate and relevancy information through the language which is well understood by them. Now, let us expand the discussion by looking briefly on the issue of media. The media that are considered in by the society and can contribute in the spread of the information are Social media such as WhatsApp, Instagram, Imo, Wikipedia Blog, Newsletters, Newspapers and Radio. In this paper

we will we consider radio as the case study. The choice of radio has been made due to the fact that, radio covers a large part of Tanzania and it has come as a traditional media in disseminating information as compared to other categories of media. Through different media have been used as the source of information but in this paper the radio is selected as the medium which covers the large area. Thus, radio is accessible to majority.

Multilingualism has therefore been viewed as problem rather than an asset that can be exploited

to "unity in diversity". Moreover, scholars and governments in Tanzania see language policies adopted at the end of colonial rule as the genesis of the good or bad practices observed in Tanzania. For many African states, important influences on the prominence, extension and functional use of languages in post-colonial times were already established during the experience of colonial occupation, not only as the result of the creation of borders which put together various ethno linguistic groups as members of future states, but also through specific language related policies and activities (Simpson 2008:2). For instance, in education, usually the kind of education offered to Africans was one to prepare them for blue-collar jobs, and thus the Bantu Mother languages were used as media of instruction in domestic domain such as at the market, traditional ceremony and dances, *shamba* work and other kinship responsibilities.

The media are always there, and have come to be taken for granted as an integral part of most people's lives. Scannel (1988), in account of the social role of broadcasting, argues that even the language, used to talk about Radio programming reflects this ordinariness, this taken-for-granted place in our lives. The expression there's nothing on Radio has come to mean there's nothing I want to watch rather than describing an actual state of affairs where there is really nothing being broadcast if you switch on your set. Beyond television the other forms of mass media cannot be underestimated in the process of developing socio-economic issues and it was worth investigating its influence on the mother language into different sphere of life in Tanzania.

Thus, it appears that the media, especially Radio, is an important agent in cognitive socialization. Beyond Radio the other forms of mass media cannot be underestimated in the process of its contributions towards socio-economical development in Tanzania. Secondly, it was important to establish how the contribution of Bantu language in socio-economic development through Media. Therefore this paper intends to investigate the most preferred languages among Swahili, English and Bantu Mother Language to be most useful if used in broadcasting socio-cultural economic activities in Tanzania. The guiding research question is that given Swahili, English and Bantu Mother Language, which one would you prefer most in radio broadcasting socio-cultural –economic activities in Tanzania?

2.0 Literature Review and Theoretical Framework

Different literatures available explain how language can be used in a different sphere of life; According to Batibo (2005:47), speakers of minority languages in most African countries are excluded from or marginalized with respect to national participation because of the use, by the ruling elite, of an ex-colonial language or of a dominant Bantu Mother language, which may be used as a lingua franca while not understood by certain groups within the nation. Speakers of minority languages are thereby denied direct participation in public interaction, meaningful audiences with government authorities, and contact with other groups, or active contribution at public rallies. The exclusion of minority language speakers for these reasons is very common in Tanzania as the case of other African countries. Most Africa countries including Tanzania either

assumes that all are able to follow discourse in those languages or insist that all official communication be made in them whatever the social cost in Tanzania for example, the assumption in that the immediate consequence is that nationalism, which is an economic necessity that can only be achieved by a communication that is capable of reaching all members of society in the economic process, is not achieved. Therefore, through broadcasting such domain can contribute to social economic development to Tanzanian. By then let us recall ourselves what development meant? It is important to understand the meaning of development in order to establish the role that language can play in development initiatives. But first of all, it is necessary to state that the concept of development is highly contested with scholars not agreeing to one definition. Tambulasi and Kayuni (2007) assert that this is so because "development is multidimensional [and hence] a topic of massive disagreements" among scholars.

Development is a process which involves the entire spectrum of the society, with each individual making a contribution. A communication channel is, therefore, imperative in order to mobilize the whole society in the process of social change. It is an essential tool in ensuring the full participation of the masses in the political, socio-economic and cultural development. In other words, institutions, organizations and even governments cannot perform clearly and effectively to expectations unless they can understand and be understood by every citizen of a particular nation. This argument is summarized by Simire (2004:1) as follows:

"In order to achieve rapid political, economic and sociocultural change in the country, all academic and specialized institutions and corporate organizations in the local and federal governments, should mobilize, inform and educate the old and the young, illiterate and literate, male and female, lowly and highly placed individuals across the diversified ethno linguistic groups in their respective code"

Therefore, it is observed in this quotation that if a common language is not adopted, which in this case would be a common African language serving as lingua(e) franca(e) of that particular nation(s), the transfer of skills, new knowledge and other vital information desired to effect changes cannot be delivered to the target group at both the regional and national levels to mobilize the masses for the development endeavor.

Giving example and experience from Nigeria, from statistical point of view, Simire (2004) points out that of about 33% of the total population of Nigerians who are literate in English (the official language), only about 15% of these can really use English effectively in professional and administrative activities. This can be interpreted to mean that 85% of Nigerians do not have sufficient knowledge of the official language, a situation that is similar to other African states that use an ex-colonial language in official matters. Simire's sentiments are echoed by Bamgbose (2011:2) when he argues that when people talk of a common language that will facilitate communication; they almost always refer to an official imported language, which, as is well known, is only truly common to perhaps 10-20%. In the light of the above statistical presentations, education in foreign languages has thus become education for a minority, and the majority is excluded in national development programs. If the development of such countries were to hinge on communication using English, then we must accept that it will involve a very small minority of the population. This becomes a hindrance to economic, political and socio-cultural development because institutions and other corporate organizations cannot perform their developmental roles effectively unless they can understand and be understood. Therefore, African leaders ought to appreciate that development is about people, and as the former Tanzanian president, J.K Nyerere insisted in most of his writings on the concept of development..

Development should be perceived in a broad sense to mean socio-economic and human development, i.e. the full realization of the human potential and a maximum use of a nation's resources for the benefit of all. Simire's analysis on the issue of language and media is very important because it has shown us the importance of using Bantu Mother language for development.

Mwangi (2001) on the other hand, has analyzed on the '*Influence of Mass Media in Socialization into Sport of Kenya Secondary School'*. In this paper it has been indicated that the majority of the athletes had their fathers' highest of education of university and mothers' education of secondary school. Most of the athletes' fathers' occupations were professional and managerial, while most of the athlete's mothers' occupational was unskilled activities. It is also apparent that gender affected the influence of mass media on socialization into sport of secondary school athletes in Kenya. Parental social economic status was significant in the influence of mass media in socialization into sport of secondary school athletes in Kenya. As such the higher the educational level and occupational of the parents the greater the influence of Television and internet on socialization into sport of the athletes, on the other hand, the lower the educational level and occupation, the greater the propensity for the athletes to be influenced by radio, newspaper and sport magazines.

As far as language of Instructions is concern, Andersen (1975) and Mvungi (1982) contend that proficiency in the language of instruction is an important factor in educational performance. "The corollary of this is that lack of proficiency in the language of instruction, in our case English, results in poor performance in subjects taught in English" (Qorro, 2008). Elsewhere, studies by Cummins (1979, 1981) and Krashen (1985) urges that poor performance in the language of instruction results in poor performance not only in other subjects, but also in overall poor performance in the second or foreign language. These findings have been confirmed by studies in Tanzania by Roy-Campbell and (Qorro, 1987) and (Qorro, 1999). In these studies, it has been noted that, when students have a firm grasp of their specialized subjects, that understanding gives them a firm ground on which to build the foundation for learning a second or foreign language, in this case English. However, this firm grasp/understanding, which is central to the quality of education, can only be achieved when teachers and students understand the language of instruction. In the secondary schools and higher education's classrooms in Tanzania, the language of instruction which is English, is not well understood by the majority of teachers and most students (Qorro, 2008). What is happening in the classroom interaction is that the instructors explain concepts using Kiswahili and some cases especially in primary schools where language of instruction is Kiswahili clarifications is done through classes.

Generally, the reviewed literature above has helped us to know and understand the way language has been used in different aspect of life, such as in education activities or how language can be used in the schools or the examination of Africa Languages as Tools for National Development. However, the limited data are established on how Bantu Mother Languages can contribute socio-economical development through media. Bantu Mother Languages have been chosen in this article believing that been used by majority in the different communities in Tanzania, especially, in rural areas. It should be well known that selection of Bantu Mother Languages for broadcasting, it does not mean that other languages such as English, Chines, Germany and French cannot contribute in socio-economic development. These languages can be taken to be complementing with Kiswahili and other Bantu Mother languages in Tanzania.

Theoretical framework

This study is underpinned by Exploratory Approach which was proposed by Thornborrow (1998) as a framework for analyzing the contribution of Bantu Mother Languages to Tanzania socio-economic development through Thornborrow framework, media has been used for many different purposes which includes: for information, for entertainment and for education. The news has been listened on radio and television for information about local, national and international events. The aim of communication for development is to find out strategies for mobilizing people and consequently resources needed for socio economic development. It facilitates people's participation at all levels of development efforts from problem identification to problem solution implementation and evaluation. Through communication for development, development beneficiaries are protagonists of the projects as they come up with solutions that aim at improving the conditions and quality of life of people both rural and urban areas.

Bamidele (1999) as cited in Upah (2008:3) confirms that "language plays an important role in national development as it fosters understanding, unity and sense of belonging among the various members of the different ethnic and social groups that constitute a nation." In other words, socio-economic development in any nationals such as Tanzania, ranges from growth in politics to economy, science and technology, education and health. Information in these areas is transmitted through language. Language is used to achieve proper co-ordination of activities that relate to more developmental context.

This study sees this framework is appropriate since it can be applied to assess how Radio as a media can broadcast through mother languages to provide information through broadcast to the communities, thus triggering development. Tanzania Broadcasting Cooperation (TBC), Radio UTUME, owned by Tanzania Lutheran Church (KKKT), SAFINA Radio owned by Safina Ministry. These radio stations covers a large part of Tanzania with programs that attract the use of ethnic community languages, for instance Mashami, Makua, Sukuma, Nyakyusa, Gogo, and Haya.

3.0 Methodology

The study used a descriptive design because of the study aims at discovering the domain preference in broadcast and insights. The research design involves identifying participants for the research, and preparing for data collection activities that comprise the research process (Creswell 2002). This study adopted qualitative research design because it is necessary for descriptive purposes and it allows the researcher to test the validity of certain claims and assumptions in the real-world contexts. The study targeted speakers of Bantu languages in rural area. They were participating in the activities of social, political and economical development. Stratified random sampling based on provincial representation was utilized to select 40 speakers from 5 Bantu Mother Languages which are Makua, Mashami, Sukuma, Gogo, Haya and Nyakyusa.. The methods for collecting data for this study were largely qualitative which involved

Documentary Review, reviewing and analyzing of contents from national language policy document (2014) and theoretical literature to gain deeper insists on mother language and role of radio broadcast in dissemination of information. Whether conducted other supplementary searches from other non-published searches like newspaper for example the newspaper that was used by Mashami Community Members known as KOMKYA means KUMEKUCHA 'GOOD MORNING'.

Focus Group Discussion, the explanatory sequential design in this approach a research first collected qualitative data and then collecting data to help explain or elaborate on the qualitative results.

Standardized questionnaire. Also, the study used a standardized questionnaire for data collection. The data collection instrument is often very crucial to the success of a research also thus can determine an appropriate data collection method.

Survey data was first collected followed by organized interviews with aim of collecting insightful data for the study. In the organized interview, the radio listeners were asked to indicate which program they propose it could be much better be broadcast in which language. Also, the focus of attention in the study was to explore the perception and experience of the participants

4.0 Result and Discussion

The preferred language broadcasting in the Society

To achieve this, respondents were required to respond this question: Which language is used in the society? Where the respondents were required to choose among Kiswahili, Mashami Language and English, the result were tabulated as follows

Table 1: The preferred language broadcasting in the Society

Language	Frequency	Percentage %
Kiswahili	15	38
Mashami	20	50
English	5	12
Total	40	100%

Source: Field Research, February 2019

The table (1) from the respondents towards on the specific question '**Which language is used in the society?** The respondents provided the responds that 38% of the speakers preferred to use Kiswahili, 12% of the speakers preferred English and 50%of the speakers preferred Mashami. Majority of the society mention the contributions of Bantu Mother Languages in Socio-economic development.

Broadcasting facilitates business Activities

Given Swahili, English, and Indigenous language, which one would you prefer most in radio broadcasting Business activities?

To achieve this, respondents were required to respond this question: **Which language is used to facilitate Business Activities in the society?** Where the respondents were required to choose among Kiswahili, Sukuma and English, the result were tabulated as follows

Table 2: The preferred language broadcasting in the Society

Language	Frequency	Percentage %
Kiswahili	10	26

Sukuma	25	63
English	5	12
Total	40	100%

Source: Field Research, February 2019

The table (2) from the respondents towards on the specific question '**Which language is used to facilitate Business Activities in the society?**' The respondents provided the responds that 26% of the speakers preferred to use Kiswahili, 5% of the speakers preferred English and 63% of the speakers preferred Sukuma. The contributions of Sukuma through media were mentioned in different perspectives. In business, the language can contribute more whereby speakers prefer to use his/her native language rather than Kiswahili or English. Anyone who wishes to do business with a foreign country can make the mistake of thinking that everything that works in one's own country will work in other countries.

Mother language and social relation

Given Swahili, English, and Indigenous language, which one would you prefer most in radio broadcasting Traditional ceremony, Weddings and marriage issues?

To achieve this, respondents were required to respond this question: **Which language is used in social relation in the society?** Where the respondents were required to choose among Kiswahili, Makua and English, the result were tabulated as follows

Table 3: The preferred language broadcasting in the Society

Language	Frequency	Percentage %
Kiswahili	8	20
Makua	30	75
English	2	5
Total	40	100%

Source: Field Research, February 2019

The table (3) from the respondents towards on the specific question '**Which language is used in social relation in the society?**' The respondents provided the responds that 20% of the speakers preferred to use Kiswahili, 5% of the speakers preferred English and 75% of the speakers preferred Makua. Different media have been using mother language to states how mother language has been used to emphasize social activities. 30 participants indicated that it is important for the media to use mother language, mother language is closely linked to our social relationships and is the medium through which we participate in a variety of social activities. This fascinating study explores the important role of language in various aspects of our social life, such as identity, gender relations, class, kinship, status, and hierarchies. Drawing on data from over thirty different languages and societies, it shows how language is more than simply a form of social action; it is also an effective tool with which we formulate models of social life and conduct. These models - or particular forms of social behaviour - are linked to the classification of 'types' of action or actor, and are passed 'reflexively' from person to person, and from generation to generation. Providing a unified way of accounting for a variety of social phenomena, this book will be welcomed by all those interested in the interaction between language, culture, and society.

Mother language facilitates Religious matters

Given Swahili, English, and Indigenous language, which one would you prefer most in radio broadcasting religious activities?

To achieve this, respondents were required to respond this question: **Which language is used facilitates Religious matters in the society?** Where the respondents were required to choose among Kiswahili, Gogo and English, the result were tabulated as follows

Table 4: The preferred language broadcasting in the Society

Language	Frequency	Percentage %
Kiswahili	15	38
Gogo	20	50
English	5	12
Total	40	100%

Source: Field Research, February 201

The table (4) from the respondents towards on the specific question '**Which language is used to facilitate religious matters in the society?**' The respondents provided the responds that 38% of the speakers preferred to use Kiswahili, 12% of the speakers preferred English and 50% of the speakers preferred Gogo. Religion is another important element in most societies. The impact of religion in the business world varies from country to country, according to the legal system of each, the homogeneity of the religious creeds and their tolerance with other religions. Religion also affects the type of products that consumers buy and the seasonality of some purchases. Religious restrictions are also imposed to individuals affecting their capacity for work as well as their availability for the work journey.

Mother language and local political rallies

Given Swahili, English, and Indigenous language, which one would you prefer most in radio broadcasting Political rallies?

To achieve this, respondents were required to respond this question: **Which language is used for local management in the society?** Where the respondents were required to choose among Kiswahili, Nyakyusa and English, the result were tabulated as follows

Table 5: The preferred language broadcasting in the Society

Language	Frequency	Percentage %
Kiswahili	4	10
Nyakyusa	32	80
English	4	10
Total	40	100%

Source: Field Research, February 2019

The table (5) from the respondents towards on the specific question '**Which language is used to facilitate local management in the society?**' The respondents provided the responds that 10% of

the speakers preferred to use Kiswahili, 10% of the speakers preferred English and 80% of the speakers preferred Nyakyusa. In practical terms, the success of organization is closely related to its capacity of reading, analyzing and giving answers to the region's cultural particularities where it acts. The globalized world intensified the presence of foreign organizations in all continents giving more attention to the cultural differences. 14 participants present an impact in many dimensions of the management activity, such as marketing, production, people, and financial-accountancy. In the marketing area, culture has a strong impact in the moment that influences tastes, preferences and customs of the consumers. This makes the company adjust its advertising policies, promotions, product development, location and pricing to the cultural specifications of the local community. In the production area, however, cultural influences the manner, the schedules and the individual and group activities. The ones responsible for the management of the production units abroad need to know the local culture in order to avoid their values clashing with local values.

Mother language facilitates cultural activities in traditional ceremony

Given Swahili, English, and Indigenous language, which one would you prefer most in radio broadcasting Traditional drums and other cultural activities?

To achieve this, respondents were required to respond this question: Which language is used facilitates cultural activities in invitational ceremony? Where the respondents were required to choose among Kiswahili, Haya and English, the result were tabulated as follows:

Table 6: The preferred language broadcasting in the Society

Language	Frequency	Percentage %
Kiswahili	5	12
Haya	20	50
English	15	38
Total	40	100%

Source: Field Research, February 2019

The table (6) from the respondents towards on the specific question 'Which language is used to facilitate cultural activities in invitational ceremony in the society**?**' The respondents provided the responds that 12% of the speakers preferred to use Kiswahili, 38% of the speakers preferred English and 50% of the speakers preferred Nyakyusa**.** Language is another important element of culture. Language organizes the way members of a society see the world. In addition, language gives important clues about the cultural values. The presence of more than one language in a country is an indicator of diversity in the country's population. Although countries with the same language should not be seen as countries with the same culture. It is the language community of the mother language, the language spoken in a region, which enables the process of enculturation, the growing of an individual into a particular system of linguistic perception of the world and participation in the centuries old history of linguistic production.

Challenges on the idea of using Mother Languages in broadcasting socio-economic domains in Tanzania

Psychological Challenge

It is clear the psychological problem has been continuing to grow in such a way that using of Bantu mother language is an old fashion or uneducated perception. This creates challenges in promoting Bantu Mother Language to be used in socio-economic development through broadcast. Some speakers of the mother language fail to use their first language due to the bad perceptions that they have about Bantu Mother Languages. In psychological challenge, the speaker fears to use his/her language because of bad beliefs.

Lack of effective National language policy

Language policy is the very sensational aspect of developing language in a different areas or community. Lack of effective National language policy creates a challenge in implementing or developing plans right about how language can be used in a different society. In Tanzania, language policy states how Kiswahili and English should be used in different places or context. Unfortunately, the language policy does not explain the way Bantu Mother Language should be used or given a certain status in Tanzania while Bantu Languages have majority status.

Development of science and technology

The development of science and technology regardless of its importance in the world is definitely creating challenges towards the development of Bantu Mother Languages in Tanzania. Products have been made up and absolutely explained by either Kiswahili or English. This is challenge in implementing Bantu Mother Language to be used in different media in Tanzania.

Superiority and Inferiority discernment

This challenge is enormously created by some speakers in the communities. Superiority and Inferiority discernment is created by speakers themselves, what is created here? is definitely unnecessary question; which is superior or inferior language in a community?.This controversy is created by speaker, whereby, to select the uses of any language in a media to facilitate socio-economic development fails because that perception among the speakers in the society.

5.0 Conclusion and suggestions

Tanzania needs to undertake a thorough review of their language situation and establish policies which are consonant with their national aspirations, optimum utilization of the national linguistic resources and the ultimate national goal. Such a goal should include not only economic development, but a truly democratic and harmonious way of life. Not all languages need to be accorded the same role or status or to be used in media. The positions and domains of use of each of the languages in a country could be determined by its relative demographic and socio-political position in that country. Hence, a hierarchy of language use could be established.

Bantu Mother Language facilitates integration, unity, economic well-being, mass participation in government, and educational growth, the socioeconomic development emphasizes progress in terms of economic and social factors with a geographic unit. Economic development is the

process of raising the level of prosperity through increased production, distribution and consumption of goods and services.

References

Bamgbose, A. (2011). African languages today: The challenge of and prospects for empowerment under globalization. In selected proceedings of the 40th annual conference on African linguistics, ed. Eyamba G. Bokamba et al., 1-14. Somerville, MA: Cascadilla Proceedings project.

Batibo, H, M. (2005). Language decline and death in Africa: Causes consequences and Challenges. Clevedon/Buffalo/Toronto: Multilingual Matters Ltd.

Simire, G. O. (2004). Developing and promoting multilingualism in public life and society in Nigeria. In New language bearings in Africa: A fresh quest, eds. Margaret, Jepkirui Muthwii, and Angelina, Nduku Kioko, 135-147. Clevedon/Buffalo/Toronto: Multilingual Matters Ltd.

Simpson, A. (Ed.) 2008. Language and national identity in Africa. Oxford: Oxford University Press.

Qorro, M. A. S. (1999). A Qualitative Study on the Teaching and Learning of Writing in Tanzania Secondary Schools in Relation to Writing Requirements of Tertiary Education', unpublished Ph.D. Thesis, University of Dar es Salaam

Qorro, M .A.S. (2008). Does Language of Instruction Affect Quality of Education? Available online http://www.hakielimu.org/hakielimu/documents/document101does_lang_instruc_fct_qual_edu_en.pdf

The Contribution of ICT in Teaching and Learning Tone of Tanzanian Bantu Languages

Joseph Hokororo Ismail, Institute of Judicial Administration LUSHOTO, P.O BOX 20, LUSHOTO- TANZANIA, (cell. +255-683500225); jihokororo@yahoo.com

Abstract

This paper was intended to discuss the contribution of Information Communication Technology (ICT) in teaching and learning tone of a given language. The paper urges that apart from depending only traditional education technology and methodology in learning and teaching, ICT can contribute successfully in teaching and learning tone. In traditional perspectives, it is believed that teaching and learning of subject matters is very much related and necessitated by offering training on formal settings which involve classroom interaction an organized classroom with hardcopy books and other related matters. With the development of ICT, and the rise of network, the correspondence and interaction through networking has expanded globally. One of the tools used in teaching and learning of Tone is ICT, specifically Computer. The theoretical framework adopted in this paper are Classic learning theories which include behaviorism (Skinner, 1953), Cognitivism (Gagne, 1984) (Akinsanmi, 2008). Qualitative approach was employed to involve the researcher's interpretation of linguistic narrative data which were obtained from the documentary reviews and focus group discussions done by respondents both students and instructors on tone class by giving them freedom of expression on how ICT was facilitated them tone learning. The study was carried out in two programes in MA. Linguistics class, in one university. This study used three methods such as focus group discussion*, interview and documentary review.*The findings of the study were: (i) that ICT facilitates teaching of tone through application of symbols and equations that couldn't be possible or difficult in using free hand drawings, (ii) easy manipulation of sounds and tone marking strategies of which the mechanical listening of sounds through ear that may miss- lead tone interpretation has facilitated the accuracy tone analysis. The conclusions drawn from this study were that the Institutions which are involved in teaching tonology can get use of ICT technology in a very formal way thus contributing to high level of mastering the of subject matter with a minimum time waste. The paper recommends that both learners and instructors should be ICT illiterate and get use of it as through establishing computer laboratory to enable students to have an access to computer facilities, thus contributing to sustainable development in terms of human resource utilization and innovation.

Key words: ICT**,** network, social media, language, teaching, tonology, Bantu

Introduction

This paper assesses the contribution of ICT in facilitating teaching and learning of tone, one of aspects of suprasegmentals phonology. Before we proceed to our discussion, it's important to explain, briefly, ICT and tone. Technology refers to the application of scientific knowledge to the practical aims of human life or as it is sometimes phrased to the change and manipulation of the human. The first attempts to integrate personal computers into the sphere of language teaching were taken in the late 1980's which opens up thousands of possibilities to revise and improve teaching including teaching tone (Chernov, 2014). The adoption of new science and technologies has led to significant changes in teaching and learning of tones of a given language (Nurutdinovaa et al, 2016). The use of ICT transforms traditional teaching and assists the adaptation of new curricula and new courses in existing applications (Nurutdinovaa et al, 2016). In any classroom, ICT is of a great value since it is an aid to comprehension; that the ICT promotes learners' response to literary texts, it promotes language awareness, and it increases learners' motivation (Zainal, 2012). On the other hand Tone in linguistics refers to pitch variation that affect the meaning of a word (Hyman, 2000). Hyman (2014) describes tone as a linguistic term for a phonological category distinguishing two utterances. For instance, in Makhuwa language the word */ukwa/* can mean to cease if the tones on each syllable are Low,

but it may mean to come if the syllable has a High tone on the infinitive prefix /u/ while the second syllable known as the final syllable has a Low tone. Therefore tone is an important feature of African tone languages because meaning and production of the syllables, words, phrases and sentences are severely guided by the tonal patterns of a language. Tone can also contributes to both lexical and grammatical contrasts. Therefore, any lexical or grammatical construction in African tone which is not properly tone-marked automatically may mislead the tonal analysis.

Also, it can be urged that the study of tone is so complicated even to the native speakers of a given language. This necessitates the need to teach and study tone using modern strategies. This paper intended to explore the contribution of ICT in teaching tone of Bantu languages in Tanzania. The study will be significant in the field of phonology as it will insist and promote the necessity of using new technological strategies of learning tone instead of depending only on traditional approaches and methodologies that depended only a mere traditional way of tone identification This will be the basis to a successful teaching and learning of tone with high performance.

Literature Review

The assessment on contribution of ICT in facilitating teaching and learning in education perspectives, has been discussed in a number of academic work. In this paper, we will briefly review works that seems close to our topic of investigation. Most of the studies urges challenges teaching and learning prior to ICT innovation.

Orie (2006) found that there were several challenges in learning and teaching tone through traditional approach such as problem of tone identification, time wastage, misleading in tonal analysis and even problems that relate with tonal convections that are used in tone marking. Drawing examples from Yoruba, one of the Bantu language, Orie reports that typically, Yoruba tone is taught through an Intuitive-imitative approach. This approach assumes that a student's ability to listen to and imitate the rhythms and sounds of the target language will lead to the development of pronunciation without the intervention of any explicit information. This approach crucially uses repeated pronunciation drills, which are supposed to enhance word and tone memorization. The problem with this approach is that it focuses on lexical tones. Post-lexical or syntactic tones, on the other hand, are rarely taught. The approach used sounds simple and logical but in general, it is not very effective. Due to that ineffectiveness and even frustrating the learner, the use of ICT has helped much in teaching and learning tone in Bantu language.

Tsai (2012) on the other hand asserts that learning the tones of Mandarin Chinese usually presents challenges to new students. Practice is the key to developing the areas of the brain that are needed to process tones. The listen-and-repeat drills that have traditionally been used extensively for teaching Bantu tone are ideal for the study, but using traditional mechanical approach creates boring and it may mislead the whole tonal analysis.

Marlo (2011) on his discussion on Teaching and learning tone of a given language indicated difficulties that learners are likely to face when interpreting pitches with traditional approach because when listening to a speaker because what is heard in fact are not tones rather we hear pitches. For that reason there is a need to employ ITC in teaching and learning for accuracy as much as possible. The same observation was noted by Hyman (2014) who suggested a need for ICT application in marking pitch on every vowel as well as on every syllabic sonorant consonant because there is no universally accepted phonetic transcription for pitch. This requires hearing

from native speakers of the language, but the problem comes on the procedures of recognizing the right pitch contours and other tonal related aspects. Traditionally, teachers and learners have to hear from the native speakers through hears direct from the speaker. In other words, traditionally, tone is realized by assuming pitch contours something which can lead to difficultness to differentiate the high pitch (H) or low pitch (L) but labels such as "falling" or "rising" are often not sufficient to describe the tones in a language (Schellenberg, 2013). This challenge marks much more difficult to teach and learn tone without the application of ICT Innovation (Holton, 2003). In this context, the application of ICT is necessary in teaching and learning of tones in very accuracy manner.

In a tonal discipline, especially after reaching sounds of a given language, teachers and learners are required to analyze tone in a given language. Whatever the approaches of analysis, traditionally, symbols and presentation of the analyzed tone have to be done using writing boards, papers or pads, chalks, pens, mark pens or typewriters. What complications that may be associated to tone learning and teaching on traditional orientations? Generally tone marking done the intuition approach in data analyzing can cause incorrect tone understanding because this approach is based on marking tone while a person is pronouncing a word. If person marking tones do not understand it may lead to unacceptable tone in specific language. For instance a linguist can mark a High tone in the place of Low tone because of improper understanding of tone but if this is done by recording the word by the PRAAT, may lead into consistency and soundness of such a word.

Kaoo (2004) indicated a challenge when marking tone in words without the use of technological devices like PRAAT, computer software used to analyze pitch sounds of languages in linguistics. Through the use of intuition approach alone in tone marking may lead to the failure of identifying proper tonal patterns of a language, such tonal patterns can be High tone (H), Low tone (L), Downstepped (D) depending how the behavior of specific language dictates.. For instance Ruhyoza, the Haya dialect consists of four tone patterns in Ruhyoza Nouns as elaborated by Kaoo (2014) in the following illustration:.

(1)	a) e ka	é ka	"a family"
	b) e nyi ndo	é nyi ndo	"a nose"
	c) o mu li ro	ó mu lí ro	"fire"

Muzale (2006) observed that, marking tone without technological instruments like PRAAT, can lead to wastage of time hence the researcher can waste his or her time in marking tones and because using the intuition approach in data analysis is like predicting tone marking on the certain leads one to remarking tones several times accompanied by deletion which result into time consuming.

(2)	a) úkwa	"to die"
	b) úlya	"to eat"

In this marking in (2) ICT can clearly show the accuracy the status of tone.

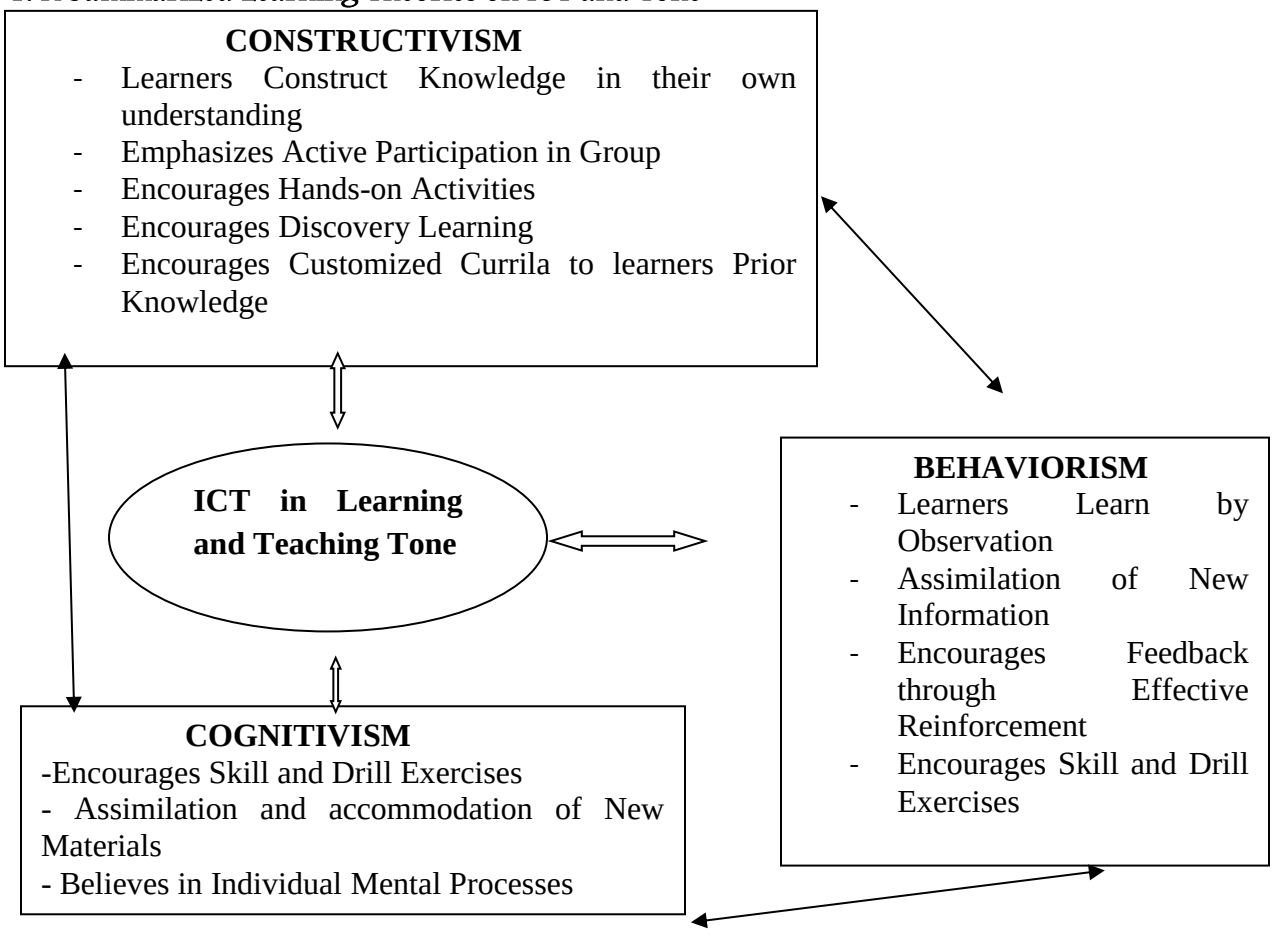
The reviewed literatures indicates the problems that can be associated with the traditional approach of teaching and learning tone of any given language. Also the reviewed literatures, shows that little has been done on the contribution of ICT in teaching and learning tonology of

Bantu languages. Therefore, this paper focused on the contribution of ICT in teaching and learning tone of Bantu languages of Tanzania.

Theoretical framework

The theoretical framework adopted in this paper are Classic learning theories which include behaviorism (Skinner, 1953) which believe that learners learn by observation, assimilation of new information, drill and exercise, Cognitivism (Gagne, 1984) which encourages skills and drill exercise and accommodation of new materials and Constructivism (Akinsanmi, 2008) which emphasizes on learners construct knowledge on their own understanding and active participation in groups. The basic principles of these theories are summarized in figure 1 below. As these learning theories are not new, a reader is advised to consult the relevant literatures for more discussion.

Figure 1: A Summarized Learning Theories on ICT and Tone



Source: **Kasocsa and Koppony (2004)**

Methodology

The stud has two types of information required. The first information was that required to observe the challenges of teaching and learning tone to a given language and the second one was the information that wanted to illustrate the contribution of ICT in facilitating learning and

teaching tones. For the first aspect the study was carried out in Makhuwa speaking area in Masasi district at Mtwara whereby Makhuwa language is spoken. The researcher collected data in only one village known as Mikangaula. The area was purposely chosen to enable the researcher to get the required data hence the Makhuwa language is well spoken over the area and there is no strong influence of Kiswahili toward the Makhuwa. Also the researcher was well familiar with the place; therefore, it simplified the process of collecting data. The researcher purposely sampled the informants, the study required speakers who were pure speakers of the Makhuwa and fluently in Makhuwa. Then I recorded myself articulating the items which later on were then transferred into a computer system for speech synthesis or annotation using software PRAAT. The instruments used for this work were computer, earphone, microphone, and software PRAAT.

In the second aspect, the information were gathered during teaching and learning tone in one program which I taught tone, at Postgraduate program. The programs are MA linguistics from University of Dar es Salaam. Through Focus Group Discussion: The researcher employed this method by employing (43) participant in group discussion from (23 MA linguistics students); During the discussions in the field time, nine (9) participants were requested to articulate words whereby the first group of three (3) participants were requested to pronounce the group of one hundred (100) words in simple infinitive, the second group of three (3) informants were requested to articulate another one hundred (100) words with Makhuwa complex infinitives and finally the other group of three participants pronounced the final group of one hundred (100) words with Makhuwa simple and complex infinitives.

Data Recording

The researcher prepared three (3) participants for the recording process whereby the first two informants were recorded while articulating the first category of infinitive verbs which is the simple infinitive stems with one to seven syllables and the second two informants articulated the complex infinitive stems with one to seven. This tool was used in data collection due to the nature of the study which based on sound identification.

The researcher used the Adobe Audition, computer software to mark tone and analyse pitch sounds.

Data Analysis Strategies: Data collected were analysed as follows, the information obtained from the corpus of Makhuwa words were compiled and arranged according to the number of syllables starting with those consisting one syllable to those infinitives having more than one syllable in the data base. This enabled the researcher to realise the tonal patterns which were discussed considering the number of syllable of the verb stem they have.

Results and Discussion

ICT facilitates accuracy in tone marking

20 participants out of 23 indicated that the application of ICT in tone marking is effective in productions, acquisition, storage and retrieval of the recorded data for use. Also the tonal information that has achieved through ICT can properly data stored and easily be retrieved and used for future research. The following illustration indicates waves in tonal identification for the

infinitive /úlya/ which can be easily identified through ICT instead of a mere listening from the ear.

Figure (1): úlya

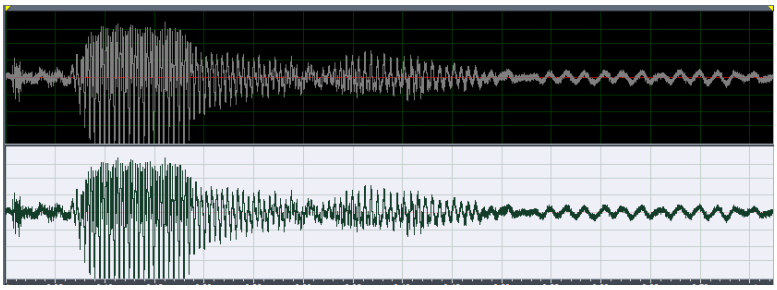


Figure (1) shows that words under simple infinitive stems in a wave forms whereby the strong wave presents the High tone /ú/ while the weak one presents the Low tone/lya/.

Therefore, a learner of tone can easily identify tone through the use technological devices like PRAAT which is computer software used to analyze pitch sounds to make effective use of the necessary technological technique of tone marking aid specifically for the analysis of tone in the era of technological developments.

ICT is Efficient in Tonal category Identification

In tonology, there is a great change of teaching and learning tone due to technology hence includes the use of PRAAT, computer software for the annotation of the pitch form which presents the number of tones a language consists, spectrographic reading can show the type of tonal patterns such as High tone (H), Low tone (L), Downstepped (D) in some languages, Low- High tone (LH) also known as Rising tone and High- Low tone (LH) also known as Falling tone. Through the use of technological devices, it is easier to identify the tonal patterns of a language rather than guessing. The participants also shows the effectiveness of tone marking on each syllable that a word consists, since tone is an abstract phenomenon, it is more practicable and easy to identify and appreciate the relative pitches on segments when displayed on a computer.

The distinction between each tone level is measured by the timing of the radiated frequency of the pitches on the right edge of the spectrograph. Therefore, this reveals the efficiency of tonal identification hence tone marking is more practicable and easy to be identified and appreciate the relative pitches on segments.

ICT Leads to Correct Pronunciation of tones

Technological tools like PRAAT computer software, displays the actual pronunciation of the word, tone marks have to be clearly written because the structure of the language requires it for accurate articulation which result into meaning of words, phrases and sentence. In order to mark tone correctly in a language, one should acquire the computer knowledge so as to make effective the necessary technological aids like PRAAT computer software

ICT enhances a feasibility study of the different patterns of tone

The use of ICT in the study of tone has led to the great changes specifically the feasibility study of different patterns of tone, it is now easy to identify the tonal patterns a language consists through the use of spectrographic reading which shows the type of tonal patterns such as High tone (H), Low tone (L), Low-High tone (LH) also known as Rising tone and High- Low tone (LH) also known as Falling tone. Consider the example below from the Haya language cited by Muzale (2006) who discusses the two types of tonal patterns in Haya language and these are High tone (H) and the Low tone (L).

2. a) kúhwa H 'to give'

b) kuhwa L 'to cease'

c) kusinga L 'to rub'

d) kusínga H 'to win'

In 2 display the tonal patterns of a Haya language which are the High and Low tones that are marked on such words.

These tones can be well marked by the use of PRAAT computer software used to analyze pitch sounds of /ukwa/ which consists of a High tone whereby the figure contains wave forms and each column contains the different sound of the segments and The distinction between each tone level is measured by the timing of the radiated frequency of the pitches on the right edge of the spectrograph.

Figure 2 ukwá

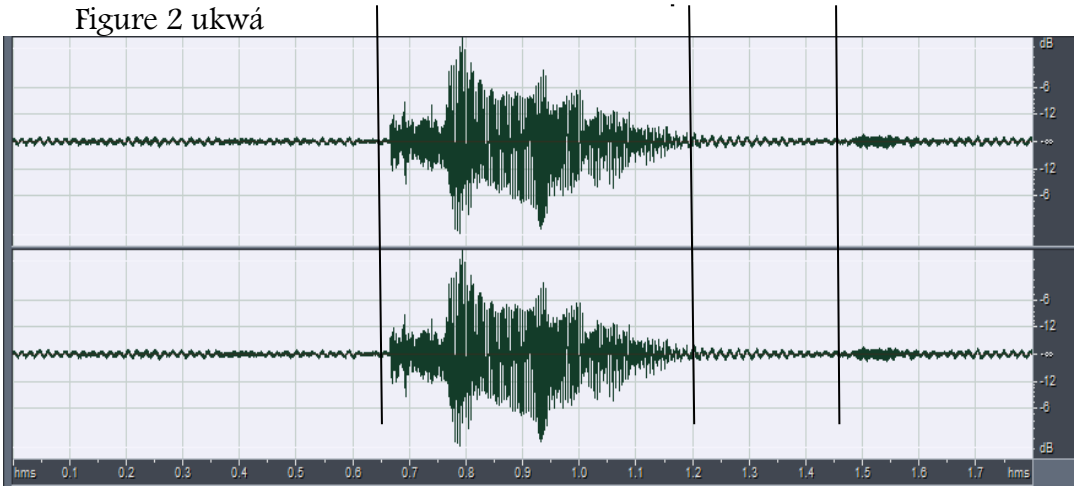


Figure (2) shows an acoustic analysis of High tone; /*ukwa*/ 'to give' H L. In this figure, wave forms, the strong wave indicates the High tone and each column contains the different sound of the segments and the distinction between each tone level is measured by the timing of the radiated frequency of the pitches. The application of PRAAT tool enhances the study of the tonal patterns of words as they are displayed on the spectrographic.

ICT facilitated learning of complicated tone system

In traditional education technology, it was difficult to identify tone of extreme complicated system of which a language may have low tone with super low, high tone with super high even a mid tone. In a sample, when students were given the following words in Kikamba and asked to articulate and one has to listen orally"

3.

e.i.à (Low) lake

è.i.o (Low) banana

ndá.a (High) louse

è.i.a (Low) weed

kóya (High) to eat

kokonà (Low) to hit (infinitive)

Source: Roberts-Kohno, R.R (2005)

The response on these tone feature didn't show any complicated tone forms apart of just L (low) and H (high). But when the same words were recorded using the Pratta and subjected to ICT tools, it shows the complicated tone system of which now it has the following tone pattern:

4.

è̏.i.a (Super Low) lake

è̏.i.o (Super Low) banana

nda´´.a (Super High) louse

e.i.à̏ (Super Low) weed

ko´´ya (Super High) to eat

kokonà̏ (Super Low) to hit (infinitive)

Roberts-Kohno, R.R (2005)

In these paradigms, the SH tone is interesting because it is the combination of the features of the High tone and the SL tone

In Bantu languages, there a variety of context of which a mora is followed by mora which bears a high tone in the same syllable. Essentially, this would result in a syllable with a rising tone. In tautosyllabic rising tones are prohibited in Makhuwa. A principal of Rising tone neutralization is active which causes such tone sequence to be resolved into level tones. Thus whenever a mora is followed by a mora which bears a high tone, the tonal node of the second mora in the syllable spread leftward, creating a level tone.

ICT enhances precision on the exact height of each tone

Technology provides the correctness and visible height of each tone, the analysis done by the technological instruments in linguistics specifically in tone marking shows the exactly height of each tone hence the distinction between each tone level is measured by the timing of the radiated frequency of the pitches and these tones are indicate in the wave forms whereby the wave which are strong indicates the High tones of the language and those which are weak in form signify the Low tones of the language. The complex infinitive stems with six syllables present the behaviuor of shifting and spreading of tone whereby the High tone of the first syllable of the stem is shifted to the penultimate syllable of the stem then the High tone of the object marker spreads three more syllables on the right side of the word before reaching the penultimate syllable, it is blocked by one Low tone followed by the High tone on the penultimate syllable and finally the Low tone on the final syllable of a word as in (3):

Figure 3: umútélángánilána “to fight for him/her for each other”

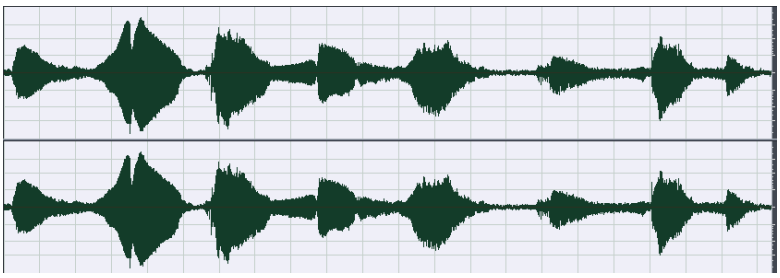


Figure (3) demonstrates the pitch sounds of the complex infinitive stems in category six which consist of Low tone followed by four High tones then Low tone followed by the High tone and lastly the Low tone as verified in figure (3) whereby the strong waves as usual present the High tones while the weak ones for the Low tones.

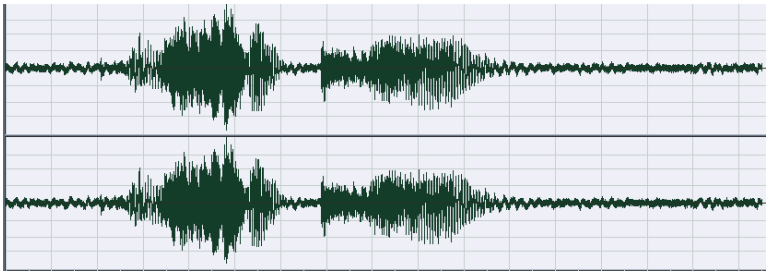
ICT facilitates the Storage of tonal information and retrieval

The application of ICT in tone analysis is effective in facilitating the storage of the tonal information and easily retrieval of the recorded tonal data that can be used for further researches. This is an advantage because data are kept safely in softcopies for future use rather than being kept in hardcopies where are easily to be lost, they can be stored in e-mails and websites. Apart from storage for retrieval, also the use of computer to analyze data provides the foundation for yielding fast and quick speed during the process of marking tone.

ICT enforces criteria for being consistency

Technological tools like PRAAT computer software used to analyze pitch sounds of a language implements the reasons for the analysis to be uniform without distinctions and complete. Technology also avoids under generalization and overgeneralization of the process of data analysis specifically in tone marking. Therefore, the use of technological devices like PRAAT software for the annotation of the pitch sound shows the number of tones a language consists, spectrographic reading can show the type of tonal a language consists since tone is an abstract phenomenon, it is more practicable and easy to identify and appreciate the relative pitches on

Figure (4) : uthékéla



In figure (4) illustrates simple infinitive stems in category three which consist of Low tone followed by two High tones and lastly the Low tone as indicated in figure (4) in wave forms whereby the sting wave stands for the High tone while the weak ones for the Low tones which are the infinitive prefix and the final syllable of the stem the High tones on the first syllable of the stem and on the penultimate syllable.

After examining the behaviour of complex infinitive stems with five syllables and rules that govern the assignment of tone in complex infinitive stems with five syllables, the following is the figure proving the pitch sounds of words under this category of complex infinitive stems in category five as done by an Adobe Audition.

ICT can facilitate tonal derivation

Tonal rules that govern an assignment of tone in complex infinitive stems with seven syllables are established by using the derivations and each rule at each stage is declared. Consider the derivation in (5) below: In (5) shows the extent of ICT can easily resolve the complicated tonal rules in */u rú kú nú sa/*

(5) Derived from.

*

u-rukunusa Accent Assignment

LHL Accent-BTM Association

*

u-ruku nusa 

LH L Tone Spread

u- rukun usa

L H H H L Melody Association and W F C

= u-rúkúnúsa Surface Representation

The derivation (5) the accent is assigned on the object marker and on the first syllable of the stem. The High tone of the first syllable of the stem shifts to the penultimate syllable because the accent on the first syllable of the stem is inferior to that of the object marker, which means the accent on the object marker is superior. Then the High tone of the object marker spreads three more syllables of the stem to the right side of the word then blocked by the third and fourth syllables of the stem which are Low toned.

Conclusion

This paper has discussed the advantage of using microcomputers in teaching and learning tone and intonation. Specifically, it has been demonstrated that the computer application has the advantage in making immediate and unlimited playback capacity compared to cassette or reel-to-reel tapes which must be rewound for each playback (Chun, 1989).

ICT has provided potentials for enabling teaching pedagogies and methods in tone teaching and learning because it enhances language learning is cooperative, authentic, and meaningful (Kumar & Tammelin, 2008). Students can listen, speak, read, write, and otherwise respond by using ICT tools in support of their language learning tasks therefore, simplifies teaching for language teachers so that they can the different needs of learners. Thus, it can be argued that ICT can transform a traditional lecture/drill-based CFL classroom into a more interactive and dynamic learning environment (Lin et al, 2014).

It has been observed in the cause of discussion that the instructor who teach tone rules through h Computer-Assisted Devices can perform in very accuracy manner as compared to the traditional ways of which a mere typewriters were employed. Individual sounds, word stress and basic intonation cab best be noted through computer application thus serving time and making learning accuracy.

Recommendation

Despite the advantages of using computers in teaching and learning of Bantu tone but the challenges are high which are attributed by the lack of many instructors to be computer illiterate. There is a concern of institutional may address on the problem of computer illiterates which can call the individual institutors and learners to make more efforts to mastery of computer applications. Few teachers use computers for teaching and learning purposes while the majority of them use computers for administrative purposes and personal use (Kafyulilo & Keengwe, 2013). This can also be realized in teaching and learning of tone. In spite of the technological advancement in education, phonology teachers and learners are still using traditional methods of teaching and learning tone thus there is a need of rethinking on the role of traditional tone teaching and learning and embarking fully to ICT application on tone teaching and learning.

References

Akinsanmi, B. (2008). The Optimal Learning Environment: Learning Theories. Retrieved 1 August 2011, from *http:// www.designshare.com/index.php/articles*.

Chernov, A. S. (2014). The Potential of ICT and Media-Technology in Foreign Language Teaching. *Вестник МГЛУ,* 3, 689.

Chun, D. M. (1989). Teaching Tone and Intonation with Microcomputers. *CALICO Journal,* 7(1), 21-46.

Holton, G. (2003). Shallow tone marking and literacy in Alaska Athabascan languages. *Proceedings of the 2003 Athabascan Languages Conference,* Arcata, California.

Hyman, L. M. (2000). Privative Tone in Bantu: Symposium on Tone. *ILCAA,* Tokyo, 12-16, 2000.

Hyman, L. M. (2014). How to Study a Tone Language, with Exemplification from Oku (Grassfields Bantu, Cameroon), Vol. 8(2014), 525-562

Kafyulilo, A. & Keengwe, J. (2013). Teachers' Perspectives on their Use of ICT in Teaching and Learning: A Case Study. *Educ Inf Technol*, DOI 10.1007/s10639-013-9259-7.

Kaoo, L. (2014). *An Investigation on the Tone Behaviour in Kiyoza-Haya Nouns*. St. Augustine University of Tanzania, (MA linguistics, Unpublished).

Kasocsa, L and Koppony, I (2004). Quality-Based Cooperative Technical Teacher Training. *The Journal of Technologies Studies.*

Kumar, S., and Tammelin, M. (2008). *Integrating ICT into language learning and teaching: Guide for institutions.*

Lin, C., Huang, C., and Chen, C. (2014). Barriers to the adoption of ICT in teaching Chinese as a foreign language in US universities. *Recall* 26(1): 100–116. 2014.

Marlo, M. R. (2011). Paradigms and Questionnaires: Studying the Verbal Tone System of a Bantu Language. University of Missouri.

Muzale, HRT. (2006*). Ikanigambo ya Oruhaya:* Kamusi ya Kihaya-Kiingereza-Kiswahili

Nurutdinovaa, A. R., Perchatkinaa, V. G., Liliya M. Zinatullinaa, L. M., Zubkovaa, G. I. and Galeevaa, F. T. (2016). Innovative Teaching Practice: Traditional and Alternative Methods (Challenges and Implications). *International Journal of Environmental & Science Education,* 11(10), 3807-3819.

Orie, Ọ. Ọ. (2006). *L2 Acquisition and Yoruba Tones: Issues and Challenges.* Selected Proceedings of the 36th Annual Conference on African Linguistics, 121-128. MA: Cascadilla Proceedings Project.

Roberts-Kohno, R.R (2005). Aspects of Kikamba Phonology: Syllabification and the Tone-Syntax Interface. Research Institute of Languages and Cultures of Asia and Africa (ILCAA) Tokyo University of Foreign Studies.

Schellenberg, M. H. (2013). *The Realization of Tone in Singing in Cantonese and Mandarin.* A thesis submitted in partial fulfillment of the requirements for the degree of doctor of philosophy in the Faculty of Graduate Studies (Linguistics) the University of British Columbia (Vancouver).

Skinner, B.F. (1953). Science and Human Behavior. New York: Macmillan.

Tsai, R. (2012). Teaching and learning the tones of Mandarin Chinese. Scottish Languages, 24, 43-50.

Wardhaugh, R. (1970). An Evaluative Comparison of Present Methods for Teaching English Phonology. *TESOL Quarterly*, 4(1), 63-72.

Zainal, A. (2012). ESL teachers' use of ICT in teaching English literature: An analysis of teachers' TPCK. Procedia - Social and Behavioral Sciences, 34, 234 – 237.

Usawiri Wa Vijana Katika Ujenzi Wa Jamii Mpya Katika Riwaya Teule Ya Kiswahili

JACKSON NDUNG'U MWANGI

IDARA YA LUGHA FASIHI NA ISIMU

CHUO KIKUU CHA LAIKIPIA

Email: jigmwas@gmail.com

Simu: 0720112251

NAIKISIRI

Katika utafiti huu, mtafiti ameonyesha nafasi ya vijana kama mawakala wa kuleta mabadiliko katika riwaya ya *Kidagaa Kimemwozea* iliyotungwa na Ken Walibora mwaka wa 2012. Hii ni kutokana na rai kwamba vijana ndiyo wengi katika jamii na wanatekeleza majukumu anuwai katika jamii.Utafiti wetu uliongozwa na Nadharia ya Uyakinifu wa kijamii ambao unajihusisha na utetezi wa wanyonge na ukombozi wao. Mtafiti amebaini kwamba vijana ni mawakala wa mabadiliko na wanaweza kuleta mchango ambao unaweza kuwafaidi wanajamii wote. Hii ni kwa sababu vijana ni wenye nguvu za mwili na maarifa ambayo wanaweza kutumia ili kuifunza jamii. Mtafiti alitumia mbinu za utafiti za maktabani na mtandaoni. Maktabani, mtafiti alisoma riwaya teule na makala tofauti kama vile tasnifu, riwaya na tamthilia zingine zinazohusiana na mada pamoja na vitabu vyenye maelezo kuhusu Nadharia ya Uyakinifu wa Kijamii. Pia, alitembelea mtandao na kuangalia masuala yanayohusiana na vijana na pia alisoma maelezo kuhusu Nadharia ya Uyakinifu wa Kijamii. Utafiti huu ulibaini kuwa vijana wanatekeleza majukumu chungu nzima katika jamii kama vile kupigana na utawala mbaya na ufisadi, kupambana na tamaduni potovu, kubadili mitazamo kuwahusu walemavu, kukabiliana na wizi wa miswada na kadhalika. Masuala haya yanadhihirisha wazi kuwa vijana wana jukumu la kipekee katika kuleta mabadiliko katika jamii.

Maneno elekezi.

Uyakinifu wa Kijamii, mawakala, ujenzi wa jamii mpya, mabadiliko chanya.

Mchango wa Kiswahili katika Upunguzaji wa Ajali za Vyombo vya Moto Barabarani: Mifano kutoka Madereva wa Magari na Pikipiki Tanzania

Joseph Hokororo Ismail, Chuo cha Uongozi wa Mahakama Lushoto, P. O. Box 20, Lushoto, Tanzania (Barua pepe: jihokororo@yahoo.com)

Ikisiri

Makala haya yanajadili mchango wa Kiswahili katika kupunguza ajali za vyombo vya moto barabarani. Tangu serikali ya Tanzania iboreshe miundombinu ya barabra baada ya uhuru, mwaka 1961, kwa kutengeneza barabara zenye upana wa kutosha na ubora wake,ilitegemewa kwamba kutakuwa na upungufu ama uondoshwaji kabisa wa ajali za barabarani. Kinyume chake, na kama inavyoonekana kwenye vyombo mbalimbali vya habari, hata baadhi ya wa-Tanzania wamekuwa wamepoteza maisha kwa ajili ya ajali za mara kwa mara. Baadhi ya sababu zilizotolewa na mamlaka husika ni pamoja na mwendokasi wa madereva, uchakavu wa magari (vyombo hivyo), kukosa umahiri wa uendeshaji na hoja zinazohusiana na hizo. Waandishi na wataalam hawajaangazia namna matumizi ya lugha ya maelekezo yanavyoweza kuchangia katika kupunguza ajali za barabarani ambazo hupunguza nguvu kazi ya taifa lile liwalo. Madereva wa vyombo vya moto Tanzania hutumia lugha kuu mbili za mawasiliano wanapoendesha vyombo hivi yaani Kiingereza kwa madereva wachache sana na Kiswahili kwa madereva wengi. Lengo la makala haya ni kuonesha kwamba Kiswahili kina mchango mkubwa katika upunguzaji wa ajali barabarani hasa kwa kuangalia lugha za maekelezo zinazotolewa barabarani kwa madereva na hata lugha ya kuelimisha madereva wa vyombo vya moto. Vibao na maelekezo yanayotolewa barabarani baadhi yake yapo kwenye lugha ya Kiingereza, lugha ambayo madereva wengi hawaifahamu wala kujua kilichoandikwa. Makala haya inaona kwamba mabango ya maelekezo haya, vitabu vya sheria za usalama barabarani na mafunzo na semina za muda mfupi na elekezi kwa madereva, zikitolewa kwa Kiswahili, zitachangia sana kupunguza ajali za barabarani. Makala imeangazia madereva wa magari na pikipiki kwa kuwa Watanzania wengi wanatumia vyombo hivi katika usafiri na shughuli za kila siku kuliko vyombo kama ndege, boti,treni na baikeli.

Maneno ya msingi: Vyombo vya moto, mabango, vibao, Kiingereza, Kiswahili

1.0 UTANGULIZI

Ajali za barabarani ni moja ya changamoto kubwa zinazoyakabili mataifa mengi duniani. Changamoto hii imekuwa na athari nyingi kwa jamii ikiwemo za kijamii, kiuchumi, kiafya, na kimaendeleo. Kwa mujibu wa ripoti na tafiti mbalimbali za usalama barabarani, ajali za barabari ni moja ya chanzo kinachoongoza katika kusababisha majeraha, ulemavu, na vifo kwa wingi. Kwa upande wa Afrika Mashariki, idadi ya raia wanaopoteza maisha na wengine kupata ulemavu wa kudumu inaongezeka mwaka hadi mwaka kutokana na ajali za njia za usafiri. Kulingana na utafiti wa Shirika la Afya Duniani uliofanywa mwaka 2016, kwa wastani, watu watatu kati ya kila watu elfu kumi hupoteza maisha katika nchi za Afrika Mashariki. Uganda iliripotiwa kuwa ilikuwa inaongoza ikiwa na idadi kubwa zaidi ya wanaokufa kutokana na ajali hizo huku ikufuatiwa na Tanzania, Rwanda, Kenya na Burundi (www.voaswahili.com).

Kwa mujibu wa Takwimu za Hali ya Uhalifu na Matukio ya Usalama Barabarani ya 2017 iliyotolewa na Jeshi la Polisi Tanzania (2018), katika kipindi cha Januari hadi Disemba 2017, jumla ya matukio makubwa ya usalama barabarani yalipungua kwa asilimia 41.5 ambapo matukio 6,022 yaliripotiwa nchi nzima ikilinganishwa na matukio 10,297 katika kipindi kama hicho mwaka 2016. Licha ya upungufu huo, idadi hiyo inadhihirisha kuwa ajali za barabarani bado zinapoteza ndugu zetu na nguvu kazi ya taifa. Ripoti hiyo inabainisha kuwa ajali nyingi zaidi zilizotokana na sababu za kibinadamu zilichangia kwa 86.5%, ubovu wa vyombo vya usafiri ulichangia 7.7% na sababu za kimazingira zilichangia 5.9%. Sababu za kibinadamu ni pamoja na uendeshaji wa hatari, uzembe wa madereva na watumiaji wengine wa barabara, mwendo kasi, mifugo isiyochungwa, kulipita gari lingine bila uangalifu, na ulevi. Ubovu wa

vyombo vya usafiri unajumuisha ubovu wa magari, hitilafu za taa za kuongozea magari barabarani; na sababu za kimazingira zinajumuisha moto, alama za michoro ya barabarani,vizuizi vya njia, ubovu wa barabara, na vivuko vya reli.

Wataalam wa maswala ya barabarani wanasema kuwa ajali nyingi za barabarani zinaepukika. Ni kutokana na ukweli huu, Tanzania imekuwa ikijitahidi kwa hali na mali kukabiliana na tatizo hili. Hatua hizo ni pamoja na kuboresha sheria ya usalama barabarani, kubadilishwa kwa Baraza la Taifa la Usalama Barabarani na mabaraza ya ngazi ya mkoa nchini Tanzania (kila mamlaka zinapobaini kuwapo kwa uzembe na umuhimu wa hatua hiyo). Hatua nyiingine ni kama ongezeko la faini kwa wakiukaji wa sheria za barabarani. Hivi karibuni imeshuhudiwa madereva wa mabasi ya mijini wakitakiwa kuwa na umri wa miaka 25 hadi 60, madareva wa mabasi ya shule na yanayosafiri masafa marefu wakitakiwa kuwa na umri wa kati ya miaka 30 na 60, na yeyote atakayeendesha zaidi ya saa nane kutakiwa kuwa na msaidizi. Kama hiyo haitoshi, imeshuhudiwa katika mkoa wa Mbeya, serikali ikiwaalika watu wa imani zote kwa ajili ya kuombea janga la ajali za mara kwa mara mkoani humo. Hizi ni dalili kwamba tunaanza kulivulia kofia tatizo hili ndio maana tumelipeleka kwenye mtazamo wa kidhanifu (kiimani) kuliko kisayansi.Kwa ujumla, ingawa nchi yetu ina taasisi na vyombo vingi vinavyohusika kwa njia moja au nyingine na usalama barabarani, kama vile Mamlaka ya Mapato Tanzania, Mamlaka ya Usafiri wa nchi kavu na Majini, Jeshi la Polisi, Jeshi la Zimamoto, Wakala wa Barabara Tanzania, Wizara ya Mambo za Ndani, na ya Ujenzi na Mawasiliano, tatizo la ajali za barabarani limeendelea kuwa tatizo sugu. Hii inapelekea wito wa tafiti mbalimbali kuendelea kufanyika. Hata hivyo, ipo haja ya kulitazama tatizo mbali zaidi ya miundombinu, mwendo kasi, uzembe, ubovu wa vyombo vya usafiri, na sababu za kimazingira. Ni kwa sababu hii, makala haya yanaangazia mchango wa Kiswahili katika upunguzaji wa ajali za vyombo vya moto barabarani hususani kutoka kwa madereva wa magari na pikipiki nchini Tanzania. Matokeo ya utafiti huu yanakusudiwa kuwa na umuhimu mkubwa kwa wana-lugha pamoja na mamlaka za usafiri kutokana na masuala yaliyoibuliwa na mtafiti, mathalani kupitia kuibuliwa kwa sababu nyingine ya matumizi ya lugha za kigeni inavyochangia katika kuchochea tatizo hili, pia kupitia mapendekezo yaliyotolewa na utafiti huu.

Malengo ya Utafiti

Lengo la utafiti huu lilikuwa ni kuchunguza mchango wa Kiswahili katika upunguzaji wa ajali za vyombo vya moto barabarani hususani kutoka kwa madereva wa magari na pikipiki nchini Tanzania.

Ili kufikia lengo kuu, utafiti huu uliongozwa na malengo mahsusi yafuatayo:

Kufahamu mtazamo wa madereva wa magari na pikipiki juu ya matumizi ya lugha ya Kiswahili na Kiingereza kwenye alama za barabarani nchini Tanzania.

Kutathmini mtazamo wa madereva wa magari na pikipiki juu ya matumizi ya lugha ya Kiswahili kwenye alama za barabarani nchini Tanzania.

Kutathmini mchango wa Kiswahili katika kupunguza ajali za vyombo vya moto barabarani nchini Tanzania.

2.0 MAPITIO YA MAANDIKO JARABATI

Ili kupata ulinganifu na kuongeza umakini wa utafiti huu, mtafiti alifanya mapitio katika machapisho yenye maandiko mbalimbali juu ya usalama barabarani kwa kiasi cha kutosha. Baadhi ya machapisho yaliyopitiwa ni kama ifuatavyo.

Han na wenzake (2010) walichunguza juu ya uelewa wa mambo ya usalama barabarani kwa wazungumzaji wa Kiingereza kama lugha yao ya kigeni nchini Australia. Msimamo wa watafiti hawa ni kwamba maarifa yoyote ya masuala ya usalama barabarani huanzia kwa madereva wanaojifunza kupitia kusoma machapisho mbalimbali kisha kuzingatia mambo yote ya usalama barabarani kulingana na uelewa wanaoupata. Mchakato huu hutawaliwa na mahusiano ya kijamii na utamaduni wa madereva wa jamii inayohusika kutegemeana na sera na maelekezo ya mamlaka za eneo husika. Kwa hivyo, lugha inachangia kwa kiasi kikubwa madereva kuelewa alama na mambo yote ya kuzingatia kwa usalama barabarani.

Akichunguza athari tabia za madereva kwa ajali za barabarani katika jiji la Tabuk nchini Saudi Arabia, Issa (2016) anaripoti kwamba takribani 87% ya madereva wa vyombo vya usafiri vilivyofanyiwa utafiti na waliosababisha ajali, wanaelewa alama za barabarani zilizoandikwa kwa lugha ya Kiarabu ilhali 52% pekee ndio wanaofahamu zile zilizoandikwa kwa lugha ya Kiingereza. Issa anaamini kuwa kiwango kidogo cha majibu sahihi kuhusu alama na utaratibu wa usalama barabarani vinaashiria mafanikio duni ya shule au taasisi zinazotoa mafunzo ya udereva kwa hivyo taasisi hizo hazina budi kuboresha mfumo wake wa utoaji mafunzo husika.

Katika utafiti alioufanya Akyüz (2017) anadai kuwa mawasiliano miondoko (hususani ya alama) ni lugha inayofungamana na utamaduni wa jamii fulani kwa hivyo utambuzi, tafsiri pamoja na tathmini ya alama (ishara) husika hutofautiana kati ya jamii na jamii. Kutokana na ukweli huo, Akyüz anachukulia kujiingiza kwenye utamaduni wa kigeni ni sawa na kufahamu maneno ya wimbo bila kujua mziki wake au kuujua mziki bila kujua mapigo. Anahitimisha kwa kusisitiza matumizi ya alama ambazo zina maana sawa kwa lugha zote.

Hammoudi na wenzake (2014) wanadai kuwa miradi na mikakati mingi ya masuala ya usalama barabarani vinajikita zaidi katika miundombinu na vyombo vyenyewe. Ni wataalamu wachache sana wanaojikita zaidi kwa watumiaji wa barabara. Ni kutokana na ukweli huo, wanahitimisha kwa kupendekeza uboreshwaji wa taarifa za usalama barabarani bila kuwasahau wageni wajapo huko Abu Dhabi. Waaidha, wanapendekeza vipimo vya vileo kwa madereva pamoja na kuhakikisha elimu inakuwa endelevu na si kuishiwa wakati wa kampeni maalum tu. Wanaongeza kwa kupendekeza elimu hiyo kuwalenga watoto, waenda kwa miguu na watumiaji wengine wa barabarani ikiwemo madereva chipukizi.

Krishnan na wenzake (2018), sambamba na yote yaliyobainika, wanapendekeza kuwa moja ya hatua zinazopaswa kuchukuliwa ili kukabiliana na tatizo la ajali za barabarani nchini India ni kutoa elimu kwa abiria na waenda kwa miguu. Elimu hiyo si budi ijumuishe sheria na taratibu za utumiaji wa barabara na hilo linawezekana kwa kutoa elimu kuanzia shuleni pamoja na kutumia mabango na njia za kielektroniki.

Katika utafiti uliofanywa na Jamson na wenzake (2005), huko New Zealand, ilibainika kwamba madereva waliopita kwenye alama zilizokuwa zimeandikwa kwa lugha moja ya kigeni (hususani kwenye kupunguza mwendo) walikuwa wazito kupunguza mwendo jambo linaloashiria kuwa alama au maelekezo yaliyoandikwa kwa lugha za kigeni huwapa tabu

madereva kutafsiri hali inayowapelekea kupunguza mwendo wakiwa wameshafika eneo husika (wakiwa wameshavunja sheria). Hali ilikuwa tofauti kwa maeneo ambayo alama hizo hizo zilikuwa zimeandikwa kwa lugha mbili. Katika maeneo hayo, madereva walionekana kuwa watiifu kwa kufuata maelekezo kabla ya kuyafikia maeneo husika. Watafiti hao wanahitimisha kwa kupendekeza matumizi ya lugha mbili au zaidi katika uandishi wa alama na maelekezo ya alama za barabarani.

Kwa ujumla, baadhi ya watafiti, kama vile Han na wenzake (2010), Issa (2016), Akyüz (2017), Hammoudi na wenzake (2014), Krishnan na wenzake (2018), pamoja na Jamson na wenzake (2005), wanazitazama sababu ajali za barabarani kwa mtazamo tofauti na ripoti zingine. Wao wanaenda mbali zaidi kwa kubaini alama na maelekezo ya usalama wa barabara kwa kuzifungamisha na utamaduni wa kila jamii. Wengine wanaona mafanikio ya alama na maelekezo hayo yanategemea sana uelewa wa walengwa hususani kutokana na kiwango chao cha umilisi katika lugha zinazotumika. Hata hivyo, suala la namna matumizi ya lugha ya maelekezo yanavyoweza kuchangia kupunguza ama kuongezeka kwa ajali za barabarani halijagusiwa kinagaubaga na waandishi au wataalam wengi. Ni kwa sababu hii, utafiti huu umejikita katika kuchunguza mchango wa Kiswahili katika upunguzaji wa ajali za vyombo vya moto barabarani hususani kutoka kwa madereva wa magari na pikipiki nchini Tanzania.

3.0 MBINU ZA UTAFITI

Utafiti huu ulitumia muundo wa kimaelezo ili kueleza kiuchambuzi mitazamo na maoni ya madereva wa magari na pikipiki kama ilivyojidhihirisha katika taarifa zilizopatikana nyanjani. Kadhalika, katika utafiti huu, mtafiti alitumia mkabala changamano katika ukusanyaji na uchambuzi data. Mtafiti alitumia mtindo wa maelezo ili kueleza tatizo kwa uyakinifu pamoja na muundo wa kiidadi kupitia majedwali.

Kwa upande wa eneo la utafiti; utafiti huu ulifanyika Mkoani Mwanza, Wilaya ya Nyamagana Tanzania. Kwa mujibu wa Sensa ya Watu na Makazi ya mwaka 2012, wilaya ya Nyamagana inakadiriwa kuwa na idadi ya watu wapatao 363,452. Utafiti huu ulihusisha kata zote 13 za wilaya husika. Kata hizo ni pamoja na Luchelele, Buhongwa, Butimba, Igogo, Igoma, Isamilo, Mahina, Mbugani, Mirongo, Mkuyuni, Pamba, Nyamanoro, na Nyamagana.

Katika usampulishaji na walengwa, utafiti huu ulihusisha jumla ya washiriki 260 wakiwemo madareva wa pikipiki 10 kwa kila kata na madereva wa magari 10 kwa kila kata. Mtafiti alichagua makundi haya kulingana na muda wa utafiti na kwa kuwa walengwa ndio walikuwa na taarifa sahihi za matumizi ya lugha katika alama za barabarani. Kwa hivyo sampuli ya washiriki ilisampulishwa kwa kutumia mbinu ya kusudio.

Kwa upande wa mbinu za kukusanyia data, mtafiti alitumia mbinu ya usimulizi mahojiano ya vikundi kwa madereva wa pikipiki na mbinu ya usaili uliofanyika kwa kila dereva wa gari. Mbinu hizi ziliteuliwa kulingana na upatikanaji wa kila kundi pamoja na kupata taarifa za kina zaidi, kwa sababu watafitiwa wanaweza kuuliza maswali na mtafiti pia anakuwa na uhuru wa kuuliza maswali zaidi ambayo ni vigumu kufanyika kwa kutumia mbinu nyingine kama vile ushuhudiaji, au hojaji.

4.0 UCHAMBUZI NA UWASILISHAJI WA DATA

Taarifa za utafiti huu zilipatikana kutoka kwa watafitiwa 260 wakiwemo madereva 130 wa pikipiki na madereva 130 wa magari. Mtafiti alitumia mbinu ya mahojiano ya vikundi ili kupata taarifa kutoka kwa madereva 130 wa pikipiki. Mbinu hii ilifanyika katika vikundi 26 ikijumuisha vikundi viwili kwa kila kata. Mbinu nyingine iliyotumika ni mahojiano yaliyofanyika kwa kila dereva wa gari. Mbinu hii ilitumika kwa madereva 130 wa magari ambapo kila kata walihojiwa madereva 10 wa magari.

Kutokana na majibu ya utafiti huu, madereva wote wa pikipiki 130(50%) waliopitia mafunzo walikiri kuwa mafunzo husika waliyapata kwa lugha ya Kiswahili. Kwa upande wa madereva wa magari, madereva 123(43.7%) walidai kuwa walipata mafunzo kwa lugha ya Kiswahili; na madereva 8(6.3%) pekee ndio waliosema walipata mafunzo yao kwa lugha zote mbili, Kiswahili na Kiingereza. Madereva wote walioshiriki katika utafiti huu walidai kuwa licha ya Kiswahili kutawala mafunzo ya usalama barabarani, mafunzo hayo hufanikiwa kwa kiwango kidogo sana kwa kuwa wakufunzi hulazimika kuchanganya Kiingereza na Kiswahili. Kutokana na hilo, walidai kuwa mara nyingi wanapata uelewa zaidi kwa kujisomea wenyewe au kupata uelewa zaidi kupitia uzoefu.

Mtafiti alihitaji kufahamu ikiwa mafunzo husika yalikuwa yanaeleweka kwa lugha ya Kiswahili au Kiingereza. Madereva wote waliopata mafunzo yao kwa lugha ya Kiswahili walisema kuwa kilichokuwa kinaelezwa kilikuwa kinaeleweka lakini kwa kuwa alama ambazo wanapaswa kuzifuata zipo katika Kiingereza, baada ya kusoma wanakuwa wanayakumbuka maelezo lakini alama zenyewe wanalazimika kuzikariri. Watafitiwa hao walisema kuwa masuala mengi wanayoyazingatia wanapokuwa barabarani yanatokana na uzoefu tu na juhudi binafsi baada ya kupatiwa mafunzo. Kwa hivyo, madereva wale wasio na juhudi binafsi katika kujifunza wanaambulia patupu.

Lengo la 1: Mtazamo wa madereva juu ya matumizi ya lugha ya Kiswahili na Kiingereza kwenye alama za barabarani

Mtafiti alihitaji kufahamu kati ya alama au maelekezo yaliyoandikwa kwa lugha ya Kiingereza na yale yaliyoandikwa kwa Kiswahili ni zipi zinazoeleweka vizuri kwa madereva. Washiriki wote walishiriki katika kujadili suala hili. Majibu ya watafitiwa katika maeneo yote hayakuwa na tofauti kubwa sana. Miongoni mwa madereva wote, madereva 242 sawa na 93.1% walidai kuwa wanaelewa zaidi alama au malekezo ya usalama barabarani yaliyoandikwa kwa Kiswahili kuliko yaliyoandikwa kwa Kiingereza; na madereva 18 (6.9%) pekee ndio waliosema wanaelewa vizuri zaidi Kiingereza. Wakifafanua majibu yao, wale waliosema wanaelewa zaidi alama na maelekezo ya Kiswahili, baadhi yao walidai ni kwa sababu Kiswahili ndio lugha wanayoifahamu vizuri zaidi kwa hivyo ujumbe unaokusudiwa wanauelewa kwa urahisi zaidi ukilinganisha na Kiingereza.

Madereva wengine kati ya hao waliohojiwa walisema kuwa Kiswahili ni lugha rahisi kwao kwamba maneno ya Kiswahili hayana utata na yanakuwa na maana sawa na maneno halisi yaliyopo katika maelekezo husika. Walisema hii ni tofauti na maneno ya tungo za Kiingereza katika alama au maelekezo ya usalama barabarani. Baadhi ya mifano ya maneno iliyotolewa ni maneno kama vile *"Slow Down", "Keep Left",na "Construction Ahead".* Katika madai yao walisema maneno hayo ya Kiingereza yanahitaji kukariri tafsiri zake barabarani kwa sababu

maneno husika hayana maana za moja kwa moja. Msisitizo zaidi uliendelea kuwekwa kwenye suala la kuelewa kwa kukariri maana au tafsiri za alama husika na siubayana katika kuelewa.

Katika vikundi vya madareva wa pikipiki, baadhi ya madereva walisema kuwa matumizi ya maneno ya Kiingereza yanawapa wakati mgumu kukumbuka tafsiri kila wakati wawapo barabarani hivyo inapotokea mawazo yako mbali ni rahisi sana kujisahau. Katika vikundi vingine, kwa hoja hiyo hiyo, walisema kuwa kulingana na maelekezo ya lugha hizo kuwa katika maneno tata ya Kiingereza yanafikia hatua yaonekana ya kawaida wala hawayatilii maanani sana. Mifano ya maneno yanayoonekana ya kawaida ni kama vile:

In - Kuingia

Out - Kutoka

No Entry – Usiingilie Hapa (Hakuna Njia Kuingia)

No Exit – Usitokee Hapa (Hakuna Njia Kutoka)

Uwezo mdogo wa kumudu lugha ya Kiingereza huchangia ajali za barabarani.Hii inatokana na ukweli kwamba madereva wengi hawafahamu tafsiri au maana ya alama zilizoandaliwa kwa lugha ya Kiingereza bila kuwa na tafsiri ya lugha ya Kiswahili. Tunaona mfano wa maelezo yaliyoandaliwa kwa Lugha ya Kiswahili katika kielelezo (1) hapa chini.

Kielelezo 1: Mfano wa Kibao chenye Tangazo lisiloeleweka



Katika kielelezo (1) hapo juu *keep left* na *overtaking* liliweza kufahamika na madereva wengi walihojiwa lakini neno *unless* halikufahamika.

Kwa baadhi ya madereva wa magari, walidai alama zilizoandikwa kwa lugha ya Kiingereza hazitiliwi maanani. Baadhi ya madereva hao walisema kuwa matumizi ya lugha ya Kiingereza

hupelekea alama husika kuonekana kama mapambo ya barabarani tu kwa kuwa hayapewi uzito na madereva. Katika kielelezo (2) madereva 50 walioshiriki kujua matumizi yake na hata ikawa n mazoea ya kukiona cha kawaida wawapo barabarani.

Kielelezo 2: Mfano wa Kibao chenye Alama zisizoeleweka



Katika kielelezo (2) madereva kulikuwa na mkanganyiko wa maana ya alama hii kati ya madereva walihojiwa . Hii inaonesha kwamba suala la lugha alama na matumizi yake barabarani bado ni changamoto kubwa kwa madereva. Mfano zaidi ni alama zilizowachanganya madereva kuhusu matumizi yake ni kielelezo (3) hapa chini:

Kielelezo 3: Mfano wa Kibao chenye Alama zinazochanganya



Kadhalika, mtafiti alihitaji kufahamu kama madereva wanazielewa vema alama za barabarani. Walio wengi walisema wanafahamu vema alama chache lakini zilizo nyingi wanazisahau maana yake. Mmoja wa madereva hao alisema kuwa kunakuwa na ugumu kuelewa alama hizi zinapofundishwa kwa Kiswahili, jambo ambalo alidai linaleta mkanganyiko katika tafsiri zake. Wengine katika vikundi walidai ili alama husika zieleweke kwa urahisi si budi zifundishwe kwa lugha ya Kiingereza na wengine walisema alama hizo zinapaswa kuwa kwa Kiswahili ili watumiaji wa barabara wazielewe moja kwa moja bila kukariri.

Aidha, mtafiti aliuliza kama kuna ajali za barabarani zinazotokea zikitokana na tatizo la lugha. Asilimia 90 ya washiriki wote walikubali kwamba suala la lugha linahusika kwa kiasi kikubwa kwa sababu kutokana na mkanganyiko wa lugha kuna alama zinatafsiriwa tofauti na inavyotakiwa. Kwa ufafanuzi wa ukweli wa jambo hilo ilibainika kuwa alama zilizo katika lugha ya Kiingereza huwafanya madereva wasiwe makini barabarani na wasitilie maanani malekezo husika. Washiriki hao walisema kuwa wakufunzi wao pia huonekana kukanganywa na tafsiri ya alama husika kwa Kiswahili. Kwa mfono kielelezo (4) kinachoonesha jinsi kibao kinavyotumia lugha mbili huku kukiwa na tafsiri yenye ukakasi au isiyokubalika.

Kielelezo 4: Mfano wa kibao kioneshacho alama mkanganyiko na Changamoto za Tafsiri



Kama inavyonekana katika kielelezo (4) kuna lugha mbili Kiswahili hakuna kupita na Kiingereza *no overtaking.* Tukiangalia kwa makini matini ya lugha chanzi hakuna kupita tafsiri yake sahihi kwa lugha Kiingereza ya Kiingereza haiwezi kuwa *no overtaking.* Tafsiri ingeweza kuwa No passing au no crossing na nyingine zinazoelekeana na hizi. Alama zenyewe zilizo ambatana na tangazo hizo (kielelezo 4) pia zinahitaji ueledi wa kutafsiri ya alama/picha.

Aidha, mtafiti alihitaji kufahamu kama madereva wanajisomea mambo ya usalama barabarani hususani alama na maelekezo. Majibu ya swali hili yalidhihirisha kuwa walio wengi hawajisomei masuala haya. Wakitoa sababu za kwa nini hawasomi, walidai kwamba matini za mambo ya usalama zilizo katika lugha wanayoimudu (Kiswahili) ni chache na zilizopo hazina maarifa wanayokuwa wakiyatafuta. Wale waliosema wanajisomea, walisema wanapenda kujisomea matini zilizoandikwa kwa Kiswahili tu. Hata hivyo, majadiliano ya hoja hii yalifikia hitimisho kwamba kiwango cha usomaji wa masuala ya barabarani ni kidogo sana kwa sababu matini za Kiswahili ni chache sana. Wengine walidai kwamba hata matini za Kiswahili hawazisomi sana kwa sababu wanaamini watakanganyika kwa kuwa alama zenyewe zipo katika Kiingereza hivyo hawaoni umuhimu wa kujisumbua kusoma Kiswahili. Mtafiti aliibua swali

kwa washiriki wenye mtazamo huu kwa kuwaomba waeleze njia mbadala wanazotumia kuhakikisha kuwa wanapata maarifa ya usalama barabarani. Washiriki walidai kwamba wanaokolewa na maarifa wanayoyapata kutoka kwa wenzao.

Kwa lengo la kufahamu utoshelevu wa Kiingereza au Kiswahili katika kutimiza malengo ya usalama barabarani, mtafiti alihitaji kufahamu kwamba madereva wanapokuta alama za barabarani zimeandikwa kwa kutumia lugha mbili hutilia maanani lugha gani au hutii maelekezo husika baada ya kuona lugha gani. Majibu ya madereva wote yalibainisha kuwa waonapo alama za barabarani zikiwa zimeandikwa lugha zote mbili hujikita zaidi katika lugha ya Kiswahili na ndio huwapa ujumbe kwa haraka zaidi. Mfano wa kibao chenye maelekezo ya lugha mbili zinazofahamika na madereva wengi na wanaotilia maanani Kiswahilini kama kilezo (5) hapa chini:

Kielelezo 5: Mfano wa Kibao chenye Alama ya Kikomo cha Mwendo



Dereva anapoona kibao kama (5) ni rahisi kuona katazo la kikomo cha mwendo kilichoandikwa kwa Kiswahili kuwa ni (20) na hivyo kutozingatia neno hilohilo kama lilivyotafsiriwa katika Kiingereza.

Kwa lengo la kupata mapendekezo halisi kutoka nyanjani, mtafiti aliwapa nafasi washiriki wote wa utafiti huu, kutoa maoni yao mmoja mmoja. Washiriki 239(91.9%) walishauri alama zote za barabarani ziandikwe kwa lugha ya Kiswahili na mafunzo yatolewe kwa Kiswahili. Washiriki 17(6.5%) walishauri lugha zote zitumike kwa kila alama na mafunzo yatolewe kulingana na ufahamu au umahiri wa lugha wa walengwa (wanaofunzwa). Na washiriki 4(1.5%) pekee ndio waliomba alama zote ziendelee kuandikwa kwa lugha ya Kiingereza na mafunzo yatolewe kwa lugha hiyo. Washiriki waliopendekeza lugha ya Kiingereza walitakiwa kueleza njia mbadala kwa Watanzania wengi wasiojua kusoma (wasiojua) Kiingereza. Walidai kuwa serikali na jamii hawana budi kukazania Kiingereza kufundishwa ipasavyo katika shule za msingi na sekondari. Pia, washiriki hao walipendekeza utolewaji wa mafunzo ya mara kwa mara kwa watumiaji wa barabara kwa kuwa wao wanaamini kuwa tatizo kuwa ni utolewaji wa mafunzo.

Kielelezo 6: Mfano wa Kibao chenye Alama zinazoweza kutafsrika Kirahisi



Kielelezo 7: ni Mfano wa alama zilizoandikwa kwa kiingereza na kiswahili zinazoonekana na zinazoeleweka kwa urahisi hata kwa dereva anayekutana nazo kwa mara ya kwanza



Kukanganya kwingine ni katika mazingira ambayo kibao kimoja kinakuwa na matangazo yanayowasilisha ujumbe wa aina mbili au zaidi kwa lugha mbili tofauti.Katika mazingira haya dereva hukuna ghafla kibao hiki na kukazia kusoma maneno ya kibao ya mwanzoni tuu bila kuzingatia kukisoma kibao chote. Turejee mfano wa kielelezo (8) hapa chini.

Kielelezo 8: Mfano wa alama maana zinazokanganya



Katika Kielelezo hiki kuna neno la Kiingereza *slow down round about ahead-100* ambayo imetafsiriwa kama nenda polepole mzunguko wa barabara mbele 300m. Tukiangalia kwa makini matini haya mawili tunaona kwamba kuna utofauti wa vipimo na mpangilio wa vipimo hivyo. Katika matini ya Kiingereza imetolewa kipimo 100m wakati katika matini ya Kiswahili imetolewa kipimo 300m. Hapa dereva humuiya vigumu kufamu kipimo sahihi katika maelekezo ya mawili (mita 100 au mita 300). Mtindo wa uandishi katika tafsiri kwa Kiswahili pia imechanganywa ama imetafsiriwa kisisi 300m katika Kiingereza inategemewa isomeke mita 300 katika Kiswahili. Hii inatokana mtafsiri kuwaza kwa Kiingereza na kuandika kwa Kiingereza kwa kutumia maneno ya Kiswahili. Hili ni tatizo na changamoto kwa mustkabali wa barabarani dhidi ya vyombo vya moto na Kiswahili kwa ujumla.

Changamoto za Tafsiri

Katika kuangalia swala la vibao barabarani yapo maswala mbalimbali yaliyojitokeza katika kutafsiri. Tatizo la kwanza ni ukosefu wa wataalamu wa watafsiri nyanja ya mawasiliano barabarani. Jambo hili hujionesha katika baadhi ya vibao vyenye tafsiri iliyofanywa na Mamlaka ya barabara Tanzania. Kwa mfano, kielelezo (8) inaweza kuchukuliwa kuwa tafsiri hii imefanywa na Mamlaka ya Barabara Tanzania.

Tatizo la pili ugumu wa tafsiri na kupata istilahi oani/mbadala kati ya lugha ya Kiingereza na lugha ya Kiswahili.Tatizo hili hujionesha katika mazingira ambapo kuna vibao vyenye maneno

ya Kiingereza yanayotatiza katika kutafsiri kama inavyojionesha katika mifano ya kielelezo 9 na kielelezo 10 hapa chini.

Kielelezo 9: Mfano wa kibao chenye maneno tatizi ya tafsiri



Kielelezo 10:



Athari za matumizi ya lugha ya alama bila maneno

Ajali nyingine za barabarani zinaweza kusababishwa na uwepo wa vibao vyenye lugha ya alama bila maelezo. Athari hii inatokana na dereva kutotambua maana ya alama husika ama wakati mwingine kupuuzia maelekezo ya alama hizo. Kwa mfano, katika kielelezo (11) kuna alama inayosemekana kuonesha katazo la barabara kuingia lakini dereva ameingia bamoja na kuwa kwa kibao hicho.

Kielelezo 11: Alama Katazo na athari zake kwa Madereva



5. 0 Hitimisho

Lengo la makala haya ilikuwa ni kuonesha mchango wa Kiswahili katika upunguzaji wa ajali barabarani hasa kwa kuangalia lugha za maekelezo zinazotolewa barabarani kwa madereva na hata lugha ya kuelimisha madereva wa vyombo vya moto.

Kutokana na matokeo ya utafiti huu, ni dhahiri kwamba mafunzo ya masuala ya usalama barabarani yanafanikiwa kwa kiwango kidogo kutokana na matumizi ya lugha ya Kiingereza katika alama husika hivyo upataji maarifa husika kutingwa na changamoto ya lugha. Kutokana na hilo, ilibainika kuwa madereva wengi hawazijui vema alama za barabarani na wale wenye uelewa na matumizi ya barabara ni kutokana na juhudi binafsi nje ya mafunzo, maarifa wanayopeana pamoja na kupata uzoefu wa muda mrefu. Ingawa mafunzo yanatolewa kwa lugha ya Kiswahili, uhusiano wa ufafanuzi na alama husika unapungua hali inayopelekea madereva kulazimika kukariri alama badala ya kuzielewa.

Pia, ilibainika kuwa madereva wanaelewa kwa urahisi alama zilizoandikwa kwa lugha ya Kiswahili kama vile *"Nenda taratibu", "pita kushoto/kulia*" na nyinginezo. Kutokana na sababu kwamba Kiswahili ni lugha rahisi na inayoeleweka vema kwa Watanzania. Madereva wengi wanaelewa na kuzingatia zaidi alama na maelekezo yaliyoandikwa kwa Kiswahili kuliko Kiingereza. Hii ni kwa sababu maneno ya Kiingereza yanawapa wakati mgumu kukumbuka kila

wakati kabla ya kuelewa, hii hupelekea alama za lugha ya Kiingereza kusahaulika kwa urahisi na hivyo kutotiliwa maanani.

Kadhalika, ilibainika kuwa madereva walio wengi hawajisomei masuala ya usalama barabarani. Hii ni kutokana na sababu kwamba matini nyingi za usalama barabarani zipo kwa lugha wasiyoimudu (Kiingereza) na chache zilizopo haina mambo muhimu. Kama hiyo haitoshi, madereva wengi wanaamini matini zilizoandikwa kwa Kiswahili zinakanganya kwa kuwa alama wanazokutana nazo au wanazotakiwa kuzifuata zinakuwa hazijaandikwa kwa lugha waliyoisomea.

6. 0 Mapendekezo

Kwa kuzingatia majibu ya utafiti huu, inapendekezwa kuwa mabango ya maelekezo haya, vitabu vya sheria za usalama barabarani na mafunzo na semina za muda mfupi na elekezi kwa madereva, zikitolewe kwa lugha ya Kiswahili kwa sababu ndio lugha inayoeleweka kwa urahisi kwa Watanzania walio wengi.

Aidha, alama za barabarani zinapaswa ziandikwe kwa lugha zote mbili (Kiswahili na Kiingereza) ili kurahisisha uelewa kwa madereva wote.Lakini lugha ya kiswahili inapaswa ianze na kufuatiwa na Kiingereza.Mapendekezo ya Alama za barabarani ambazo zinatumika sana Tanzania na ambazo zinaweza kuandikwa kwa lugha ya Kiingereza na Kiswahili ni kama zifuatazo katika (12):

Stop	–	Simama
Go	–	Nenda
Road Work Ahead	–	Ujenzi Unaendelea Mbele
Slow Down	–	Nenda Taratibu/Punguza mwendo
Zebra crossing	–	Wavuka kwa Miguu
Stop Police	–	Kizuizi cha Polisi
One way	–	Njia Moja Tu
Roundabout	–	Njia Panda
Get Ready	–	Jianadae
Bus Stop	-	Kituo cha Mabasi
Police – Accident	–	Kizuizi Ajali Mbele

Alama zinazotumika ziandikwe kwa maneno ya lugha ya Kiswahili badala ya matumizi ya lugha ya alama. Kwa watafiti wajao, mtafiti anapendekeza utafiti mwingine ufanyike juu ya mchango wa Kiswahili katika udhibiti wa ajali za barabara kwa kutumia mbinu ya ushuhudiaji.

MAREJELEO

Akyüz, U. (2017). Visual Signs as a Cross-Cultural Language. *International Journal of Sciences and Research,* 73 (4) 170-179 April 2017.

Hammoudi, A., Karani, G. na Littlewood, J. (2014). Road Traffic Accidents among Drivers in Abu Dhabi, United Arab Emirates. *Journal of Traffic and Logistics Engineering,* 2(1), 7-12, March 2014.

Han, J., Singh, M., na Zhao, D. (2010). Road Safety Literacy for Speakers of English as a Foreign Language: Educating Novice Drivers for the Public's Health Safety. *Literacy & Numeracy Studies,* 18 (1) 2010.

Issa, Y. (2016). Effect of Driver's Personal Characteristics on Traffic Accidents in Tabuk City in Saudi Arabia. *Journal of Transport Literature,* 10(3), 25-29, Jul. 2016.

Jamson, S. L., Tate, F. N. na Jamson, A. H. (2005). Evaluating the Effects of Bilingual Traffic Signs on Driver Performance and Safety. *Ergonomics* 48(15) 1734 – 1748.

Jeshi la Polisi Tanzania. (2018). *Takwimu za Hali ya Uhalifu na Matukio ya Usalama Barabarani Januari - Desemba 2017.* Dar es Salaam: Jeshi la Polisi Tanzania.

Krishnan, S. Geetha, K. na Basri, R. (2018). *Road Accidents and Road Safety Measures in Tamil Nadu: An Analysis.* Unpublished paper.

Han, J., Singh, M., na Zhao, D. (2010). Road Safety Literacy for Speakers of English as a Foreign Language: Educating novice drivers for the public's health safety. *Literacy & Numeracy Studies,* 18 (1) 2010.Issa, Y. (2016). Effect of driver's personal characteristics on traffic accidents in Tabuk city in Saudi Arabia. *Journal of Transport Literature,* 10(3), 25-29, Jul. 2016.Akyüz, U. (2017). Visual Signs as a Cross-Cultural Language. *International Journal of Sciences and Research,* 73 (4) 170-179 April 2017.Hammoudi, A., Karani, G. na Littlewood, J. (2014). Road Traffic Accidents among Drivers in Abu Dhabi, United Arab Emirates. Journal of Traffic and Logistics Engineering, 2(1), 7-12, March 2014.Krishnan, S. Geetha, K. na Basri, R. (2018). Road Accidents and Road Safety Measures in Tamil Nadu: An Analysis. Unpublished paper.Jamson, S. L., Tate, F. N., na Jamson, A. H. (2005). Evaluating the Effects of Bilingual Traffic Signs on Driver Performance and Safety - Ergonomics 48(15) 1734 – 1748.Tovuti

https://www.voaswahili.com/a/waziri-avunja-baraza-la-taifa-la-usalama-barabaranitanzania/4469231.html https://www.voaswahili.com/p/6617.html

Viambatisho

Kiambatisho A: Kielelezo cha Kibao Ya Kuonesha Mwendo



Kiambatisho B: Kielelezo cha Kibao, Kuonesha punguza mwendo (kivuko cha watoto)



Kiambatisho C: Kielelezo cha Kibao, Kuonesha simama (waenda kwa miguu wapite)



Itikadi katika Riwaya za *Dunia yao* (2006) na *Mhanga Nafsi Yangu* (2013) za S. A. Mohamed

Murithi Joseph Jesse, Richard Makhanu Wafula na Geofrey Kitula King'ei

Wote wa Chuo Kikuu cha Kenyatta.

Ikisiri

Makala hii inanuia kuonesha kuwa itikadi ni dhana badilifu na nyumbufu kulingana na maendeleo ya kijamii, kiuchumi, kisiasa na kiteknolojia. Itikadi ndiyo huelekeza misimamo, mielekeo na imani ya mtunzi na hivyo kuathiri mtazamo wa mwandishi kuhusu ulimwengu unaomzunguka, ambao huweza kubadilika kulingana na wakati na mahitaji ya kijamii. Katika mkabala huo makala hii inalenga kutathmini itikadi ya mtunzi katika riwaya za *Dunia Yao* (2006) na *Mhanga Nafsi Yangu* (2013) za S. A. Mohamed. Kwa kutumia riwaya hizo, makala hii inatarajia kuthibitisha kwamba, itikadi ni dhana badilifu na nyumbufu na hutangamana na jinsi mtunzi anavyobadilisha mikakati yake ili kukidhi mahitaji ya jamii lengwa kiwakati.

1.0 Utangulizi

Itikadi ni dhana changamani na imeleta mijadala mingi miongoni mwa wanazuoni. Dhana hii ni telezi kwa sababu inaweza kufasiriwa kwa namna tofautitofauti kutegemea madhumuni na dhamira ya mtumiaji. Kwa hivyo, itikadi ni jumla ya mfumo wa mawazo, fikra na imani, inayoongoza na kumwelekeza mtunzi katika kuwasilisha ulimwengu wake kwa masuala mbalimbali ya kisiasa, kiuchumi na kijamii. Itikadi ndiyo humuongoza mtunzi kuteua namna atakavyotekeleza majukumu yake ya kisiasa, kiuchumi na kijamii. Kulingana na Chuachua (2011), itikadi ndiyo dira ituelekezayo kwenye sababu za mtunzi kupendekeza au kukemea jambo fulani. Kwa hiyo, itikadi hutuonesha namna mtunzi alivyotekeleza mafunzo yake, dhamira na falsafa yake na hivyo kuathiri kwa kiwango kikubwa uandishi wake. Itikadi ni maoni na mwenendo wa kufikiri juu ya maisha ya mwanadamu na jamii yake katika vipengele vya siasa, uchumi, dini, utamaduni na masuala ya kijamii kwa ujumla (Adorno na wenzake, 1950). Hii ina maana kuwa, itikadi waliyonayo wanajamii kuhusu maisha, ndiyo itakayowaongoza katika kufikiri na kutafakuri kuhusu masuala mbalimbali yanayohusu maisha yao, kwa maana ya kufanikiwa au kutokufanikiwa. Mawazo haya yanapatikana pia katika Loewestein (1953) ambaye anaeleza kwamba, itikadi ni imani na tafakuri inayoeleza mtazamo wa mwanadamu kuhusu mfumo mzima wa maisha ya mwanadamu. Kwa mantiki hiyo, itikadi ni mfumo wa imani ambao unaeleza, unajumuisha na kufafanua masuala ya madaraka, haki za binadamu na kutathmini masuala ya kihistoria na maendeleo yake ili kufanya maamuzi sahihi kwa wakati uliopo na ujao.

Jessee (2017) anaeleza kuwa wahakiki wengi husema kwamba mtunzi hutawaliwa na itikadi moja ambayo hufumbata msimamo wake, kuanzia mwanzo hadi mwisho wa utunzi wake. Akiwanukuu Mbatiah (1990) na Njogu (1997) anaeleza kwamba Mohamed ametawaliwa na itikadi ya Ujamaa katika baadhi ya kazi zake kama katika *Asali Chungu* (1978), *Utengano*

(1980), *Dunia Mti Mkavu* (1980) na *Kiza katika Nuru* (1988). Jessee anaonesha kuwa itikadi zinazojitokeza katika riwaya za awali za S. A. Mohamed ambazo ni *Asali Chungu* na *Kiza Katika Nuru* ni umwinyi na ubepari. Katika makala hii tumeangazia riwaya za *Dunia Yao* (2006) na *Mhanga Nafsi Yangu* (2013) za S. A. Mohamed, kwa madhumuni ya kuonesha itikadi yake jinsi ilivyo badilifu na nyumbufu.

2.0 Itikadi katika *Dunia Yao*

Katika sehemu hii tunazungumzia itikadi iliyotawala katika riwaya hii, hususan itikadi ya utandawazi na itikadi ya kimapinduzi katika kuyatazama mambo ya ulimwengu.

2.1 Itikadi ya Utandawazi

Utandawazi ni mchakato wa kuunganisha uchumi, siasa, jamii, uhusiano wa tamaduni na kadhalika baina ya nchi. Utandawazi unaifanya dunia kuwa kijiji kimoja kisichokuwa na mpaka. Utandawazi unasisitiza uondoaji wa vikwazo vya kibiashara na kuifanya dunia kuwa soko moja, unahimiza soko huria, demokrasia, utawala bora, usawa wa kijinsia na haki za binadamu (Thomas, 2005). Aidha, utandawazi ni mtazamo ambao huiangalia dunia kama moja na tangamano. Mtunzi anayeamini katika utandawazi huzungumzia mambo yanayoiathiri dunia nzima. Huweza kuchora wahusika wanaoweza kukubalika katika ulimwengu na mandhari ya kazi yake.

Said Ahmed Mohamed amejadili masuala mbalimbali ambayo yanadhihirisha itikadi tawala katika riwaya ya *Dunia Yao*, kuwa ni ya utandawazi. Baadhi ya masuala hayo ni ndoa, mapenzi, magonjwa, elimu, uchumi, sheria, siasa, uongozi, dini na mengineyo yanayoonesha kuridhia itikadi ya kitandawazi. Wahusika wake wamepewa sifa za kimataifa na mawazo yaliyopevuka. Mandhari ya dunia nzima imesawiriwa kwa majina ya "Peponi" na Motoni". Mtindo wa kinjozi umetumiwa kumwezesha kuwasafirisha wahusika wake kwa kadiri apendavyo. Haya yote yanadhihirisha jinsi mwandishi anavyoongozwa na itikadi ya utandawazi katika kuyatazama mambo ya ulimwengu mzima.

Kuhusu mfumo wa kiuchumi, kupitia kwa Bi. Mize, Mohamed anaonesha kuwa dunia anayoichunguza inazingatia mfumo wa ubepari. Aidha anaonesha kuwa, dhana ya utandawazi inatumiwa kuhalalisha mfumo huu kandamizi kote duniani. Mataifa yenye nguvu na mamlaka yanapendekeza sera na mifumo isiyo rafiki kwa uchumi wa mataifa machanga ambayo hulenga kuzinufaisha nchi zilizoendelea. Hivyo mataifa hayo yanaendelea kunawiri, huku mataifa machanga yakizidi kuwa masikini. Uhusiano huo unadhihirisha kuwa utandawazi ni asasi ya kiitikadi inayotumiwa na mataifa yenye nguvu kuendeleza mifumo ya ubepari inayoyanufaisha.

Mtunzi anaonesha namna utandawazi unavyoimarika kimataifa kutokana na teknolojia mpya, kama vile kompyuta, kampuni za mtandao, barua pepe na vyombo vya habari. Mwandishi anamsawiri Ndi, anayeisifu talakilishi aliyoletewa na Mtima binti yake (uk. 6). Pia, maneno ya Mtima kwenye barua aliyomtumia babake akimwambia kuwa atakapokwishakujifunza kuitumia barua pepe kuzungumza, wangewasiliana vizuri.

Itikadi ya utandawazi inazidi kujitokeza pale ambapo Ndi anasimulia jinsi alivyojifunza kompyuta kwa bidii, kwani alijua ni mwokozi wake katika maisha ya upweke na unyamavu kiasi cha kuihuisha (uk.11). Aidha, mwandishi anasimulia kuhusu kampuni ya mtandao ambayo inawezesha mazungumzo kupitia barua pepe ambayo Ndi anafurahia sana, ili

wazungumze na bintiye Mtima. Pia, anaonesha kuwa kuna uhuru wenye hatari kutokana na usasa na mabadiliko ya haraka na hivyo Ndi anakerwa na bintiye Yungi aliyemkashifu na kumkemea hadharani.

Mwandishi anasema kuwa ubinafsi katika karne hii umeimarishwa na sayansi na teknolojia, na dunia imekuwa moja kwa sababu ya usahili wa uwazi wake na wepesi wa mawasiliano. Kwa mfano, maafa yakitokea pahala pamoja huenea duniani kote kwa sababu ya teknolojia (uk.48 – 49). Mwandishi anaonesha kuwa teknolojia inachangia kuenea kwa taarifa za maafa kwa kasi mno ulimwenguni, pamoja na kutohifadhiwa kwa utamaduni na maadili mabaya katika jamii kama vile ngono, ulevi, uchi, matusi, kelele, mavazi mabaya na madawa ya kulevya. Pia, kuna CD ya "*I need to know*" ya Marc Anthony na chombo cha kuendesha CD alichokinunua zamani katika safari alizopata kwenda London kikazi, alipokuwa mkuu wa idara ya matumizi (uk. 56).

Kuhusu elimu ambayo ni njia inayotumiwa kimakusudi na jamii kupitisha maarifa, ujuzi na maadili, kutoka kwa kizazi kimoja hadi kingine, mwandishi anaisawiri kama ambayo haithaminiwi sana siku hizi. Elimu inapuuzwa na waalimu wake wamepungukiwa maarifa kwa kuwa watoto wanafeli na mitihani inauzwa (uk. 42). Jambo hili linaonesha kuwa, elimu katika enzi ya utandawazi sio tiketi ya kupata kazi nzuri, bali ni asasi tu ya kuuendeleza ubepari wa kilimwengu. Mwandishi anaonekana kuamini kuwa elimu ni kipengele kimojawapo cha utawala ambapo walio na elimu ya juu hawafaidiki sana, huku wanaomiliki mifumo ya kiuchumi na biashara wakiendelea kutajirika na kujilimbikizia mali. Hili linafungamana na mkabala wa Althusser (1981) kuhusu itikadi kuwa, elimu ni asasi mojawapo inayotumiwa na watawala kuendeleza itikadi ya kitawala, ili kuhifadhi utabaka wao.

Mwandishi katika riwaya ya *Dunia Yao* anaona kuwa, utandawazi umekwishaondoa mipaka na kufanya ulimwengu jiji moja na kuathiri utamaduni. Mwandishi anaonesha imani yake kuwa, mavazi na mienendo ya Yungi imechangiwa kwa kiasi kikubwa na utandawazi (uk. 128). Kupitia mavazi ya Yungi, na jinsi anavyojibizana na baba yake kunaonesha imani ya mtunzi ya kuwa utandawazi umeleta ubinafsi kiasi cha kuwa hakuna anayemjali mwingine. Mtunzi anaonesha kuwa mabadiliko ya kitamaduni yamesababishwa na utandawazi na kufanya watu kuujali ubinafsi kuliko umoja na ushirikiano katika jamii zao. Pia, anaonesha jinsi wananchi wa kawaida wanavyoingia katika sherehe wakiwa wamevaa nusu uchi. Hali hii inaonesha namna utandawazi ulivyoathiri utamaduni wa dunia nzima na kuwa ni itikadi tu ya watawala wa nchi matajiri kuendeleza njama zao za kuendelea kutawala uchumi wa ulimwengu. Mwandishi anasema:

Wengine wamevaa kama Mao, Lenin na wengine kama Gandhi. Kuna pia waliovaa ki-churchill au kirais wa US, wengine ki-cowboy au ki-Western (uk. 175).

Mwandishi anaamini kuwa utandawazi umeenea na umeathiri mavazi ya jamii yake ambayo imeuacha utamaduni wao na kuukumbatia wa kigeni. Majina yaliyomo kwenye dondoo iliyodokezwa ni ya viongozi waliowahi kuwa viongozi wa nchi za ng'ambo wala sio wa Kiafrika. Hali hiyo, inaonesha namna utandawazi ulivyoathiri dunia nzima, hasa Afrika.

Mohamed anaonesha msimamo wake kuwa kuna hatari zinazotokana na mambo ya kiteknolojia na utandawazi ambazo wengi wanakimbilia. Ogun mhusika ambaye ana sifa za

kiungu, anaendelea kueleza wenyeji kuhusu athari za utandawazi, huku akionesha kuwa manufaa yake ni kwa nchi zenye mizizi ya utandawazi (uk. 192). Kwa hiyo, utandawazi ni jambo la hatari, na lenye athari mbaya kwa wenyeji kutegemea tu ubunifu wa nchi za kigeni hasa zile nchi zilizoendelea kwa sababu manufaa huwa ni kwao pekee (uk.193).

Kuhusu ndoa mwandishi anatuonesha utengano kati ya mume na mke mara kwa mara katika *Dunia Yao.* Kutokana na maelezo ya Sakarati, ndoa haiheshimiwi katika jamii kwa kuwa mkewe hakujali ndoa yao, mpaka anapoanza majuto walipopatwa na ugonjwa wa UKIMWI. Hii inaonesha ndoa zinavyokabiliwa na talaka, kuachana, pamoja na kunyimana haki za unyumba. Kwa jumla, mwandishi anaonesha jinsi mume anavyoyakimbia majukumu yake katika ndoa. Mhusika ambaye amewakilisha suala hili ni Ndi ambaye anayakimbia majukumu yake. Ndoa na familia inatumiwa tu kama asasi ya kuhalalisha maovu, na hivyo ni kigeu cha itikadi tawala ya kitandawazi.

Kuhusu dini ambayo ni imani maalum ya kuamini na kumtii Mungu wa haki, mtunzi ametaja dini za Kiislamu, Kikristo na Kibudha. Anasema dini ya Kiislamu ilitiliwa maanani alipokuwa mchanga, lakini siku hizi inatumiwa kuwadanganya watu na kuafikiana na mawazo ya Marx kuwa, dini ni ung'amuzi potoshi unaotumiwa na watawala kuendeleza itikadi tawala ya kitandawazi na kuuendeleza ubepari (Althusser, 1981). Hii ndiyo sababu inayowafanya watu wengi kuhama kutoka dini moja hadi nyingine jambo linalohusishwa na itikadi tawala ya kitandawazi. Ili kuendelea kudhibiti mataifa machanga na kimaskini dini inatumiwa kuwafanya watu wa nchi hizo kuendelea kuziamini huku mataifa ya Ulaya yakizidi kupiga hatua kimaendeleo (uk 141). Dini inatumiwa kama kipengele cha utawala wa kilimwengu wa kitandawazi, ili mataifa tajiri yaendelee kuhifadhi na kuendeleza utajiri, biashara na mifumo ya kiuchumi na utawala, huku mataifa yanayoendelea na ya kimaskini yakizidi kupotelea kwa dini mbalimbali, kwani hawana suluhu.

Siasa ni njia ya kufanya maamuzi katika taifa, mji au hata dunia nzima. Sehemu muhimu ya siasa ni majadiliano kati ya watu mbalimbali wenye nguvu au mamlaka. Katika demokrasia, kila mtu ana kiasi fulani cha nguvu. Kwa hivyo, siasa ya demokrasia ina maana ya watu wote huchangia maamuzi. Wakati mwingine haya hayawezekani kutokana na mambo kama vile utawala mbaya wa ukoloni mamboleo unaoleta jaribio la mapinduzi na maandamano ili kupigania haki. Mtunzi anaonesha kuwa siasa za kidemokrasia ni vigeu tu vya itikadi tawala ya kitandawazi, ambapo mataifa yenye nguvu hupendekeza mifumo yao ya kitawala kwa manufaa yao wenyewe.

Mtunzi anazungumzia sheria ambazo ni kanuni zinazoongoza nchi au jamii. Anatujulisha kuwa nchi haizingatii haki na sheria. Hata polisi wanapojua kuwa sheria haizingatiwi, hakuna anayeshughulika kuona haki inatendeka. Hivyo sheria ni asasi tu mojawapo ya kuendeleza itikadi ya watawala ya utandawazi, kama ambavyo Althusser (1981) anaeleza kuwa sheria hutumiwa kuendeleza itikadi ya kitawala, wala si kulinda haki. Aidha, mifumo ya kitawala kama demokrasia ni asasi mojawapo ya kunyamazisha watu, wala sio kwa masilahi yao.

Kuhusu utawala, ambayo ni shughuli nzima ya uongozi inayojumuisha mchakato wa kutoa uamuzi, kupitia kwa vikundi kama vile vyama vya kisiasa, mtunzi anasema kwamba, utawala ni jambo la kimsingi ambalo linapaswa kuzingatiwa kwa makini katika dunia nzima, la sivyo, dunia nzima inaweza kuangamia kutokana na utawala mbaya na wenye ukorofi na matumizi ya kimabavu. Polisi wanaiwakilisha serikali ya nchi na wanatumiwa kuwanyamazisha

watu na kudhihirisha zaidi itikadi ambapo tabaka tawala huweza kutumia nguvu kama kuendeleza itikadi yao hata huko Ulaya.

2. 2 Itikadi ya Kimapinduzi

Mwandishi wa riwaya ya *Dunia Yao* anaendeleza itikadi ya mapinduzi ya marekebisho ya utandawazi. Kulingana na mwandishi, jamii yake imo katika kasi ya mabadiliko ya kiuchumi, kijamii na kisiasa. Mabadiliko haya yanatokana na itikadi tawala ya utandawazi ambao umesababisha kasi kubwa ya kuwekeza kiuchumi na mabadiliko makubwa ya utamaduni. Mabadiliko haya, kwa sehemu kubwa, yanatokana na upeo wa matatizo ya kiuchumi yaliyosababishwa na masilahi ya kibiashara na utashi wa mataifa makubwa yanayolenga kila siku kupata faida kubwa kupita kiasi, kutokana na dhamira ya utandawazi kuwatawala binadamu. Mabadiliko mengi yanatokea kwa upande wa lugha, uchumi, mavazi, maadili, mila, utamaduni, dini, muziki, chakula na mengineyo (uk 41). Mwandishi anaonesha jinsi jamii ilivyoathirika na kubadilika kutokana na itikadi tawala ya utandawazi.

Mohamed katika riwaya ya *Dunia Yao* anasawiri mabadiliko makubwa ya matumizi ya lugha za kigeni. Mara kwa mara panatokea mchanganyo ndimi katika muundo na mtiririko wa riwaya. Jambo hili anaonekana kulifanya tu kimakusudi. Hii inaonesha kuwa amekumbatia mabadiliko kupitia uvunjaji wa kanuni za lugha. Vilevile, tunaona utohozi wa hali ya juu hata kwa maneno yenye maana halisi kwa lugha ya Kiswahili. Haya yote yanatokana na athari za itikadi tawala ya utandawazi na kuonesha kuwa kwa upande mmoja anakubaliana na itikadi hii ya utandawazi na upande mwingine anaipinga. Anaona ni bora utandawazi ufanyiwe marekebisho au mabadiliko kadhaa ingawa uko sawa.

Aidha, mwandishi kupitia kwa Ndi anaonesha jinsi jamii yake ilivyopoteza hisia na jinsi mabadiliko yalivyosababisha maadili mabaya. Kutoathirika kwa Ndi na habari anazozipokea kutoka kwa Kilua kuwa Yungi anaugua UKIMWI kunaonesha mwandishi anaamini kuwa usasa unaoletwa na utandawazi umewafanya watu wa jamii yake kupuuza nguvu za kiasili, kwa vile wamebadilika kimawazo.

Mohamed anaamini kuwa dunia iko katika harakati za mabadiliko katika kila nyanja. Mabadiliko haya hayafai kwa nchi changa, kwani utandawazi ni itikadi inayoendelezwa na mataifa yaliyoendelea. Mataifa hayo hufanya hivyo ili yaendelee kuhifadhi nguvu zao za kiuchumi, kibiashara, kiutawala na kiteknolojia. Mataifa maskini na machanga huzidi kutumbukia kwenye lindi la umaskini kutokana na uongozi mbaya kwani asasi za utandawazi haziafikiani na malengo yao ya kitaifa na mazingira yao halisi. Hivyo, mtunzi anaupinga utandawazi kuwa haufai kwa mataifa machanga kutokana na kuleta madhara makubwa yaliyojidhihirisha.

Kwenye riwaya hii tumeshuhudia ubinafsi wa hali ya juu unaosababishwa na utandawazi ambapo hakuna mtu anayemjali mwenzake. Mtunzi anaonesha kuwa mapinduzi ya marekebisho ya utandawazi yanahitajika katika jamii ili kuondoa hali ya ubinafsi na kuwa na jamii yenye umoja na ushirikiano. Jamii ambayo inaweza kushiriki pamoja kwenye sherehe na hivyo kuonesha kuwa msimamo wake kuhusu mapinduzi sio mmoja. Aidha, anaonesha kuwa mabadiliko hutokana na maamuzi ya mtu binafsi wala sio matumizi ya nguvu kama katika *Kiza Katika Nuru* na *Asali Chungu* hivyo itikadi yake kuhusu mabadiliko ya kijamii imebadilika.

Kwa hivyo, itikadi ya mwandishi ni kwamba utandawazi umekuja kumomonyoa kila kitu katika jamii yake, kama vile utamaduni, shule, vyuo, desturi, mila, na heshima. Itikadi ya mwandishi kuhusu utandawazi ni kwamba una maafa mengi kuliko faida. Msimamo wake kuhusu utandawazi ni kwamba haufai na unapaswa ufanyiwe marekebisho kwa mataifa machanga, kwani ni itikadi inayoendelezwa na mataifa yaliyoendelea kujinufaisha na kuendeleza dhuluma na tawala zao katika mifumo ya kiuchumi, kibiashara na kiteknolojia.

3.0 Itikadi katika *Mhanga Nafsi Yangu*

3.1 Itikadi ya Utandawazi

Katika riwaya ya *Mhanga Nafsi Yangu,* itikadi tawala inayojitokeza ni ya utandawazi, hasa ukichunguza baadhi ya masuala kama vile mfumo wa kiuchumi, kisayansi na kiteknolojia, mfumo wa elimu, utamaduni, asasi za utawala na mifumo ya sheria kati ya mingineyo. Mfumo wa kibepari unajitokeza katika riwaya hii. Mfumo huu una matabaka mawili ambayo ni tabaka la chini la watu wanaoishi kwa kufanya kazi na tabaka la juu la watu wanaoishi kwa kufanyiwa kazi. Mfumo huu unadhihirisha kuwa watu wachache wanajilikimbizia mali yote na kuwaacha maelfu na mamia ya watu wakiwa hawana chochote. Wanaoishi kwa kufanya kazi ndio wavuja jasho na msingi mkuu wa mfumo wa kibepari ni unyonyaji wa tabaka. Unyonyaji hautokani na nia mbaya ya mtu binafsi bali ni msingi wa mfumo wenyewe bila kujali nia au dhamira za watu waliomo katika mfumo huo. Mfumo huu wa kipebari pia huwa na sifa ya ulimbikizaji na uwekezaji wa mtaji ambao hutokana na ziada ili kuendeleza uzazi wa mfumo wenyewe.

Mwandishi anawaonesha Neshboch na Bw. Bawa wanavyoendeleza mfumo wa kipebari, pale wanapolijilimbikizia mali nyingi (uk. 140). Aidha, mali ilithaminiwa sana katika mfumo huu kiasi cha kwamba mali ndiyo huamua tabaka lao na maisha wanayoishi. Neshboch anaionea mali yake fahari kuu na anaitumia kumshawishi Afida akubali mapenzi yake. Naye, Afida kwa sababu ni zao la mfumo huu, anaamini kuwa akiolewa na tajiri, mali pia itakuwa yake. Hii inadhihirisha namna mfumo wa kibepari unavyoathiri watu kiasi cha kuuasi utu wao na kukubali kufanya lolote mradi wapate mali. Afida anaasi dini yake ya Kiislamu, anasahau watu wao kule motoni, anamtupa mpenzi wake Shaaban na mwishowe hata masomo anayaacha alipopachikwa mimba na Neshboch. Anadhihirisha kuwa mfumo huu wa kiuchumi huhalalishwa kwa kutumia itikadi inayotawala ya utandawazi ambapo waliopo katika mataifa machanga wanataka kusafiri kwenda kuishi mataifa ya ng'ambo ili kujinasibisha na utajiri na umaarufu wa mataifa hayo.

Mohamed anaonesha kuwa mfumo huu wa ubepari umesambaa kote ulimwenguni kupitia utandawazi na kusababisha umasikini mkubwa, kwani kadiri matajiri wanavyoendelea kuhodhi mali ndivyo masikini wanavyoongezeka. Hali hii, kama mtunzi anavyoonesha, husababishwa na mifumo ya kiuchumi ya kilimwengu hasa umwinyi, ubepari na utandawazi ambapo matajiri, humiliki nyenzo za uzalishaji mali na masikini hubakia hohehahe. Hali hizi huendelea kudumishwa kwa matumizi ya itikadi potofu ambazo huendelezwa na dini, utamaduni na asasi za serikali kama vile sheria, polisi, mahakama au ukubalifu na ukawaida tu. Mtunzi anadhihirisha kuwa hali hizi zinakuwa katika mataifa yote na hili linafanya kuamini kuwa itikadi inayojitokeza katika *Mhanga Nafsi Yangu* ni ya utandawazi kutokana na vile anavyowasilisha mfumo wa kiuchumi.

Mtunzi anaonesha namna pesa inavyochukuliwa kuwa ndiyo kila kitu huko Peponi. Pia, huonesha namna mfumo wa kiuchumi ulivyoathiri mataifa yote ulimwenguni. Kila kitu ni pesa,

na maisha yao yote hutegemea pesa. Mfumo wa kiuchumi uliopo katika jamii zetu ni wa kibepari ambao unapendelea mataifa ya Ulaya huku mataifa machanga ya Kiafrika yakizidi kuwa masikini. Nao Waafrika wanazikimbia nchi zao kama Afida, wakidhania maisha yatakuwa bora. Aidha, wanazidi kuumia kwani mifumo ya kiuchumi, kiutawala, kibiashara na asasi zote zinazounga mkono itikadi ya utandawazi huzingatia masilahi ya waliozianzisha ambao ni watu wa mataifa ya Kimagharibi.

Elimu ni mfumo wa mafunzo yanayopatikana shuleni, vyuoni na maishani. Mwandishi anaonesha kuwa elimu ni muhimu duniani kote kwani hupanua na kumfanya awe na akili iliyopevuka. Mwalimu wa kina Afida kule Motoni alikuwa amepevuka kiakili, ndiyo maana alikuwa na uwezo wa kuwaonya dhidi ya utashi wa vitu. Mtunzi anaendeleza dhana hii ya elimu ya akademia kwa kuonesha umuhimu wa fasihi, kwani Afida anamkumbuka mwalimu wao wa fasihi kule Motoni kuonesha mafunzo ya mwalimu wake yaliyomwathiri sana hata akiwa Motoni. Afida anasoma Peponi na kuweza kuhitimu na kutuzwa zawadi kwa kuwa mwanafunzi wa kwanza wa Motoni kufaulu vizuri na kupewa fursa ya kutoa hotuba ya shukrani. Hii inaonesha kuwa Mwafrika anaweza kusoma ughaibuni na kufaulu vizuri kuliko wanafunzi wa huko. S. A. Mohamed anadhihirisha kuwa itikadi ya utandawazi haijali rangi ya mtu bali uwezo wake wa kiakili ndiyo humwezesha kufasiri dhana za kiakademia (uk. 96). Kwa mfano, Profesa Marjan alikuwa amesoma hadi akafuzu kuwa profesa na kupata kazi ya kusomesha Chuo Kikuu cha Peponi licha ya kuwa asili yake ni “Motoni” (uk157).

Aidha, Mohamed anazungumzia dhana ya ugonjwa hasa unaoathiri dunia nzima. Sada, dada yake Afida aliaga dunia kutokana na ugonjwa usiopona wa UKIMWI. Aidha, Shuhuda rafikiye Afida alishikwa na ugonjwa usiokuwa na tiba hatimaye anaaga dunia (uk. 161). Mtunzi anaonesha jinsi ugonjwa wa UKIMWI ulivyoathiri dunia nzima kutokana na madhara ya utandawazi na jinsi ulivyosambaa kote duniani ikiwamo Afrika na Ulaya. Pia, anaonesha namna watu wanaoishi maisha ya ovyo, mfano ukahaba kama kina Shuhuda, wako katika hatari ya kuangamia kutokana na UKIMWI. Mwandishi anaamini kuwa kuwapo kwa magonjwa hayo ni mojawapo ya athari za utandawazi.

Utamaduni ni mtindo wa maisha unaotambulisha kundi fulani la watu kwa lugha, tabia, na mila zao; na pia mfumo mzima wa maisha ya jamii hiyo. Utamaduni unahusisha tabia, lugha ya mwili, mahusiano na salamu. Katika riwaya ya *Mhanga Nafsi Yangu*, mwandishi anaonesha namna utamaduni wa jamii ya Motoni na Peponi ulivyokuwa. Kule Motoni, Shaabani haruhusiwi kumkumbatia Afida mbele ya wazee au jamaa zake licha ya kuwa mpenzi wa pekee wa Afida anayejulikana na jamaa yake. “Shaabani alimsogelea Afida, alitamani kumvamia na kumkumbatia lakini madhehebu ya utamaduni hayakumruhusu….” (uk 14). Jamii ya kina Afida na jumuiya yao iliruhusu wasichana kuvaa buibui ambayo haioneshi mkatiko wa mwili na kuwahimiza kufunga khanga kutokea kichwani hadi miguuni na kujifunika mtandio.

Mtunzi anaonesha kuwa misingi ya kitamaduni imesambaratika. Afida baada ya kukaa Peponi kwa muda alisahau ahadi zake kwa jamaa zake na akamsahau mchumba wake, Shaabani na akaanza kunywa vileo. Afida akaolewa na Nesboch, akapata mtoto nje ya ndoa, baadaye anatalikiwa na akapata mtoto mwingine. Hakulipiwa mahari na arusi ilihudhuriwa na watu wachache tu wa familia yao. Mambo haya yanadhihirisha kwamba aliasi utamaduni wa Kiafrika (Motoni) na kufurahia maisha ya Ulaya (Peponi). Mtunzi anaonesha kuwa utamaduni hauna mashiko tena yaani watu hutenda vile wanavyotaka mradi malengo yao ya kibinafsi yanatimizwa ambayo ni mawazo ya kiulimwengu wakati huu.

Mohamed ameongozwa na itikadi ya utandawazi kusawiri dhana ya ndoa. Ametuonesha kuwa ndoa inaweza kuwa baina ya Wazungu na Waafrika pia. Mwafrika yeyote anaweza kuolewa na Mzungu kwani siku hizi dunia imekuwa kama kijiji. Watu wanaweza kukutana kwa urahisi kwa sababu teknolojia inarahisisha mawasiliano kupitia simu na kompyuta na pia kurahisisha usafiri kupitia ndege. Bi Marneti ambaye ni Mwafrika ameolewa na Bw. Bawa ambaye ni Mzungu na Afida ambaye ni Mwafrika ameolewa na Neshboch ambaye ni Mjerumani. Sio lazima Mwafrika amuoe Mwafrika ndiyo maana Mohamed alituangazia kuhusu Yakrobich mwenye asili ya Kiafrika akikataliwa na Afida (Mwafrika mwenzake) na badala yake anaolewa na Mzungu Neshboch.

Mohamed kwa kuzingatia dhana ya utandawazi, anatuangazia jinsi ndoa zote zinavyofanana, iwe nchi ya Afrika au ya ng'ambo. Misukosuko ya ndoa iko sawia haijalishi mahala mulipo. Ndoa za Kiafrika na ndoa za nchi za ng'ambo hukumbwa na matatizo kama vita, ugomvi, fitina na talaka. Mohamed anatumia wahusika katika ndoa kuangazia mambo haya. Mfano, ndoa ya Afida na Neshboch inaishia katika talaka. Ndoa hii pia ilikumbwa na fitina kutoka kwa Bi. Marneti na Bi. She-iza. Mohamed kwa upande mwingine anataka kutuonesha jinsi kizazi kipya cha siku hizi kisivyothamini kanuni za ndoa. Anaelekeza kuwa ndoa yapaswa kulindwa kwani ni asasi muhimu. Mwanamke anapaswa kupata mtoto ndani ya ndoa sio nje ya ndoa kama alivyofanya Afida na Neshboch. Aidha, kulingana na sheria za ndoa, mke anapaswa kutumia jina la mume wake. Hii inaonesha kwamba ndoa na familia ulimwenguni kote ni asasi ya kiitikadi ya kumnyamazisha mwanamke, na kumfanya mnyenyekevu kuambatana na itikadi tawala (Althusser, 1981).

Inavyodhihirika ni kuwa, mtunzi anaamini katika mawazo ya kiulimwengu kuhusu ndoa kuwa ni baina ya watu wawili na yule wa tatu anapojitokeza basi matatizo mengi huzuka. Hili huwezekana kwa sababu katika ndoa nyingi katika nchi za Ulaya watu hukaa wawili, yaani mume na mke bila kuingiliwa na watu wengine kifamilia. Hata hivyo, hapa Afrika mara nyingi watu wa familia hukaa pamoja na jamaa zao wa familia kama shangazi, shemeji binamu na wengineo. Mtunzi anaonekana kuamini katika ndoa ambayo watu hawakai pamoja na jamaa zao. Haya ni mawazo ya kiutandawazi au kiulimwengu ambapo watu wengi duniani wanaamini kuwa ili ndoa idumu wawili waliooana wanapaswa kuishi hivyo, yaani familia ya baba, mama na watoto kama wapo.

Mtunzi pia anaonesha ndoa kati ya Afida na Neshboch ambapo Afida alishawishiwa kukubali kuolewa na mzee Neshboch licha ya kumzidi kiumri. Alikuwa kama rika ya baba yake mzazi Afida, miaka sitini na miwili (uk. 138). Afida alikuwa na mpenzi mwingine Yakrobich ambaye walikuwa wa rika moja lakini kutokana na ushawishi wa Bi Marnet, anakubali kuolewa na Nesboch. Ndoa hii kwa Afida ilikuwa ni kivukio cha kupata uraia wa kuishi Peponi. Hii inaonesha namna ambavyo mali na utajiri huweza kumwathiri mtu yeyote katika maamuzi yake. Hali hii inawakilisha imani ya mtunzi kuwa, wasichana wengi wa kilimwengu siku hizi wana tamaa ya mali na utajiri, na kwa hivyo, ndoa zenye msingi imara wa mapenzi na ukweli ni muhali kupatikana hasa barani Afrika.

Aidha, katika suala zima la ndoa mtunzi hajaonesha kuhusu malipo ya mahari ama kuhusishwa kwa wazazi kabla ya ndoa kufungwa. Haya yote yanadhihirisha kuwa msimamo wa Mohamed kuhusu ndoa umeongozwa na itikadi yake ya utandawazi. Anaonesha kwamba watu wanaingiliana na kuwa na uhusiano wa kimapenzi na kuoana kutoka mataifa tofauti na asili tofauti. Kwa hivyo, dhana ya wazazi kuhusika katika masuala yahusuyo ndoa na mahari yanatupiliwa mbali. Aidha, wanapoachana wanaenda kortini na kupata uamuzi huko badala ya

kupata ushauri wa wazazi. Haya yote yanaonesha kuwa Mohamed anaongozwa na itikadi ya utandawazi.

Kuhusu dini, mwandishi anasema kuwa, Afida na familia yake walikuwa waumini wa dini ya Kiislamu na alilazimika kuvaa baibui. Babake hakuchelea kumhimiza Afida kumshukuru Mungu na kupenda dini yake, na kila mara katika mazungumzo yake na Afida, hakusita kumhimiza jinsi Mungu alivyotenda mema (uk. 118). Vilevile, Darwesh (babake Afida) anaendeleza vyema jambo hili la dini, kwani tunafahamishwa kuwa alikuwa kiongozi wa kidini. Hii ni kutokana na imani katika utandawazi ambapo katika ulimwengu mzima sasa, masuala ya dini na viongozi wa kidini hayachukuliwi kuwa ndiyo ukweli, kwani misimamo ya kidini inaonekana kusambaratika.

Mohamed pia anatuonesha kuwa dini haiwezi ikamkomboa mtu katika ulimwengu wa kisasa, bali mtu binafsi ndiye anayepaswa kujikomboa na nafsi yake. Hii ina maana kuwa, mtu binafsi ndiye huweza kuamua afanye lipi, aache lipi, wala sio misingi ya kidini ambayo haina mashiko katika ulimwengu wa kisasa. Hali hii inamfanya Afida kufanya uamuzi wa kupata mtoto nje ya ndoa, kuolewa na Nesboch ambaye ni Mkristo, kunywa vileo na kufanya mambo bila ya kuzingatia misingi yoyote ya kidini. Haya pia yanadhihirisha kuwa mtunzi anaridhia itikadi ya utandawazi ambapo mtu binafsi hufanya maamuzi kwa kuzingatia utashi binafsi na uhuru wa fikra zake.

Sheria za Peponi zinakubali serikali kumpa pesa mwanamke ambaye amelemewa kumlea mtoto wake ili aweze kujikimu kimaisha na mwanawe. Hili linadhihirika pale serikali ya Peponi ikimfadhili Afida pesa za kumtunza mtoto kwa kuwa hakuwa na kazi rasmi ya kufanya ili kupata kipato. Sheria ya Peponi, kama Afida alivyotambua baadaye, ilikuwa na upendeleo. Hii inaonesha kuwa katika mataifa yote asasi za utawala, kama vile sheria na mahakama, hutumiwa na wenye uwezo kuendeleza na kulinda maslahi yao. Afida hakupata haki katika mahakama. Sheria inatumiwa kumdhulumu, kwani hata Neshboch hakushtakiwa wala kuhukumiwa kwa kumpiga na kumuumiza Afida nusura afe. Sheria na mahakama ni vyombo tu vya kuendeleza itikadi tawala kwa kuwanyamazisha wanaodai haki zao.

Mtunzi pia amezungumzia mfumo wa kuumeni. Mwanamke amechorwa kwa vigezo viwili vikuu; vya uzuri na ubaya. Tukiegemea katika kitengo cha wanawake kuwa wazuri, hili linadhihirishwa na shangazi yake Afida, Bi Sinangoa ambaye hakuchelea kumsaidia Afida alipokuwa anasoma, kwa sababu wazazi wake Afida mara nyingi hawakuwa na hela za kutosha za kuikimu familia. Bi Sinangoa alikuwa akiingilia na kumsaidia Afida. Aidha, mke wa Profesa Marjan (Maryam) alikuwa kama mamake wa kupanga. Afida alimwendea na kumwambia kuwa alikuwa ni mjazito na ilimpasa aache masomo ya Chuo Kikuu ili amlee mtoto wake. Maryam alikuwa tayari kumlelea mtoto ili aendelee na masomo yake (uk. 158). Aidha, Afida alikuwa na msimamo thabiti hakuingia katika mtego wa Sapataro, Bw. Bawa au wa Yakrobich, ambao walijaribu kwa lolote lile kumnasa katika mtego wao wa mapenzi ya uongo (uk. 123). Hili linadhihirisha mawazo ya mtunzi kuwa kuna tofauti kubwa baina ya mapenzi na urafiki. Afida alikuwa na msimamo wake kuwa urafiki haumaanishi kushiriki ngono. Mawazo haya yanaafikiana na mtazamo wa kiutandawazi ambapo watu wana uhusiano wa kirafiki na jinsia tofauti bila kushiriki ngono. Aidha, mtunzi anadhihirisha kuwa Afida na mamaye Bi Mwamda ni watu wenye bidii katika kazi zao.

Mtunzi pia amezungumzia kudunishwa kwa mwanamke katika riwaya hii. Katika nchi ya “Peponi” wanawake wa asili ya Kiafrika wanadunishwa sana kwa kuwa wengi wanachorwa kama vyombo vya kumaliza ashiki ya wanaume. Wanawake wenyewe wanashikilia jambo hili

na kulitenda bila kujali. Saparata alikuwa na matamanio ya kimwili na Afida (uk. 85). Hii inaashiria kuwa wanawake walichukuliwa kama chombo cha kumaliza ashiki za wanaume na mtazamo huo unaathiri namna wanavyoiona jinsia ya kike, yaani kama kitu cha "kuliwa" tu na kuachwa, wala sio binadamu kamili. Hali hii inasababishwa na mfumo wa kuumeni ambapo wanaume huonesha kuwa wao ndio viumbe bora zaidi duniani ilhali jinsia ya kike haina thamani yoyote. Neshboch anamfunza mwanawe wa kiume Dinda kuwa, wanawake hawana thamani yoyote na kuwa wanaume ndio walio na mamlaka na maana zaidi duniani (uk. 163). Hii inaonesha kuwa mfumo wa kuumeni ni kigeu au asasi ya kiitikadi kinachotumiwa kuhalalisha udhalilishaji wa jinsia.

Mohamed pia ameonesha ubaguzi wa rangi katika riwaya ya *Mhanga Nafsi Yangu*. Hiki ni kitendo cha kuthamini au kutenga binadamu kwa misingi ya rangi za ngozi. Hii ni dhana ya kumbagua mtu kulingana na rangi ya ngozi yake. Binadamu huwa na rangi ya ngozi ya aina mbili; mweusi au mweupe. Waafrika huwa weusi ilhali Wazungu huwa weupe. Ubaguzi wa rangi ulikuwa maarufu sana katika nchi kama Afrika Kusini na Marekani ambapo Waafrika walikandamizwa kutokana na rangi yao. Wakati wa Ukoloni barani Afrika, rangi ilitumika kama msingi wa utoaji huduma muhimu na haki nyingine za kibinadamu. Rangi nyeusi ilipewa hadhi ya chini zaidi. Aidha, Visiwani Zanzibar, rangi ilitumiwa kumuweka mtu katika tabaka fulani, kwa mfano, Rehema katika *Nyota ya Rehema*, Fuadi alimkataa kutokana na weusi wake. Siku hizi, takribani nchi zote, sheria za kupinga ubaguzi wa rangi zimewekwa, lakini katika nchi nyingi, bado kuna wabaguzi wachache ambao wanavunja sheria kwa kuendelea kubagua kwani ni asasi mojawapo cha kiitikadi (Gramsci, 1981). Afida alibaguliwa na Wapeponi kwa sababu ya rangi yake. Alikuwa mweusi, ilhali wao Wapeponi ni waeupe. Afida alibaguliwa kila mahali sio shuleni bali pia katika basi na hata katika ndoa yake (uk. 90). Dinda ambaye alikuwa mchanganyiko wa asili ya Kiafrika na Kizungu, alibaguliwa sawia na Waafrika wenzake. Jambo hili ni dhihirisho kuwa ubaguzi wa rangi ni kigeu tu cha kuiendeleza itikadi tawala.

4.0 Hitimisho

Kwa ujumla, makala hii imeonesha jinsi itikadi ya utandawazi inavyojitokeza katika riwaya ya *Dunia Yao* na *Mhanga Nafsi Yangu* kama iivyodhihirishwa katika vipengele vya mfumo wa kiuchumi, kielimu, kindoa, kidini, asasi za utawala, kimaadili na mfumo wa kuumeni. Pia, imeonesha kuwa, mtunzi anapendekeza mapinduzi kufanyika ili kusuluhisha matatizo yao kwani kutorokea mataifa ya Ulaya hakubadilishi hali. Kwa hakika, Mohamed anaupinga utandawazi na kuonesha namna unavyoathiri mataifa machanga ya Kiafrika. Mtunzi ameonesha kuwa matumaini ya ukombozi yapo lakini si kupitia utandawazi. Waafrika wajinasue kutokana na itikadi hii ya utandawazi na wafanye mambo yao wenyewe. Kwa hiyo, itikadi inayotawala katika riwaya zote mbili ni utandawazi. Hata hivyo, mwandishi anadokeza itikadi ya mapinduzi ili kuukabili utandawazi katika nchi zinazoendelea.

Marejeleo

Althusser, L (1981). Ideology and Ideological State Apparatuses katika *Lenin and Other Essays.*

Mtafsiri. B. Brewster. London: New left Books.

Ardono, T. (1950). *The Authoritarian Personality*. New York: Haper.

Chuachua, R. (2011). *Itikadi katika Riwaya za Shaaban Robert.* Dar es Salaam: TATAKI.

Derrida, J. (1976). *Of Grammatology and Writing and Difference*. Mtafsiri. G. C. Spivak. Baltmore: John Hopkins.

Gramsci, A. (1971). *Selections from Prison Note Books*. New York: International Publishers.

Gramsci, A. (1985). Selections from Cultural Writings, katika D. Forgas and G. Nowel-Smith (Wafs.). London: Lawrence and Wishart. kur. 389-390.

Jesse, M. (2017).Itikadi Katika Riwaya za S.A Mohamed.Tasnifu ambayo Haijachapishwa:Chuo Kikuu cha Kenyatta

Lowenstein, K. (1953). "The Role of Ideologies in Political Change." International Social Science Bulletin, 5 (1): 51-74.

Marx, K. na F. Engels. (1973). *On Literature and Art*. New York: International General

Marx, K na F. Engels.(1977). *The German Ideology.* London: Lawrence and Wishar.

Mbatiah, M. (1997). Commitment in the Swahili Novel: An Appraisal of the Works of Said Ahmed Mohammed katika D. P. B. Massamba and Mulokozi, M. M. (Wah.) *Kiswahili*.

Dar-es-Salaam: TUKI. 6:75-80

Mbatiah, M. (1999). The Origin and Development of the Swahili Theses Novel in Tanzania

Tasnifu ambayo Haijachapishwa: Chuo Kikuu cha Nairobi.

Mohamed, S. A. (1978). *Asali Chungu.* Nairobi: Shungwaya.

Mohamed, S. A. (1980). *Utengano.* Nairobi: Longhorn.

Mohamed S. A. (1986). *Kiza katika Nuru.* Nairobi: Oxford University Press.

Mohamed S. A. (1995). *Kunga za Nathari ya Kiswahili: Tamthilia, Riwaya na Hadithi Fupi.*

Nairobi: E.A E. P.

Mohamed, S. A. (2001). *Babu Alipofufuka*. Nairobi: Jomo Kenyatta Foundation.

Mohamed S. A. (2006). *Dunia Yao*. Nairobi: Oxford University Press.

Njogu, K. (1997). *Uhakiki wa Riwaya za Visiwani Zanzibar*. Nairobi: U. O. N. Press.

Njogu, K. na Chimerah, R. (1999). *Ufundishaji wa Fasihi: Nadharia na Mbinu*. Nairobi: J. K.F.

Rossiland, F. (1990). *Marxism and Ideology.* Oxford: Clarendon Press.

Depiction of The Roles of Youth in The National Development in Selected Swahili Novel

JACKSON NDUNG'U MWANGI

IDARA YA LUGHA FASIHI NA ISIMU

CHUO KIKUU CHA LAIKIPIA

Email: jigmwas@gmail.com

Simu: 0720112251

ABSTRACT.

The youths play a very important role in national development since they are very energetic, strong and forms the majority of the country's population. Despite the fact that youths face a lot of challenges, they can also play a very important role in economic development and can bring a lot of changes in the society they live in for the benefit of all. This research aims at examining roles of the youths as an agents of positive change in their society in Swahili novel *Kidagaa Kimemwozea* which was written by Ken Walibora (2012) The nature of this research is descriptive and qualitive in nature and was based in the library. Tenets of Contemporary Realism Theory were used to analyze the outcomes of this research. The novel *Kidagaa Kimemwozea* by Ken Walibora was used as a sample for this research and was arrived at through purposive sampling. It was observed that youths plays a very important role in bringing change in the society such as opposing a dictatorial leadership, dealing with corruption, changing people mindset on how to treat people with disabilities and opposing some oppressive traditions that hinders development in the society.

Keywords. Contemporary Realism, Youths, Agents of Change,

Utangulizi

Utafiti wetu ulihusu ubainishaji wa mchango wa vijana katika kuleta mabadiliko chanya katika riwaya ya *Kidagaa Kimemwozea* iliyoandikwa na Ken Walibora (2012). Hii ni kwa sababu vijana katika fasihi wana nafasi muhimu kwa hivyo majukumu yao katika jamii hayawezi kupuuzwa. Neno kijana linaweza kutolewa fasili tofauti tofauti kwa kutumia vigezo mbalimbali kama vile kigezo cha ki- umri, kijamii na hata kiuchumi.

Kwa kuzingatia kigezo cha ki-umri, nchini Kenya, sera ya kitaifa kuhusu vijana inawaeleza vijana kama watu wa jinsia zote mbili ambao umri wao ni kati ya miaka kumi na mitano na thelathini. Haya yanatokana na tarakimu za Wizara ya Vijana na Michezo iliyobuniwa mwaka wa 2008. Katiba ya nchi ya Kenya (2010) inamwelezea kijana kama mwananchi wa umri kati ya miaka 18 hadi 35.

Makala ya Chepkwony (2005) yanayoitwa "Vijana: Changamoto kwa kanisa katika Afrika ya leo", yanaeleza ujana kama kipindi kilichojaa uhai kati ya utoto na utu uzima. Kundi hili la

binadamu ni muhimu kwa sababu ndio wanategemewa kuendeleza kizazi cha kesho. Kwa hivyo, watu wazima wanapaswa kuwafunza vijana amali na tamaduni za jamii. Kwa sababu hii, vijana wanashinikizwa kukubali na kufuata vigezo na mahitaji ya jamii kwa sababu sehemu kubwa kati yao haikubaliani na matakwa haya.

Kutokana na fasili hizi mbalimbali za neno kijana, tunapata kuwa kuna mkanganyo katika kuamua kipindi cha ujana huanzia wapi na kuishia wapi. Hata hivyo, katika kazi hii, tutaangalia vijana kulingana na jinsi mwandishi amewasawiri na pia kwa kuzingatia baadhi ya majukumu aliyowapatia vijana. Zaidi ya hayo, mwandishi ameonyesha umri halisi wa baadhi ya wahusika ambao ni vijana. Kwa mfano, Amani alikuwa na miaka 24.

Katika kazi hii, tulimchukulia kijana kama binadamu wa kiume au kike aliye na umri kati ya miaka 15 hadi 35. Vijana waliorejelewa katika riwaya teule wana umri huu wa kati ya miaka 15 hadi 35.Utafiti wetu kwa upande ule mwingine ulishughulikia suala la mabadiliko, ambalo pia huwa ni tata. Utata huu unatokana na sababu kuwa, mabadiliko yanaweza kuwa chanya au hasi. Utata kuhusu mabadiliko hutokea kwa sababu kuna watu ambao hupuuza mabadiliko hata yale ambayo ni chanya kama hayafuati maadili ya jamii. Mabadiliko katika jamii ni lazima yatokee na jinsi jamii inavyobadilika ndivyo vijana wanavyobadilisha majukumu yao. Mfumo wa zamani wa maisha umebadilika na hivyo kuyabadilisha majukumu ya vijana. Maisha ya kiasili ya Mwafrika yalihusu jamii nzima na watoto walikuwa mali ya jamii nzima.

Mabadiliko katika jamii yamevuruga mfumo huu wa maisha na kuwaacha vijana na changamoto nyingi. Elimu ya kimagharibi imeathiri mtagusano uliokuwepo katika jamii na kusababisha mabadiliko makubwa katika thamani na maadili ya jamii. Mabadiliko tuliyoyashughulikia katika utafiti wetu ni yale yanayotokana na kuvunjwa kwa maadili ya kijamii yanayopelekea kuwa na mifumo dhalimu, vita vya kikabila, matumizi mabaya ya mali ya umma, mtazamo mbaya kuhusu walemavu na maovu mengineyo.

Utafiti huu ulidhamiria kuonyesha kuwa wahusika vijana wana uwezo wa kuwa mawakala wa mabadiliko na wakafanikiwa. Katika kazi tulizozichambua, vijana wamesawiriwa kama wanajamii waliojitolea ili kuleta mabadiliko chanya yatakayowafaidi wanajamii wote wanaodhulumiwa kwa njia mbalimbali. Watu hutekeleza mapinduzi ya kisiasa, kiuchumi na kijamii kwa sababu ya kutoridhika na jinsi ambavyo wanatawaliwa au kwa kuichukia mifumo fulani ya watu inayowakandamiza na kudumisha maslahi ya watu wachache wenye vyeo na mamlaka.

Vijana ni kundi la binadamu ambalo ni muhimu sana kwa sababu wanaweza kuchangia vizuri upande wa kiuchumi, kisiasa na kijamii. Katika karne ya ishirini, baadhi ya waandishi wa kazi za fasihi waliangazia vijana kwa mtazamo hasi na kuwaona kama watu wasiojiweza. Waliwasawiri kama watu waasi wasioweza kuleta mchango wowote wa kimaendeleo. Katika karne ya ishirini na moja, kuna mwamko kuhusu umuhimu wa vijana katika kuleta mabadiliko chanya. Mashirika mbalimbali yameanza kutetea maslahi ya vijana. Kwa mfano, tarehe kumi na mbili Agosti ni siku ya vijana duniani inayonuia kuangazia mchango na changamoto zinazowakumba.

Mwandishi Ken Walibora aliyetunga *Kidagaa Kimemwozea (2012)* amebuni wahusika vijana wanaotoa mchango mkubwa katika riwaya zake. Utafiti huu unahusu ubainishaji wa mchango wa vijana katika kuleta mabadiliko hii ni kutokana na rai kuwa watafiti wengi wamejikita katika kushughulikia tu changamoto zinazowakumba vijana na utovu wa nidhamu

maishani mwao wakiwa katika harakati za kukidhi mahitaji yao ya kila siku. Isitoshe, mtafiti hajaweza kutambua utafiti wowote unaoshughulikia nafasi chanya ya vijana katika riwaya ya *Kidagaa Kimemwozea*.

Madhumuni makuu yalikuwa ni kuhakiki mchango wa vijana katika kuleta mabadiliko chanya katika jamii katika riwaya ya Kidagaa Kimemwozea,

Tulichagua mada hii kwa sababu tulitaka kuonyesha umuhimu wa vijana katika jamii kwani wao huwakilisha kizazi chenye nguvu za mwili na maarifa mapya. Kwa hivyo, wakipewa nafasi wanaweza kuleta mabadiliko yatakayowafaidi wanajamii. Isitoshe, baadhi ya waandishi wamekuwa hawathamini mchango wa vijana katika kuleta mabadiliko ya kimaendeleo. Hili limetokana na dhana-gande kuwa vijana ni watu ambao hawawezi kujisimamia ki mawazo na hata kimatendo. Kwa hivyo, waandishi wanapaswa kubadili huu mtazamo na kuanza kuwathamini vijana kwa kuwapatia nafasi ya kuchangia katika ujenzi wa taifa.Fauka ya hayo, kumekuwa na mwamko ambao unawahamasisha vijana kujipigania katika masuala ya jamii kama vile tamaduni zilizopitwa na wakati na ambazo zinazuia maendeleo. Hizi tamaduni ni pamoja na ndoa za mapema na za lazima, tohara ya wanawake na kadhalika. Vijana pia wameanza kujipigania kisiasa kwa kupambana na watawala wabaya na kwenda kinyume na uongozi dhalimu. Mwamko huu unapinga kasumba kuwa vijana ni viongozi wa kesho. Kwa sababu hii, ni vizuri kuchunguza jinsi waandishi wa kazi za fasihi wamelichukulia suala hili.Aidha, vijana huwakilisha uhai wa taifa. Hii inamaanisha kuwa vijana hutegemewa sana katika taifa kwa hivyo nchi ambayo haina vijana imekosa matumaini.

Kuna watafiti mbalimbali ambayo wamegusia mchango wa vijana katika jamii. Kwa mfano, Mazrui (1984), alihakiki suala la mabadiliko kwa jamii na majukumu ya vijana wa Kiafrika kwa kutumia nadharia ya ki-marx katika riwaya ya *Dunia Mti Mkavu (1980)*. Utafiti huu ulimfaa mtafiti uligusia majukumu ya vijana katika jamii. Isitoshe, Utafiti wa Mutua (2007) ulishughulikia mitazamo ya vijana na wazee kuhusu ukombozi wa mwanamke katika tamthilia tatu za Kiswahili. Tamthilia hizi ni pamoja na *Natala* (1997), *Kitumbua Kimeingia Mchanga* (2000), na *Migogoro* (2006). Kazi hii ni muhimu sana katika utafiti wetu kwa sababu inaonyesha jinsi vijana wamehusika katika ukombozi wa mwanamke. Vilevile, Naliaka (2012), alishughulikia hali ya vijana katika riwaya ya *Vipanya vya Maabara (2007)*. Katika kazi yake umuhimu mkubwa umepewa vijana. Alionyesha jinsi vijana wanavyotumiwa kama vipanya vya maabara. Pia, aliangazia matatizo ambayo huwakumba vijana mijini nchini Kenya, mji wa Nairobi ukitumiwa kama mandhari ya riwaya husika na kuonyesha jinsi wanavyojikakamua kubabiliana na changamoto hizo. Utafitii huu utamfaa mtafiti kwani unadhihirisha jinsi vijana wanavyojumuika kuleta mabadiliko katika jamii za.

2.0 Msingi wa kinadharia

Utafiti wetu uliongozwa na Nadharia ya Uyakinifu wa Kijamii. Nadharia hii ilituongoza katika kuhakiki jinsi wahusika vijana wanaweza kuangaza uovu katika jamii na juhudi wanazotia ili kukabiliana na uovu huu.

2.1 Usuli wa nadharia ya uyakinifu wa kijamii

Utafiti huu unahusu uhakiki wa mchango wa vijana katika kuleta mapinduzi katika jamii. Kwa hivyo, nadharia inayofaa ni ile inayohusiana na utetezi wa wanyonge na ukombozi wao katika jamii. Kwa sababu hii tulichagua nadharia ya uyakinifu wa kijamii ambayo iliasisiwa na Stalin

mwaka wa 1934, miaka michache baada ya mapinduzi ya Urusi ya mwaka wa 1917. Stalin aliishi miaka ya 1878-1953. Msukumo wake wa kutaka kubadilisha jamii ya Urusi ulichangiwa mno na mawazo ya Maksi hasa alipokuwa mhazili wa Chama cha Ujamaa. Malengo yao makuu yalikuwa kuzindua tabaka la chini la wanaonyanyaswa ili wafahamu na kutetea haki zao dhidi ya tabaka la juu. Stalin alitumia mwongozo wa nadharia ya umaksi ili kuonyesha uyakinifu wa maisha kwa kuleta usawa.

Nadharia ya uyakinifu wa kijamii ilihusishwa na mahusiano ya kitabaka katika jamii yaliyozua mikinzano. Kwa sababu ya maovu, jamii huwa na mikinzano ambayo itamalizika tu iwapo mfumo wa uzalishaji mali utakuwa mikononi mwa mafalahi. Istilahi hii ya uyakinifu wa kijamii ilichangiwa sana na wahakiki wengine baada ya uasisi wake miongoni mwao akiwa ni Lukacs (1963). Lukacs alieleza kuwa uyakinifu wa kijamii una uwezo wa kusawiri jamii katika ukamilifu wake na kuonyesha hatua za jamii hiyo za kimabadiliko. Pia, alisema kuwa uyakinifu wa kijamii huzingatia hali halisi ya jamii na kuitumia kueleza jinsi jamii inavyoelekea kwenye usoshiolisti. Jamii hupata msukumo fulani ambao huleta mabadiliko hasa wahusika wanapokumbwa na ubaguzi fulani kama vile wa kisiasa, kiuchumi na kisosholojia. Nadharia hii imetufaa katika utafiti wetu kwani masuala yanayogusiwa yanaleta uyakinifu wa maisha. Kimani wa Njogu (1989) anasema kuwa uyakinifu wa kijamii hutetea maslahi ya walio wengi katika jamii na hulenga katika wakati ujao wenye utu na usawa. Dhamira yake kuu huwa ni ukombozi. Ukombozi huu kwa mujibu wa uyakinifu wa kijamii huongozwa na tabaka la wafanyakazi.Wamitila (2002) anaeleza kuwa fasihi huwa na sifa bia ambazo huipa sifa za kiulinganishi. Mhakiki huyu anadai kuwa msingi wa fasihi ni binadamu kwa sababu jamii mbalimbali zimeundwa na binadamu. Hii ndiyo sababu kuu ya fasihi kuingiliana.

2.2 Mihimili ya uyakinifu wa kijamii

Nadharia ya uyakinifu wa kijamii huongozwa na mihimili ifuatayo:

Nadharia hii husawiri jamii katika ukamilifu wake na kuonyesha hatua za jamii kimaendeleo. Huwa na wahusika wa kimaendeleo ambao hunuia kupindua na kuibadilisha hali yao ya maisha.

Wahusika hutekeleza matendo yao kitabaka pamoja na kusawiri matukio kihistoria. Hufanya hivi kimakusudi au bila kufahamu. Tabaka la wanyonge hujifungata masombo ili kujipa mamlaka na nguvu za kiuchumi. mhimili huu, jamii katika *Kidagaa Kimemwozea*, imegawika katika makundi mawili; kundi la wanyanyasaji na wanaonyanyaswa. Pia, matukio yamesawiriwa kihistoria ambapo matukio ya awali katika jamii husika yameonyeshwa.

Uyakinifu wa kijamii huzingatia hali halisi ya jamii na maslahi ya makabwela ambao ni mafukara wa ulimwengu wanaotaka kuimarisha udikteta wa makabwela.

Wahusika huonyeshwa kiuyakinifu. Wahusika ambao hutumiwa kama vipaza sauti vya watunzi hupulizwa uhai mathalan wanadamu wa kawaida wanaoishi katika ulimwengu tunaojua.

Huonyesha matumaini juu ya kizazi cha binadamu. Hii inamaanisha kuwa mtu atakuwa mshindi dhidi ya unyonyaji na unyanyasaji wa aina yoyote. Mhimili huu ulitufaa katika utafiti wetu kwa sababu baada ya mapambano, vijana wanatokea kuwa washindi na kuikomboa jamii dhidi ya unyanyasaji.

Mihimili yote mitano ya Nadharia hii ya uyakinifu wa kijamii iliufaa utafiti wetu kwa sababu inaonyesha jamii katika uyakinifu wake ambapo kuna migogoro kati ya mamwinyi na makabwela na inapeana matumaini ambapo wahusika wa kimaendeleo wana uwezo wa kuleta mabadiliko katika jamii na kutupilia mbali utabaka.

3.0 Mbinu za utafiti

Uteuzi wa sampuli ambao ulitumiwa katika utafiti huu ni wa mbinu–kusudio. Mbinu hii iliwezesha kuteuliwa kwa riwaya ya *Kidaaga Kimemwozea* ambayo imesawiri wahusika vijana na kuonyesha mchango wao katika kuleta mabadiliko. Utafiti huu ni wa kiuthamano na kimaelezo. Data ambayo ilitumika katika utafiti huu ilitoka maktabani na mtandaoni. Maktabani, utafiti huu ulihusu kusoma kwa makini na kuchanganua riwaya ya *Kidagaa Kimemwozea* ili kuchunguza na kuangazia michango ambayo vijana wametoa katika kuleta mabadiliko katika riwaya hii. Vilevile, makala na machapisho yaliyoandikwa kuhusu mada yetu ya utafiti yalisomwa. Kwa mfano; vitabu, majarida na tasnifu za wasomi wengine. Pia, mtafiti alitumia mtandao na pia alisoma vitabu ambavyo vina maelezo kuhusu nadharia ya uyakinifu wa kijamii, ili tupate kujua misingi ya nadharia hii, mihimili yake na waasisi walioianzisha.

4.0 Vijana kama mawakala na visababishi vya mabadiliko katika riwaya ya *Kidagaa Kimemwozea* iliyoandikwa na Ken Walibora 2012.

Mabadiliko katika jaamii yanaweza kuwa ya kisiasa, kiuchumi na kijamii. Watu hutekeleza mabadiliko kwa sababu huwa hawajaridhika na jinsi viongozi wanavyowatawala au kwa sababu ya kuchukia mifumo dhalimu ambayo huwa inadumisha maslahi ya watu wachache wenye mamlaka. Mabadiliko yanaweza kutekelezwa kwa kutumia nguvu au yakapatikana kwa njia ya amani. Vijana wengi katika kazi hii wanatumia amani kutekeleza mabadiliko kama vile baadhi ya majina yao yanaashiria. Vijana katika riwaya *Kidagaa Kimemwozea* wamesawiriwa kama mawakala wa mabadiliko.

4.1 Vijana Kupigana na Utawala Mbaya na Ufisadi

Utawala mbaya huwa unaenda sambamba na ufisadi. Wanajamii wakichagua viongozi wabaya bila shaka kutakuwa na ufisadi. Amani katika *Kidagaa Kimemwozea* aliwaambia wananchi wa Tomoko kuwa kuwapo kwa viongozi wabaya mamlakani si kosa lao tu bali wao pia ni wakosaji kwa sababu ndio huwachagua. Anaendelea kusema kuwa viongozi wakitokea kuwa wafisadi, wananchi ndio huwaruhusu kwa kunyamaza badala ya kuwashutumu viongozi hao. Kijana Amani aliamua kumkabili Mtemi Nasaba Bora kuhusu umiliki wa mali yake. Baada ya Amani kumwokoa Mtemi Nasaba Bora wakati alipokuwa karibu kuuawa na genge la majambazi, Mtemi alimpeleka Amani nyumbani kwake na kumwambia amwitishe chochote alichotaka. Amani alichukua fursa hii kumdadisi Mtemi kuhusu mali aliyoimiliki. Amani alimwambia:

…Halafu naomba unieleze kinagaubaga mali yako umeipataje, mashamba na kadhalika? Nimenunua kwa jasho langu.

``Hukupoka mali ya mtu, hukubini na kughushi chochote na kufanya maskini sina sinani wakiulizwa hawaungami kumaskinika zaidi, waliokuwa na kichache wasiwe na chochote? Hukufanya njama yoyote mtu akauawa na mwingine akafungwa bure? (uk. 148)

Hii ni hatua mojawapo ambayo Amani amechukua ili kuangazia uovu wa kiongozi huyu wa kuwapokonya watu mashamba yao na kuwafunga jela na hata wengine kuuawa. Amani anamwitisha Mtemi Nasaba Bora hatimiliki zote alizokuwa nazo na kuzikagua kwa makini. Aligundua kuwa kulikuwa na hatimiliki mbili tofauti kwa kila shamba, moja bandia na nyingine halali, jambo lililomfanya athibitishe mambo aliyofichuliwa na amu yake Yusufu kuhusu wizi wa mashamba.

Amani anachukua hatua nyingine ya kuzipeleka hatimiliki alizopata mahakamani kama ithibati. Pia anamwambia Mtemi atoboe siri ya njama zake ndio amu yake aliyefungwa jela aachiliwe. Haya yanamfanya Mtemi kukiri aliyoyafanya, jambo ambalo litaleta mabadiliko kwa maisha ya wengi watakaotendewa haki baada ya ukweli kudhihirika. Mtemi alisema:

...kwa kweli najuta, alisema Mtemi Nasaba Bora baada ya kushusha Pumzi. Nilifanya mengi mabaya lakini siwezi kukueleza yote. Katika wizara ya ardhi na makao nilikoanzia ajira niligundua kwamba yupo Mtomoko aishiye nchi ya nje ambaye amenunua shamba la mzungu yaani *special plot*. Niliwalipa majambazi kumumaliza pindi awasilipo nchini. Nilijua fika kwamba mwanawe Yusufu angempokea uwanja wa ndege. Nilitaka kuwamaliza wote lakini watu niliowalipa hawakufuata maagizo vema. Ikawa lazima kutafuta njia ya kumfungisha jela kwa kumnasibisha na mauaji ya babake. Ilibidi kulipa hela nyingi za kadhongo kuwalipa polisi, makarani wa mahakama, majaji, wajua tena mti hauendi ila kwa nyenzo (uk. 150)

Amani hakomi ila anaendelea kumhoji Mtemi na kumtaka kuwataja waliomsaidia kutekeleza njama hii. Hili linamaanisha kuwa waovu wote watachukuliwa hatua na jambo hili litaleta mabadiliko makubwa kwa kuukomesha ufisadi katika jamii. Kwa hivyo, jamii mpya itakuwa imejengwa. Baada ya mashamba yaliyokuwa yamenyakuliwa na Mtemi Nasaba Bora kutwaliwa, Amani alikuwa mmoja wa wale waliofaidika sana kwa sababu mashamba mengi yalikuwa yamenyakuliwa kutoka kwa nasaba yake. Amani alifanya mabadiliko kwa sababu wengi walitarajia ajiwekee hayo mashamba na kuyatumia na nasaba yake. Kinyume cha matarajio, Amani aliamua kuwafaidi wanajamii wenzake badala ya kujirundikia mashamba hayo. Kwa mfano, alimgawia Bob DJ" shamba la ekari 20 (uk. 155).

4.2 Vijana Kupambana na Tamaduni potovu zilizopitwa na wakati

Katika jamii kuna imani ambazo ni potovu na huwa zinawafanya wanajamii kurudi nyuma kimaendeleo. Katika *Kidagaa Kimemwozea*, Imani amejitolea kukiuka na kuvunja imani kama hizi na kuleta mabadiliko ambayo yatawafanya wanajamii kupiga hatua za kimaendeleo. Imani ni msichana ambaye aliamua kuvunja mwiko kuhusu maji ya mto Kiberenge. Ilisemekana kuwa zamani mgonjwa mmoja wa kifafa alitumbukia na kuzama katika mto huu alipokuwa akioga. Maiti yake ilisakwa lakini haikupatikana. Ilizuka itikadi kuwa kutokomea kwa kifafa yule kulikuwa ishara ya miungu kuwapokonya waja haki ya kuyanywa maji ya mto Kiberenge. Imani wakiwa na kijana mwenzake Amani waliamua kuyanywa maji haya lakini hawakufa kama ilivyotarajiwa. Tunaambiwa kuwa:

Vizazi vingi baadaye pindi kunywa maji ya mto Kiberenge kulipokuwa tena mazoea, watu Sokomoko walisimuliana kuhusu msichana mmoja aliyekuwa wa kwanza kuvunja mwiko na kukosa kufa kama ilivyotarajiwa na kuwa chanzo cha mtazamo mpya kuhusu mto Kiberenge. Mwiko ulikuwa tena si mwiko (uk.7)

Wanajamii wakiendelea kuthamini imani kama hizi watarudi nyuma kimaendeleo. Imani za kijamii ni muhimu lakini kuna zile ambazo huwa zimepitwa na wakati na hazina budi kutupiliwa mbali. Maji ni uhai na yanaweza kuwa kitega uchumi kwa wanajamii. Kwa hivyo, imani kama hii ya kutotumia maji ya mto fulani itazuia maendeleo. Hii ndiyo sababu vijana hawa wawili waliamua kuvunja mwiko na kuyanywa maji ya mto Kiberenge.

Vijana hawa wanasema kuwa visa vya watu kufedheheshwa hadharani na kulazimishwa kutahiriwa vinasinya. Hii ni kweli kwa sababu hakuna mtu aliye na haki ya kumlazimisha mwingine kutimiza matakwa ya kitamaduni hasa katika enzi hii ambapo watu wameerevuka na kujua kwamba baadhi ya tamaduni zilikuwa za kipuuzi na zimepitwa na wakati. Ni heri zitupiliwe mbali na jamii izingatie mambo yanayoleta maendeleo.

4.3 Vijana Kubadili Mtazamo kuhusu walemavu

Imani alibadilisha mtazamo wa wengi kuhusu walemavu. Mwalimu Majisifu alikuwa na watoto ambao walizaliwa wakiwa walemavu. Mapacha wa kwanza walitoka udenda mdomoni mfululizo na kwenda haja zote katika nguo zao. Hao wengine nao hawakuweza kutembea. Vijakazi walioajiriwa kuwalea walihitaji kujikaza kisabuni. Imani hakujikaza tu kisabuni. Alikuwa na imani na ndiye mtu wa kwanza kuwaona na kuwatendea watoto hao kama binadamu.

Baba yao alikuwa anawachukia mpaka alikuwa anataka kuwatupa majini. Imani aliwapenda watoto wote walemavu kwa dhati na kuvunja rekodi kwa wema aliowatendea na staha aliyowastahi. Tunaambiwa kuwa kisa cha Imani kilisimuliwa na wengi baadaye; “Naam Walisimuliana kuhusu msichana ambaye pia alipindua mtazamo wa wengi kuelekea watu waitwao walemavu.”(uk.7)

Mtazamo chanya wa Imani kuhusu walemavu ulimfanya Mwalimu Majisifu ambaye ndiye alikuwa baba ya watoto wale walemavu kubadili mtazamo wake kuelekea watoto wake walemavu. Majisifu anasema, “Hatuwezi kuwa binadamu endapo hatuwaoni walemavu kama wenzetu. Tutakuwa tumelemaa ulemavu mbaya zaidi kuliko ulemavu.” (uk.159)

Mtazamo hasi kuhusu walemavu unajitokeza tena kwenye matwana ambapo Nasaba Bora alikutana na msichana mmoja mzuri ajabu. Nasaba Bora alivutiwa naye kwa urembo wake na akaanza kumtaka awe mpenzi wake. Msichana huyo alimwambia kuwa hilo haliwezekani kwa sababu alijua Nasaba Bora angekimbia baada ya kugundua kuwa alikuwa mlemavu. Haya ndiyo yalitendeka baadaye kwa sababu Nasaba Bora alipogundua msichana huyo alikuwa kiguru; baada ya kushuka kwenye matwana, alishindwa la kufanya na kumhepa. Tunaambiwa kuwa:

Nasaba Bora alimwambia msichana washuke watembee pamoja mjini. Msichana kainama uvunguni kutoa mikongojo miwili ya kwapani… Ndiposa Nasaba Bora kagundua kumbe banati huyo kiguru…‘si nilikwambia? Nilijua ngoma hii itakushinda. Nasaba Bora aliondoka pale baada ya kuomba radhi, haya zimemvaa uso…(uk.101)

Taswira ya kijana huyu imejitokeza ili kuonyesha umuhimu wa kuwaona walemavu kama binadamu wenzetu ndiposa tupate kuwa na maendeleo katika jamii kama vile Imani anavyoashiria. Inaaminika kuwa ulemavu sio udhaifu na kwamba walemavu wakipewa nafasi wanaweza kuchangia sana katika kuleta maendeleo.

4.4 Kubadili Mitazamo ya watu kuhusu maisha

Amani na Imani wanajaribu kubadilisha fikira za vijana wenzao na jamii kijumla kuhusu uhusiano wa vijana wa jinsia tofauti. Wanawafunza kuwa vijana wa jinsia tofauti wanaweza kuishi pamoja na kuheshimiana bila kujihusisha katika mapenzi. Tunaelezwa kuwa:

Amani alistakimu na Imani katika kibanda chake…kwa siku kadhaa. Imani alikuwa akibaki nyumbani mchana kutwa kukitunza kitoto kile kichanga alichopagazwa Amani…usiku Amani alilala kwenye mkeka mkuukuu uliotandikwa sakafuni akamwachia Imani kitanda chake cha teremka tukaze na kitoto chao cha kupanga. (uk.52)

Heshima kati ya vijana hawa wawili inazidi kuonekana kwa jinsi wanavyobadilisha nguo humo kibandani. Amani anasema hivi:

Tafadhali Imani, alisema Amani, kafumbe macho nibadili nguo. Imani akafumba macho na kupindua kiti bila neno na kukitazamisha ukutani. Hiyo ndiyo iliyokuwa kawaida yao. Wakati Imani alipotaka kubadili nguo pia ilibidi Amani kugeuka na kuangalia upande mwingine na kufumba macho ama yote mawili. (uk.75)

Heshima kama hii ingeshamiri miongoni mwa vijana na wanajamii kijumla jamii ingesonga hatua kadhaa kimaendeleo. Hii ni kwa sababu tangu Amani na Imani walipokutana ukingoni mwa mto Kiberenge usiku, wamekuwa safarini pamoja na heshima kati yao ndiyo iliwafanya kufaulu katika kuleta mabadiliko makuu katika jamii.

4.5 Kukabiliana na Wizi wa miswada

Amani ambaye ndiye alikuwa mwandishi halali wa riwaya ya *Kidagaa Kimemwozea*, alimwuliza maswali Mwalimu Majisifu kuhusu uandishi na wizi wa mawazo. Walikuwa wakizungumziana na Mwalimu Majisifu wakati walikutana karibu na mto Kiberenge. Majisifu anasema alikumbuka vizuri mazungumzo yaliyomshitua kwa vile kijana aliyefikiriwa hajui kusoma na kuandika alivyoonekana kuangusha hoja nzitonzito na kuuliza maswali kama wakili aliyetopea. Tunaelezwa hivi:

Hebu nikuulize swali moja, ukiandika kitabu kikawa maarufu ukaambiwa hukukiandika utasemaje? 'jibu mwafaka kwa madai kama hayo ni kunyamaza', alijibu mwalimu majisifu… Lakini ni kweli kwamba upo pia wizi, wizi wa mawazo, wizi wa miswada kama vile ulivyo wizi wa mashamba na magari, wizi wa mitihani na mifugo, wizi wa wake na waume za watu na kadhalika? (uk. 96-97)

Maswali kama haya anayoulizwa Mwalimu Majisifu na Amani yanalenga kubadilisha huo uovu wa mtu kuandika mswada wake na ukaibiwa na mtu mwingine, kama vile Mwalimu Majisifu alivyokuwa amemwibia Amani mswada wake. Jambo kama hili la kuibiwa mswada linarudisha nyuma maendeleo na kuwafisha moyo waandishi wa baadaye kwa sababu wakijua kuwa wataandika na miswada yao iibiwe, hawatakuwa na ilhamu ya kuandika tena. Hili linawafanya vijana kuinuka na kutetea jambo hili.

Mashaka na mjombake Majisifu walipokuwa wakizungumziana, waligusia uandishi wa riwaya ya *Kidagaa Kimemwozea* ambayo Mwalimu Majisifu alikuwa anadai kuwa ndiye aliyeiandika. Maswali ambayo Mashaka anamwuliza amu yake kuhusu uandishi wa riwaya hii na jinsi Majisifu anavyoyajibu yanaelekea kuonyesha kuwa Majisifu hajui chochote kuhusu uandishi wa riwaya hiyo. Haya yanafunua uovu ambapo watu huwaibia wengine mawazo na miswada yao. Mashaka alimuuliza amu yake hivi, "Basi *Kidagaa Kimemwozea* kilichukua muda gani kuandika?"Siku moja."Aha! Kurasa zote hizo?"

Mwandishi bora lazima aandike haraka kabla mawazo hayajayeyuka na kugeuka upepo" (uk.48) Katika mazungumzo haya, ukweli kwamba Mwalimu Majisifu siye aliandika kitabu hiki unaendelea kudhihirika. Wakati Mwalimu Majisifu alikuwa amealikwa kwenda kuhutubia umma huko Wangwani, vijana wa chuoni walimwuliza maswali kuhusu uandishi wa riwaya yake ya *Kidagaa Kimemwozea* ambayo ilimfanya kupata umaarufu sana. Mwalimu Majisifu alishindwa kuhutubia hadhira na hata akashindwa kujibu maswali ambayo alikuwa anaulizwa na vijana kuhusu uandishi wake. Tunaambiwa kuwa:

Ghulamu mweusi ti aliamka na kuuliza, 'Mwalimu Majisifu riwaya yako umeiita *Kidagaa Kimemwozea*. Je, unaweza kutuelezea kilichokufanya kuchagua kichwa hicho?' Kwa kweli ee, sijui kwa nini nilichagua kukiita kitabu hicho *Kidagaa Kimemwozea*. Niligutuka tu nimekiita hivyo. (uk.123)

Banati mmoja naye alijitokeza na kuendelea kumwuliza Mwalimu Majisifu maswali kuhusiana na maudhui yaliyomo katika riwaya yake:

Una maoni gani mwenyewe juu ya jinsi nchi huru za Afrika zilivyo baada ya kuondoka kwa mkoloni? Aliuliza banati mmoja. Ahaa. Kusema kweli Afrika imepiga hatua kimaendeleo baada ya uhuru…kuna umoja na utangamano humu barani… Afrika imejikomboa kutoka matatizo ya njaa. Lakini Mwalimu Majisifu, alidakia tena yule banati kwa nini maoni yako ni tofauti na maudhui katika riwaya yako ya *Kidagaa Kimemwozea* maana huko umeonyesha kuna walakini katika Afrika huru. Sina haja kuzungumzia hapa udhaifu mkubwa wa kimuundo ulio dhahiri shahiri katika riwaya yako. Huo, hata mtoto wa shule ya msingi anaweza kuutambua mara moja. (uk.124)

Kijana mwingine aliendelea kumwuliza Mwalimu Majisifu maswali ili kudhihirisha udhaifu wake. Alimwuliza:

Je wewe ndiye uliyeandika *Kidagaa Kimemwozea*? Ghulamu mmoja mwenye nywele za rasta aliuliza. Twasikia tetesi kwamba hukuandika riwaya hiyo, kwamba uliuchukua mswada wa mtu mwingine? Mwalimu Majisifu akaubana. Hayo yalikuwa mno. (uk.125)

Haya maswali yanayoulizwa na vijana na jinsi yanayojibiwa vibaya vibaya na Mwalimu Majisifu yanaonyesha. kuwa vijana wamejitolea kuleta mabadiliko katika uandishi kwa kuwaangazia waandishi bandia ambao wanaiba miswada ya wengine na kuifanya yao. Kwa hivyo, wanachangia kuangamiza wizi wa kitaaluma.

4.6 Kupigana na Unyanyasaji wa wanyonge

Katika jamii huwa kuna wanyonge ambao wakati mwingi wananyanyaswa na kuhukumiwa bila hatia. Watu kama hawa wanaweza kuumia sana kama hakutakuwa na mtu wa kuwatetea. Katika *Kidagaa Kimemwozea*, Lowela alijitokeza na kuamua kuwatetea vijana wenzake; Amani na Imani wakati walipofungwa jela na Mtemi Nasaba Bora bila hatia, ingawa alikuwa mpenzi wake Mtemi. Katika barua aliyomwandikia Mtemi, Lowela alimwambia, "Usipowaachilia wale vijana wawili, mchunga wako na yule msichana waliojisabilia kumtunza mtoto uliyempagaza mchunga huyo nitatoboa siri." (uk.106)

Tendo hili la Lowela ni ishara kuwa vijana wako tayari kupambana na uovu wa viongozi hata kama wana uhusiano wa karibu nao, kama vile Lowela alivyofanya alipomshutumu Mtemi ingawa walikuwa na uhusiano wa kimapenzi.

Amani na Imani walipofungwa gerezani, Bob Dj alikuwa mmoja wa waliojitolea kuwatetea kwa sababu hawakuwa na hatia. Walikuwa wanasingiziwa tu kuwa walikiua kitoto Uhuru. Mtemi anasema kuwa alipokutana na Dj mjini, alimuuliza kwa nini hawezi kuwaachilia wale vijana, Amani na Imani ilhali hawana hatia. Haya yanaonyesha kuwa Dj alikuwa anawatetea vijana wenzake. Tunaelezwa hivi:

Yule kijana asemaye kama mkora? Mtundu wa mwisho. Kama kaumwa na mbwa, hiyo ni stahili yake. Juzi tulikutana mjini akaniuliza eti kwa nini siwezi kuwaachilia wale vijana kumbe wanaitwaje vile? Amani na Imani… basi kanikuta juzi na kuniuliza kwa nini nisiwaachilie ilhali hawana hatia. Nikamwuliza kama hawana hatia yeye ajuaje. Akanijibu kwa takaburi kwamba na mimi najuaje kama wanayo hatia.(uk.104)

4.7 Umuhimu wa haki za watoto

Kila mtoto anapozaliwa huwa ana haki ya kuishi. Katika *Kidagaa Kimemwozea*, Mtemi Nasaba Bora na Lowela walikiuka haya wakati Lowela alipojifungua na wakaamua kumtupa mtoto huyo. Amani na Imani wanazindua jamii kuhusu umuhimu wa haki za watoto kwa kujisabilia kukilea kitoto Uhuru ijapokuwa kitoto hiki si chao. Mtoto Uhuru alikuwa amezaliwa na Lowela ambaye alikuwa hawara wa Mtemi Nasaba Bora. Kwa sababu Lowela hakutaka wazazi wake wajue amezaa, naye Mtemi Nasaba Bora hakutaka bibi yake Bi. Zuhura ajue kuwa ana jicho la nje, Mtemi aliamua kumwacha mtoto huyo mlangoni mwa kibanda cha mchunga wa mifugo wake, Amani. Amani aliamua kumwita Imani aje amsaidie na wakamlea mtoto huyo vizuri sana mpaka alipougua na kufariki. Kwa kufanya hivi, vijana hawa wanaonyesha umuhimu wa haki za watoto na kuzitetea.

4.8 Kubadili mtazamo wa kulipiza Kisasi na kukuza msamaha.

Katika *Kidagaa Kimemwozea*, Amani alibadilisha mtazamo wa wengi kuwa mtu akikukosea ni lazima ujitenge naye na kuacha kushirikiana na yeye. Baada ya Amani kufunguliwa kutoka Jela ambako Mtemi Nasaba Bora alikuwa amewafungia bila hatia, hakuacha kufanya kazi kwake. Ingawa Imani alikuwa anamshawishi aache kufanya kazi kwa Mtemi Nasaba Bora alikataa katakata. Tunaelezwa kwamba:

Amani alirejea kwake kibandani na kuendelea na kazi ya kuchunga na kukama ng'ombe. Alikataa katakata rai ya Imani kuacha ajira kwa Bwana Nasaba Bora na kutafuta kwingineko. (uk.110)

Kuendelea kufanya kazi kwa Mtemi Nasaba Bora ndiko hasa kunafanya Amani kutambua maovu ya Mtemi na baadaye mabadiliko mengine mengi yakatokea. Pia, licha ya kuwa Mtemi Nasaba Bora alikuwa akiwatesa watu, Amani alisisitiza kuwa Mtemi azikwe kwa heshima kuonyesha kuwa yeye alikuwa na mtazamo tofauti kuhusu watu waovu. Tunaambiwa, "Amani alisisitiza kwamba sharti azikwe Mtemi kwa heshima inayomstahiki si hoja kafanya makuruhu mangapi alipokuwa mamlakani." (uk 159)

Amani alimsamehe tena Mtemi Nasaba Bora kwa kumtandika kinyama baada ya kumpata katika chumba chake cha kulala alipokuwa ameitwa na Bi. Zuhura amsaidie. Mtemi aligundua kuwa Amani hakuwa na ngoa naye baada ya Amani kumwokoa alipokuwa amevamiwa na majambazi njiani. Amani alimwambia Mtemi kuwa ijapokuwa alimtendea maovu, yeye hakumchukia. Anamkumbusha kuwa hali yake ilikuwa karibu sawa na ile ya Yusufu na Potifa. Amani alimsamehe Mwalimu Majisifu baada ya kugundua kuwa ndiye alimwibia mswada wake. Amani aliamua kumwandikia Majisifu ujumbe mfupi wa kishairi na kumwambia kuwa hakuwa na kinyongo na yeye. Ingawa alimwibia utungo wake, anastahili kusamehewa. Amani angeamua kulipiza kisasi huenda hangefaulu katika mapambano yake dhidi ya utawala mbaya. Hii ni kwa sababu watu ambao aliwasamehe ndio wanamsaidia kupambana na uovu.

5.0 Hitimisho na mapendekezo

Utafiti huu umeangazia kwa undani mchango wa vijana katika kuleta mabadiliko katika jamii kwa kuchunguza riwaya ya *Kidagaa Kimemwozea*. Ni wazi kuwa mwandishi wa riwaya hii ameshughulikia mchango ambao vijana wanatoa katika jamii zao ili kuzibadilisha na kuleta maendeleo. Kwa hakika uhalisia wa kijamaa unadhihirika wazi pale ambapo vijana wanatambua mambo ambayo yanaathiri jamii na kuzuia maendeleo na kujitahidi ili kupambana na mambo hayo. Masuala ambayo vijana wamejitolea kuyashughulikia katika makala haya ni kama vile kupambana na utawala mbaya na ufisadi. Vijana kama Amani, Imani, Madhubuti, Mashaka na vijana wa chuo cha Tandika wako mstari wa mbele kuhakikisha kuwa uovu huu umeisha kabisa. Isitoshe, vijana wanapigana na uongozi mbaya, wanabadili mitazamo ganda kuhuwahusu walemavu, kukabiliana na wizi wa miswanda pamoja na kuendeleza maadili mema kwa kutolipiza kisasi kwa mahasidi wao. Mtafiti anapendekeza kuwa tafiti za baadaye zifanywe kuhusu nafasi ya vijana katika kuleta mabadiliko katika tanzu zingine za fasihi kama vile hadithi fupi na ushairi.

Marejeleo

Arege,T. (2013) *Tunu ya Ushairi*. Nairobi: Oxford University Press.

Erikson, H.E (1961) *Youth change and challenge.* New York: America Academy of Art and Science.

Gorky, M (1921) *Through Russia*. London: CJ Hoogarth.

Hussein, E. N (1971) *Wakati ukuta*. Nairobi: East Africa Publishing house.

Kaui T.M (2008)'Usawiri wa vijana katika tamthilia za Kiswahili'Tasnifu ya uzamili, Chuo Kikuu cha Kenyatta (Haijachapishwa)

Keniston, K (1975) *Youth as a stage of life*: USA, The National Society for the Study of Education.

Kezilahabi, E (1971) *Rosa Mistika.* Nairobi: Kenya Literature Bureau.

_____ (1974) *Kichwamaji*. Nairobi: East Africa Publishing House.

Kiongera, K.J (2012) 'Mchango wa vijana katika kuleta mabadiliko chanya, katika tamthilia nne za Kiswahili'. Tasnifu ya uzamili,Chuo Kikuu cha Nairobi (Haijachapishwa)

Kitsao, J (1980) *Uasi*. Nairobi: Oxford University Press.

Lugano, R.S (1989) 'Mwanamke katika riwaya za Kezilahabi'. Tasnifu ya uzamili, Chuo Kikuu cha Nairobi (Haijachapishwa)

Lukacs (1962) *The Meaning of Contemporary Realism*. London: Merlin Press.

Mayieka, N.M(2014). 'Masuala ibuka katika *Kidagaa Kimemwozea*.' Tasnifu ya uzamili, Chuo Kikuu cha Kenyatta (Haijachapishwa)

Marx, K. (1959) *Marx and Engels on Literature*. New York: International General.

Mazrui, A. (1984) 'Uhakiki wa *Dunia Mti Mkavu*.' Tasnifu ya uzamili, Chuo Kikuu Cha Nairobi. (Haijachapishwa)

Mbatiah, M (2001) *Kamusi ya Fasihi*. Nairobi: Standard books, Graphics and publishers.

Mohamed, S.A (2000) *Kitumbua Kimeingia Mchanga*. Nairobi: Oxford University Press.(2014) *Mkamandume*. Nairobi: Longhorn Publishers.

Msokile, M (1993) *Misingi ya Uhakiki wa Fasihi*. Nairobi: East Africa Education Publishers.

Muriithi, (2016) 'Changamoto ambazo huwakumba vijana katika riwaya za *Upotevu* na *Dunia Uwanja wa Fujo.'* Tasnifu ya uzamili, Chuo kikuu cha Nairobi (Haijachapishwa)

Mutua, J.M (2007) 'Mitazamo ya vijana na wazee kuhusu ukombozi wa wanawake katika tamthilia tatu za Kiswahili'Tasnifu ya uzamili,Chuo Kikuu cha Nairobi (Haijachapishwa)Naliaka, R (2012)`Hali ya vijana katika riwaya ya *Vipanya vya Maabara*'Tasnifu ya Uzamili, Chuo Kikuu cha Nairobi (Haijachapishwa)

Njogu, K (1997) Uhakiki wa riwaya za *Visiwani Zanzibar*. Nairobi: Nairobi University Press.

Njogu, K na Chimerah, R (1999) *Ufundishaji wa Fasihi; Nadharia na Mbinu*. Nairobi: Jomo Kenyatta Foundation.

Nkonge, G, (2006). 'Athari za Udhanaishi katika *Kichwa Maji* na *Nguvu ya Sala*.'Tasnifu ya uzamili, Chuo Kikuu cha Nairobi (Haijachapishwa)

Nyamemba, (2012) 'Uchanganuzi linganishi wa jinsi waandishi katika *Tunu ya Ushairi* wanavyoshughulikia masuala ya vijana.'Tasnifu ya uzamili, Chuo Kikuu cha Nairobi (Haijachapishwa)

Obore, E. M (2012)'Dhuluma dhidi ya vijana wa kike katika Riwaya ya *Rosa Mistika'*.

Tasnifu ya uzamili, Chuo Kikuu cha Nairobi (Haijachapishwa)

Osango (2015) 'Ukombozi wa kisiasa na kiuchumi katika *Mkamandume*.'Tasnifu ya uzamili, Chuo Kikuu cha Nairobi (Haijachapishwa)

Rono, P (2013) 'Uhakiki wa kimaudhui na kifani wa *Kidagaa Kimemwozea'*,Tasnifu ya uzamili, Chuo Kikuu cha Nairobi (Haijachapishwa)

Senkoro, F.E.M.K(1987) *Fasihi na Jamii*. Dar es Salaam: Press and Publicity Center.

Wa Mberia, K. (1997) *Natala*. Nairobi: Marimba publications.

_____(2001) *Kifo Kisimani*. Nairobi: Marimba publications.

_____ (1999) *Maua kwenye jua la asubuhi*. Nairobi: Marimba publications.

Wafula, R.M(1999) 'Uhakiki wa tamthilia tatu kuhusu wahusika vijana'. Tasnifu ya uzamili Chuo Kikuu cha Kenyatta (Haijachapishwa)

Wafula, R.M na Njogu K (2007) *Nadharia za Fasihi*. Nairobi: Jomo Kenyatta Foundation.

Walibora, K (2006) *Kufa Kuzikana*. Nairobi: Longhorn Publishers.

_____(2012) *Kidagaa Kimemwozea*. Nairobi: Target Publications

Limited.

Wamitila, K.W (2001) *Nguvu ya Sala.* Nairobi: Longhorn Publishers.

_____(2002) *Uhakiki wa Fasihi: Misingi na Vipengele Vyake*. Nairobi: Phoenix Publishers.

_____(2003) *Kamusi ya Fasihi: Istilahi na Nadharia*: Focus publishers. ._(2003) *Pango*. Nairobi: Focus publishers.

_____(2008) *Misingi ya uchanganuzi wa Fasihi*. Nairobi.Vide- Muwa Publishers Ltd.

Mustakabali wa Ufundishaji na Ujifunzaji wa Fonolojia ya Kiswahili kwa kutumia Uwili Lugha katika Elimu ya Juu Tanzania: Mifano kutoka Programu za Uzamili

Joseph Hokororo Ismail, Chuo cha Uongozi wa Mahakama Lushoto, P.O. Box 20, LUSHOTO-TANZANIA

na

Baraka Kasinge Mwikwabe, Chuo Kikuu cha Mt. Agustino, Bewa Kuu Mwanza, P. O. Box 307, MWANZA, TANZANIA

Ikisiri

Tangu serikali ipanue wigo wa utoaji elimu ya juu Tanzania, hususani elimu ya Chuo Kikuu, kumekuwa na ongezeko la vyuo vikuu vinavyotoa elimu ya Juu. Ongezeko hili limechangiwa na taasisi zisizo za umma kuanzisha vyuo vikuu binafsi ambavyo hutoa shahada kuanzia za awali mpaka za Uzamivu kwa kutumia ama lugha ya Kiswahili au Kiingereza. Katika vyuo Vikuu hivi, lugha ya Kiswahili imekuwa ikitumika kujifunzia na kufundishia somo la Kiswahili na taaluma za Kiswahili kwa shahada za awali. Katika jitihada za kupanua taaluma za Kiswahili, baadhi ya vyuo vikuu hapa Tanzania, kama vile Chuo Kikuu Huria cha Tanzania, Chuo Kikuu cha Ruaha na Chuo Kikuu cha Dar es Salaam, vinafundisha taaluma za Kiswahili kwa lugha ya Kiswahili katika kiwango cha shahada ya Uzamili na Uzamivu. Hivyo, kozi za fasihi na isimu kama vile fonolojia, mofolojia, semantiki, sintaksia, isimu Jamii, kuyataja kwa uchache, katika ngazi za uzamili hufundishwa kwa lugha ya Kiswahili. Katika ufundishaji na ujifunzaji wa taaluma za Kiswahili kwa kutumia lugha ya Kiswahili kumekuwa na changamoto za namna Kiswahili inavyowezesha ufundishaji na ujifunzaji wa fonolojia katika ngazi ya Umahiri na Uzamivu. Lengo la makala haya ni kujadili mustakabali wa ufundishaji wa fonolojia katika ngazi ya Umahiri kwa kutumia lugha ya Kiswahili. Vyuo vikuu viwili vilitumika kama sampuli ya kukusanya data na Mkabala wa Kifafanuzi na Ulinganisho zilitumika katika uchambuzi wa data. Utafiti huu utasaidia kuona aina ya maboresho yanavyoweza kufanyika hasa katika kipengele cha tafsiri za istilahi za fonolojia yanayoweza kusaidia kukuza taaluma ya fonolojia na lugha ya Kiswahili kwa ujumla kwa kuwa vitabu mbalimbali vya fonolojia (vingi) vimeandikwa kwa lugha ya Kiingereza ambayo huwatatiza wajifunzaji na wafundishaji. Makala yanahitimisha kwamba pamoja na changamoto za tafsiri na ukosefu wa vitabu vya rejea vilivyoandikwa kwa lugha ya Kiswahili, upo mwanga mkubwa kwamba lugha ya Kiswahili inaweza kutoa maarifa ya kutosha kuhusu taaluma ya fonolojia kwa ujumla wake.

Dhana za Msingi: Kiswahili, fonolojia, ufundishaji, ujifunzaji, elimu ya juu.

UTANGULIZI

Makala haya yalilenga kujadili mustakabali wa ufundishaji na ujifunzaji wa fonolojia ya Kiswahili kwa kutumia uwili lugha katika elimu ya juu Tanzania hususani programu za Uzamili. Kama inavyoonekana katika sehemu ya ikisiri, utafiti huu umehusisha vyuo vikuu viwili vya umma vinavyofundisha kozi ya fonolojia ya Kiswahili katika kiwango cha Umahiri. Kihistoria, katika miaka ya 2000, kumekuwa na mwamko na mjadala mkubwa wa taasisi za elimu hapa Tanzania kuona uwezekano wa kutumia lugha ya Kiswahili kama chombo cha kufundishia na kujifunzia masomo mbalimbali katika ngazi zote za elimu ya juu. Hali ya mijadala hii ilipelekea kuwa na matamko yaliyotilia maanani utekelezaji ama kuunga mkono kwa hoja ya kukifanya Kiswahili kuwa lugha ya kufundishia na kujifunzia, kwa mfano vikao mbalimbali vya Mabaraza ya Uongozi wa Vyuo Vikuu kuendeshwa na kuchukuliwa mihtasari ya vikao hivyo kwa Kiswahili. Aidha baadhi ya taasisi kama vile Chuo Kikuu cha Dar es Salaam, zimeanzisha programu za Kiswahili katika ngazi za shahada ya awali mpaka shahada ya Uzamivu. Tunapozungumzia shahada za awali tunamaanisha shahada ya kwanza, shahada ya Umahiri inamaanisha shahada ya Pili na shahada ya Uzamivu inamaanisha shahada ya Udaktari wa Falsafa. Hivyo kwa mujibu wa programu za Kiswahili, kunakuwa na Shahada ya Awali (Kiswahili); Shahada ya Umahiri (Kiswahili) na Shahada ya Uzamivu (Kiswahili),

Hapa Tanzania, kupitia Chuo Kikuu cha Dar es Salaam, kulikuwa na programu ya Umahiri ambayo hapo awali imekuwa ikifundishwa kwa ushirikiano baina ya idara ya Kiswahili na idara ya lugha za kigeni na isimu. Wafanyakazi ,wanataaluma na wasio wanataaluma wamepata mafunzo kupitia programu hii. Hata hivyo, kwa sababu ya muundo wa programu yenyewe, Kiswahili kama somo, hakikuzingatiwa ipasavyo. Taaluma za Kiswahili kama vile isimu na matawi yake, Fasihi na matawi yake na Uchapishaji na mawasiliano havikuzingatiwa. Kutokana na mapungufu haya, Taasisi ya Taaluma za Kiswahili, ya Chuo Kikuu cha Dar es Salaam, ikaamua kuanzisha programu ya ufundishaji wa Taaluma za Kiswahili, ikiwemo fonolojia ya Kiswahili.

Malengo Makuu ya Programu ya MA (Kiswahili) yameainishwa katika Silabasi ya Programu ya MA Kiswahili (2010) kama ifuatavyo:

Kuandaaa wataalamu ambao watafundisha taaluma za Kiswahili kwenye ngazi za elimu ya juu;

Kuandaa wataalamu watakaofanya kazi katika vyombo vya habari, mashirika ya uchapishaji, idara za serikali, mashirika ya Kimataifa na maeneo mengineyo husika;

Kufunza wanafunzi watakaoweza kusoma masomo ya Uzamivu katika isimu na /au fasihi ya Kiswahili.

Kutokana na malengo haya, lugha ya kufundishia na kuandikia tasnifu ni Kiswahili.

Baada ya kuangalia usuli unaohusu ufundishaji wa programu ya Umahiri kwa ujumla, sasa tuangalie kwa ufupi kuhusu programu ya kozi ya fonolojia katika Umahiri. Madhumuni ya msingi ya kozi hii ni kuwawezesha wanafunzi kuzielewa nadharia za sasa za viwango vya juu vya fonolojia na jinsi nadharia hizo zinavyoweza kutumika katika kuvichambua na kuvichanganua vipengele mbalimbali vya fonolojia ya Kiswahili. Kozi inaanza kwa kupitia maoni mbalimbali yaliyotolewa dhidi ya Modeli Rasmi (MR) ya mkabala wa Fonolojia Zalishi (FZ). Kisha itaelezea baadhi ya nadharia na mikabala iliyopendekezwa ili kuepukana na matatizo

yaliyojitokeza katika Kiunzi Msingi hicho. Katika kufundisha nadharia hizi kozi itakuwa ikifanya ulinganisho baina ya Kiswahili na lugha nyingine za kibantu. Kutokana na usuli huu,

Katika kufundisha programu ya fonolojia ya Kiswahili, ilitarajiwa kwamba lugha ya kufundishia na kujifunzia programu hii iwe Kiswahili, kwamba mhadhiri aitumie lugha ya Kiswahili katika ufundishaji wa Kiswahili kwa ufasaha na michango na majadiliano ya wanafunzi darasani, na Makala mbalimbali yanayoandikwa na wanafunzi kwa minajili ya kukidhi tathimini za programu ziandikwe kwa Kiswahili sanifu na fasaha. Hivyo, makala haya yanaangazia kujadili mustakabali wa ufundishaji na ujifunzaji wa fonolojia ya Kiswahili kwa kutumia lugha ya Kiswahili kama lugha ya kufundishia na kujifunzia. Malengo mahususi yatakuwa Kujadili namna ambavyo lugha ya Kiswahili na Kiingereza zinavyotumika katika ufundishaji na ujifunzaji wa fonolojia ya Kiswahili darasani; Kuangalia matumizi ya Kiswahili katika kuandika kazi na vitabu vya fonolojia ya Kiswahili na Kutathimini ujitoshelezaji wa vitabu vya rejea vilivyoandikwa kwa Kiswahili kuhusu fonolojia ya Kiswahili. Utafiti huu umeongozwa na maswali yafuatayo:

Je lugha ya Kiswahili na Kiingereza zinatumikaje katika ufundishaji na ujifunzaji wa fonolojia ya Kiswahili darasani?

Je vitabu na kazi za wanafunzi za fonolojia ya Kiswahili zimeandikwa kwa Kiswahili fasaha? na

Je kuna vitabu vya kutosha vilivyoandikwa kwa Kiswahili kuhusu fonolojia ya Kiswahili?

Utafiti huu utatoa mchango mkubwa katika fonolojia ya Kiswahili kwa kuwa utapendekeza mikakati stahiki ya kukabiliana na changamoto zitakazoonekana kujitokeza katika ufundishaji na ujifunzaji wa fonolojia ya Kiswahili. Aidha utachangia katika kuhamasisha wataalamu wa fonolojia na taaluma ya isimu kwa ujumla namna ya kujipanga kwa kufanya uchunguzi wa kutosha na kutoa machapisho ya kutosha kuhusu taaluma ya fonolojia ya Kiswahili kwa lugha ya Kiswahili. Hivyo kupunguza changamoto za ufundishaji na ujifunzaji wa fonolojia ya Kiswahili kwa kutumia lugha ya Kiswahili. Baada ya kuangalia usuli wa tatizo letu la utafiti, tuendeleze mjadala huu kwa kuangazia wataalamu kadhaa walioandika kuhusu ufundishaji wa lugha na dhana ya uwili lugha, tukianza na Brown na Atkins hapa chini.

Brown na Atkins (1988) wanafafanua mchakato wa ufundishaji kama utoaji wa fursa za kujifunza kwa wanafunzi. Kujifunza ni mchakato wa kupata mafunzo yanayokusudiwa kwa mwanafunzi au mtu anayejifunza. Brown na Atkins wanaongeza kwa kusema kuwa mchakato wa kufundisha na kujifunza ni wa mwingiliano na ni zoezi lenye makusudio fulani. Mambo yanayotakiwa kufunzwa kwa wanafunzi inaweza kuwa uhalisia, michakato, ujuzi, mawazo (dhana), na mitazamo. Hata hivyo, inasisitizwa kuwa wanafunzi, si wakati wote, watajifunza kile tunacholenga wajifunze, wakati mwingine wanaweza kujifunza dhana ambazo hatukukusudia wao kujifunza.

Lisilo budi ni kwamba, mchakato wa kufundisha na kujifunza hutegemea lugha. Mara nyingi lugha ya kufundishia na kujifunzia huelekezwa na sera ya elimu au sera ya lugha ya jamii husika. Kwa Tanzania, hususani kwa elimu ya juu ambayo ndio lengo la utafiti huu, Sera Mpya ya Elimu na Mafunzo ya Mwaka 2014 inaelekeza kwamba lugha ya Taifa ya Kiswahili itatumika kufundishia na kujifunzia katika ngazi zote za elimu na mafunzo na Serikali itaweka utaratibu wa kuwezesha matumizi ya lugha hii kuwa endelevu na yenye ufanisi katika kuwapatia walengwa elimu na mafunzo yenye tija kitaifa na kimataifa. Sera hiyo inaongeza kuwa serikali

itaendelea na utaratibu wa kuimarisha matumizi ya lugha ya Kiingereza katika kufundishia na kujifunzia, katika ngazi zote za elimu na mafunzo (JMT, 2014).

Hata hivyo, kuutokana na sababu mbalimbali, katika vyuo vikuu kumekuwepo na mazoea ya uwili lugha ambapo badala ya lugha ya kufundishia kutumika kama lugha pekee, walimu na wanafunzi hujikuta wakitumia lugha zaidi ya moja. Dhana hii ya uwili lugha, ni dhana inayoweza kuleta utata inaposikika kwa wazungumzaji wa Kiswahili, kadhalika kwa msomaji wa kazi hii. Tafsiri ya kwanza, mtu anaweza kujiuliza kama uwili lugha ni matumizi ya lugha mbili kama mfumo rasmi wa jamii?[23] Au ni matumizi ya lugha mbili katika mazungumzo iwe ni kuchanganya katika sentensi au kuongea kwa lugha moja kisha mzungumzaji akahamia kwenye lugha nyingine lakini akiendelea na mazungumzo yale yale?[24] Vyovyote iwavyo, kwa kuwa lengo letu si kueleza ufanano wala tofauti za dhana hizo katika Kiswahili, katika makala haya tutatumia neno *uwili lugha* kama matumizi ya lugha zaidi ya moja katika ufundishaji na ujifunzaji bila kujali ni mfumo-lugha ulio rasmi au si rasmi. Kwa maneno mengine, katika utafiti huu, neno uwili lugha linatumika kwa kuzijumuisha dhana mbili za Kiingereza "Bilingualism" na "Code switching/code mixing".

Katika muktadha wa elimu, uwili lugha unaweza kuwa ni mfumo wa kitaasisi au wa watu binafsi. Kama anavyofafanua Du Plessis (2006), uwili lugha wa kitaasisi ni mfumo lugha wa taasisi husika kutumia lugha mbili hata kama hazitumiki katika ufundishaji na ujifunzaji. Aina hii ya uwili lugha, pia, inafafanuliwa na Langner & Imbach (2000) kama matumizi ya lugha mbili katika shughuli za taasisi fulani. Ilhali uwili lugha wa watu binafsi ni matokeo ya taasisi inayotumia au kutambua matumizi ya lugha mbili (Du Plessis, 2006). Kutokana na hali au mfumo huo wa lugha, uwili lugha kwa watu binafsi ni matokeo ya kiisimujamii ya mfumo-lugha wa taasisi (chuo, kwa muktadha huu) ambapo washiriki[25] wa chuo husika hutumia lugha zaidi ya moja. Utafiti huu unajikita katika mfumo wa uwili lugha darasani. Lin (2013) anafafanua matumizi ya uwili lugha darasani kama utumiaji wa lugha zaidi ya moja darasani miongoni mwa washiriki wa darasa (walimu na wanafunzi).

Ni ukweli usiopingika kuwa ufundishaji wa kozi za fasihi na isimu kama vile fonolojia, mofolojia, semantiki, sintaksia, isimujamii, kwa uchache, katika ngazi za uzamili kwa lugha ya Kiswahili unakabiliwa na changamoto kadhaa. Kwa kujikita katika fonolojia, kama kipengele mahsusi cha utafiti huu, walimu wa fonolojia wanakumbana na fonolojia wanakumbana na changamoto kama vile ugumu katika kueleweka kwa istilahi za fonolojia pamoja na uhaba wa dhana za kifonolojia katika vitabu mbalimbali vilivyoandikwa kwa Kiswahili. Ili kukabiliana na tatizo, baadhi ya wakufunzi hulazimika kutumia mbinu mbalimbali ikiwemo mbinu ya uwili lugha. Ni kutokana na changamoto hii, utafiti huu ulilenga kuchunguza na kujadili changamoto na mustakabali wa namna ufundishaji wa fonolojia katika ngazi ya Umahiri kwa kutumia lugha ya Kiswahili.

MAPITIO YA MAANDIKO JARABATI

Watafiti walihusisha mapitio tangulizi kadha wa kadha ili kupata ufahamu wa kutosha juu ya mada hii. Katika sehemu hii, baadhi ya mapitio yanayohusu uwili lugha yameelezwa kwa ufupi kama ifuatavyo.

[23] "Bilingualism"

[24] "Code switching/code mixing"

[25] Wahadhiri, wanafunzi na wafanyakazi wengine wa taasisi husika.

a) Sababu na Malengo ya Utumiaji wa Uwili Lugha katika Ufundishaji na Ujifunzaji

Sababu au malengo ya uwili lugha katika ufundishaji yameelezwa na wataalamu mbalimbali ambao wanaelekea kufanana kwa sababu zilizo nyingi. Sababu na malengo hayo ni kama ifuatavyo.

Sababu mojawapo ni kusisitiza dhana kwa kuirudia; hii ni pale ambapo mwalimu huamua kueleza dhana fulani kwa lugha zote mbili ili ieleweke zaidi (Lewis, 2008; Shartiely, 2016; Flyman-Mattsson and Burenhult, 1999). Sababu nyingine ni malengo ya kumudu darasa (Shartiely, 2016; Flyman-Mattsson na Burenhult, 1999). Pia, kuhamisha mada ya mazungumzo (Flyman-Mattsson na Burenhult, 1999; Shartiely, 2016). Sababu nyingine ni walimu kuonesha umoja na mshikamano kwa wanafunzi wao (Merritt na wenzake, 1999; Flyman-Mattsson and Burenhult, 1999). Lengo lingine ni kuonesha hisia katika uelekezaji (Flyman-Mattsson and Burenhult, 1999).

Wengine wanadai walimu hutumia uwili lugha kwa kukosa msamiati wa lugha moja kueleza dhana fulani (Flyman-Mattsson and Burenhult, 1999; Merritt na wenzake, 1992; Shartiely, 2016). Nao Shartiely (2016) na Blommaert (2008) wanadai uwili lugha hutumika ili mzungumzaji aweze kueleweka vema. Naye Skiba (1997) anaongeza kuwa kuwa uwili lugha husaidia wazungumzaji kuwasilisha ujumbe wao kama inavyotakiwa. Wengine ni García na Wei (2014), wao wanasema uwili lugha huwasaidia wanafunzi wa jamii zenye uwingi-lugha kuendanisha dhana wanazojifunza na uzoefu[26] wao.

Ni kutokana na sababu hizo, wataalamu kama Rugemalira (2017), moja ya mapendekezo yake, ni kuboresha mfumo wa uwili-lugha katika elimu ya vyuo vikuu ambapo anapendekeza lugha ya Kiswahili iruhusiwe kutumika walau kwa matumizi ya rasha rasha hususani katika mihadhara, semina, majadiliano pamoja na mitihani.

b) Mambo ya Kuzingatia katika Utumiaji wa Uwili Lugha katika Ufundishaji na Ujifunzaji

Hata hivyo, licha ya uwepo wa sababu za msingi za uwili lugha katika ufundishaji, baadhi ya wataalamu wanashauri kuwepo kwa umakini katika mfumo huu. Kwa upande wake, Brisk (2000) anadai kuwa uthabiti wa uwili lugha hutegemeana na mambo muhimu katika kozi husika kama vile mafunzo aliyoyapata mwalimu, mtaala, nyenzo zitumikazo, uwasilishaji wa mwalimu darasani, na mbinu zitumikazo katika tathmini ya upimaji. Nao Madrid na Julius (2017) wanasisitiza kuwa mafanikio ya ufundishaji kwa uwili lugha hupimwa kwa matokeo kwa wanafunzi ikiwemo umilisi wa lugha, maendeleo ya kitaaluma, na mtagusano wa kijamii na kiutamaduni. Wanaongeza kwamba mafanikio ya uwili lugha hutegemea tambia za wanafunzi pamoja na familia.

Nao Villareal na Solís (1998) wanaripoti juu ya sababu zinazochangia kufanikiwa kwa ufundishaji kwa uwili lugha ambapo wanabainisha vitu kadhaa, vifuatavyo ni baadhi ya vitu hivyo: malengo bayana, watekelezaji wenye uelewa unaotakikana, uwezeshaji wa mamlaka zinazosimamia mfumo wa elimu, maelekezo toshelevu kwa kozi husika, njia mwafaka za upimaji wa wanafunzi, vifaa toshelezi na vyenye kuendana na uwili-lugha, uwasilishaji wa somo uwe shirikishi, collaborative, meaningful, na unaojali na kujibu mahitaji binafsi ya wanafunzi mmoja mmoja.

[26] Mambo ambayo tayari mtu anayafahamu kutokana na pilikapilika za kimaisha

Kwa ujumla, Madrid na Julius (2017) wanadai kuwa tafiti nyingi zinaonesha kwamba uthabiti wa ufundishaji kwa kutumia uwili lugha unaweza kutazamwa kwa vigezo mbalimbali ikiwemo wanafunzi wenyewe, jamii, shule, mchakato wa ufundishaji na ujifunzaji darasani, aina ya somo/kozi inayotolewa, miktadha mbalimbali kama vile wa kijamii, kisiasa na utamaduni, pamoja na matokeo yanayopatikana. Wanaongeza kuwa kufanikiwa kwa ufundishaji wa uwili lugha hutegemea uhusiano mzuri wa vigezo tajwa hapo juu.

c) Tafiti Juu ya Utumiaji wa Uwili Lugha katika Ufundishaji na Ujifunzaji

Tukitazama upande wa kiwango cha matumizi ya uwili lugha katika ufundishaji na ujifunzaji darasani, kuna tafiti mbalimbali zilizokwisha kufanyika. Zifuatazo ni baadhi tu ya tafiti hizo.

Katika utafiti wake katika Chuo Kikuu cha Dar es Salaam, Shartiely (2016) alibaini kwamba wakufunzi walitumia uwili lugha kwa kuchanganya Kiswahili na Kiingereza zenye ili kuchangamana na wanafunzi, kuhawilisha dhana fulani, kufafanua jambo, kumudu darasa ama/na kushauri au kuhamasisha wanafunzi wao. Utafiti wake ulibaini kuwa uwili lugha katika chuo hicho hutokea katika namna mbili, mojawapo ni pale ambapo wakufunzi wa chuo hicho wanapotumia Kiswahili na Kiingereza kulingana na muktadha kutokana na sababu kwamba chuo hicho kinajumuisha wafanyakazi wa wanataaluma na wasiowa wanataaluma. Namna nyingine ni kwamba Kiswahili na Kiingereza hutumika darasani hususani katika mihadhara ambapo Kiswahili na Kiingereza hutumika kwa lengo la kukidhi mahitaji ya kimawasiliano. Mtafiti huyo anakazia kwamba wahadhiri wote nane walioshiriki katika utafiti huo hutumia uwili lugha na hili halijitokezi kwa bahati mbaya bali wanakusudia kwa sababu mbalimbali kama ilivyodhihirika katika sehemu (a) huko juu.

Ibrahim na wenzake (2013) wanaripoti kwamba walimu wafundishao lugha hutumia uwili lugha darasani ingawa wao walikataa kwamba hawatumii. Katika uchunguzi wao walibaini kwamba mara nyingi uwili lugha hutumika kwa malengo ya mbinu za kiufundishaji.

Nao Bhatti na wenzake (2018) katika utafiti wao walibaini kuwa uwili lugha hutumika darasani ingawa Kiingereza hubaki kama lugha kuu ya kufundishia katika vipindi husika. Kwa mujibu wao, wahadhiri huchanganya lugha kwa kukusudia. Wanahitimisha kwa kusema kuwa uwili lugha ni mbinu mwafaka katika ufundishaji wa lugha kwa kuwa huwezesha zaidi ufundishaji na ujifunzaji. Mtazamo huu ni sawa na Songxaba na wenzake (2017) wanaodai kuwa washiriki wa utafiti wao walionesha mtazamo chanya juu ya matumizi ya uwili lugha na kwamba hurahisisha uelewa. Songxaba na wenzake wanaenda mbali zaidi kwa kupendekeza mbinu hii itambulike kama mfumo rasmi katika ngazi zote.

Kwa mujibu wa utafiti uliofanywa na Marie (2013) nchini Rwanda, Uwili lugha ni moja ya mbinu ambazo wanafunzi wa vyuo vikuu, nchini humo, huzitumia kukabiliana na changamoto zitokanazo na matumizi ya Kiingereza kama lugha ya kufundishia na kujifunzia. Utafiti huo ulibaini kuwa wanafunzi hao hutumia Kinyarwanda katika kujifunza Kiingereza kwa kuwa Kinyarwanda ndio lugha mama inayowaunganisha wote. Hata hivyo, ilibainika kwamba dhana za msingi hubaki kwa Kiingereza kutokana na kukosekana kwa msamiati wa Kinyarwanda unaolingana na dhana hizo. Utafiti unapendekeza kwamba japokuwa Kinyarwanda hakitambuliki kama lugha rasmi ya kufundishia, si budi kizingatiwe kwa kuruhusu uwili lugha wakati wa mihadhara darasani au katika vikundi vya wanafunzi.

Makulloluwa (2013) anadai kuwa, katika utafiti wake, washiriki wengi walionesha kupendezwa na matumizi ya uwili lugha katika ufundishaji wa lugha ya pili kwa sababu kwamba mbinu hiyo, kupitia lugha ya kwanza, hurahisisha ufahamu kwa lugha ya pili. Makulloluwa anapendekeza kwamba walimu wanatakiwa kupewa mafunzo zaidi juu ya ufaafu wa lugha ya kwanza katika ujifunzaji wa lugha ya pili.

Tofauti na watafiti wengine, kwa upande wake, Johanes (2017) anauona mtindo huu (uwili lugha) kuwa unarudisha nyumba ufundishaji na ujifunzaji wa lugha. Katika utafiti wake alibaini kuwa uwili lugha darasani hupelekea wanafunzi kutofanikiwa katika kujifunza Kiingereza kwa sababu hupelekea wanafunzi kushindwa kujiamini wanapoongea, huwanyima wanafunzi fursa ya wanafunzi kujaribu kuzungumza Kiingereza. Johanes anaongeza kuwa walimu ndio chanzo kikuu cha tabia hii na kwamba juhudi zaidi zinahitajika kwa walimu ili kuboresha uwezo wao wa kimethodolojia.

Pengo la Utafiti

Kutokana na mapitio yote hapo juu, wengi kati ya wataalamu wote wanajadili uwili lugha kwa kujikita katika upande wa majukumu ya mawasiliano nje au darasani. Hata wale wanaojadili kuhusu suala hili katika vipindi vya somo la Kiingereza bado wanazitazama faida na hasara za uwili lugha katika kona ya uwezeshaji wa mawasiliano tu. Mjadala wao haujikiti sana katika faida au hasara za uwili lugha katika upataji maarifa kwa kujikita katika nyanja, somo au mada mahsusi. Upungufu huu wa data zilizopo ndio uliowapelekea waandishi wa makala haya kulenga kujadili changamoto na mustakabali wa namna ufundishaji wa fonolojia katika ngazi ya uzamili kwa kutumia lugha ya Kiswahili. Hii ni kwa sababu data zilizopo si sahihi kuzitumia kuhitimisha juu ya faida na hasara za uwili lugha katika ufundishaji na ujifunzaji kwa kuwa changamoto za ufundishaji wa lugha hasa isimu hutofautiana kulingana na viwango vya kiisimu.

MBINU ZA UTAFITI

Kwa kuwa lengo la makala haya ilikuwa ni kujadili mustakabali wa ufundishaji na ujifunzaji wa fonolojia ya Kiswahili katika ngazi ya Umahiri kwa kutumia lugha ya Kiswahili, watafiti walichagua vyuo viwili vilivyotumika kama sampuli ya kukusanya data, Vigezo vya kuchagua vyuo hivi ilikuwa kama vyuo husika vinafundisha kozi ya fonolojia ya Kiswahili kwa kutumia lugha ya Kiswahili katika kiwango cha Umahiri. Ili kuzingatia maadili ya kiutafiti, vyuo hivi tumevipa majina dhahania (majina yasiyo halisi) ya Chuo Kikuu A na Chuo Kikuu B. Izingatiwe kwamba Majina A na B haihusiani na tafsiri kwamba Chuo kilichoitwa jina la chuo A ni bora kuliko kile kilichoitwa Chuo B.

Walengwa wakuu katika utafiti huu walikuwa ni wahadhiri wa somo la fonolojia ya Kiswahili pamoja na wanafunzi wa uzamili waliokuwa wanasomea fonolojia ya Kiswahili. Vyuo vilichaguliwa kwa kutumia mbinu ya kusudio na baadhi ya vigezo vilikuwa ni uwepo wa programu ya uzamili hususani Isimu kwa Kiswahili na utolewaji wa kozi ya fonolojia katika chuo husika. Pia, walimu na wanafunzi waliolengwa ni wale waliokuwa wanafundisha na kusomea fonolojia ya Kiswahili (mtawalia). Wahusika kwa chuo A, darasa la fonolojia lilikuwa na wanafunzi 20, hivyo wanafunzi wote 20 walishiriki katika mahojiano walisampulishwa kwa kutumia mbinu ya kusudio-rahisi ambapo walipatikana kwa kadri watafiti walivyokutana nao au walivyokuwa tayari kwa majadiliano. Pia katika Chuo B, darasa la fonolojia ya Kiswahili lilikuwa na wanafunzi 15 ambapo pia wote walishiriki katika mahojiano ya utafiti huu. Ili

kupima ulinganifu, utafiti ulihusisha wahadhiri na wanafunzi wa isimu katika programu za uzamili (Kiswahili).

Data za utafiti huu zilipatikana kwa kutumia mbinu zifuatazo:

Mbinu ya mahojiano: Mbinu ya mahojiano ilitumika kupata mawazo na mitazamo ya walimu na wanafunzi juu ya mustakabali wa ufundishaji na ujifunzaji wa fonolojia ya Kiswahili kwa kutumia uwili lugha katika vyuo vyao na mfumo wa elimu ya juu Tanzania kwa ujumla. Kwa upande wa mbinu ya mahojiano, wanafunzi na walimu walihojiwa kwa nyakati tofauti katika maongezi ya kawaida yahusuyo masomo. Hii ilikuwa ni mbinu faafu kwa sababu wahusika walijieleza vema na kuonesha mitazamo yao halisi kuliko wangekuwa wanajua kuwa wanahojiwa kwa ajili ya utafiti. Lengo la kutokuwataarifu ilikuwa ni kupata data halisi.

Njia ya Ukusanyaji Data Maktabani na Makavazini: Kulikuwa na usomaji wa muhistasari wa kozi ya fonolojia kwa vyuo vyote viwili na vitabu vya fonolojia vilivyoandikwa kwa Kiswahili. Kwa kutumia njia hii, mtafiti aliweza kuona idadi ya vitabu vya fonolojia vilivyoandikwa kwa Kiswahili kulinganisha na vile vilivyoandikwa kwa Kiingereza, pia, kwa vitabu vile vilivyoandikwa kwa lugha ya Kiswahili, mtafiti alisoma vitabu vyote kuona kama vimeandikwa kwa lugha ya Kiswahili ama kulikuwa na mchanganyiko wa lugha iliyotumika na Kiingereza au lugha nyingineyo. Baadhi ya vitabu ambavyo mtafiti alivisoma kwa madhumuni ya kukusanya data kwa mbinu hii ni Misingi ya Fonolojia (2012) na Maendeleo katika Nadharia ya Fonolojia (2011)

Mbinu ya ushiriki wa mtafiti na Ushuhudiaji: Mbinu ya ushiriki na ushuhudiaji ulifanyika kwa saa tatu kwa chuo A na saa tatu pia katika chuo B. Somo la fonolojia hufundishwa kwa saa tatu kwa juma, hivyo watafiti walitumia juma moja kwa chuo A na juma moja pia kwa chuo B (kwa nyakati tofauti) kwa kila darasa moja la fonolojia.

Baada ya kukusanywa, data zilizopatikana zilichambuliwa na kisha kuchanganuliwa kwa kutumia mkabala changamano ambapo Mkabala wa Kifafanuzi na Ulinganisho zilitumika.

UCHAMBUZI NA UWASILISHAJI WA DATA

Makala haya yalilenga kujadili changamoto na mustakabali wa namna ufundishaji wa fonolojia katika ngazi ya Uzamili kwa kutumia lugha ya Kiswahili. Yafuatayo ni majibu yaliyopatikana kutoka kwa wahadhiri, wanafunzi pamoja na ushuhudiaji.

Kupitia mbinu zote za kukusanyia data, lengo mojawapo ilikuwa ni kufahamu kama kuna matumizi ya uwili lugha (Kiswahili na Kiingereza) katika somo la fonolojia ya Kiswahili. Kupitia ushuhudiaji, katika vyuo vyote viwili na madarasa yote ya fonolojia ya Kiswahili, ilionekana dhahiri kwamba licha ya Kiswahili kubaki kama lugha ya kufundishia na kujifunzia, wahadhiri na wanafunzi hutumia lugha ya Kiingereza katika ufundishaji na ujifunzaji wao. Tofauti iliyobainika miongoni mwa wahadhiri hao ni kiwango cha utumiaji wa uwili lugha kutegemeana na mada na muda anaokuwa darasani kama ni kipindi cha saa moja au kipindi cha saa mbili. Katika Chuo A, katika kipindi cha fonolojia cha saa mbili, mhadhiri alilazimika kutumia istilahi za Kiingereza kuelezea istilahi za Kiswahili, istilahi hizi zilikuwa kumi na mbili katika kipindi kizima. Katika kipindi cha saa moja, mhadhiri alitumia maneno ya saba za

Kiingereza zinahusu dhana za kifonolojia. Tofauti ya mhadhiri huyu na wengine ni kwamba yeye, wakati mwingine, alikuwa akitumia Umbo Upeo na fonolojia Mawanda Upeo kutafsiri dhana za kifonolojia alizokwisha kuzisema kwa Kiswahili.

Kwa Chuo B, tofauti na vyuo vingine, katika kipindi cha saa moja, mhadhiri hakutumia kabisa Kiingereza katikati ya kipindi bali alifikia kufanya hivyo alipokuwa akihitimisha kipindi. Wakati huu, mhadhiri huyu alikuwa akitoa kazi kwa wanafunzi wake na kuwaelekeza dhana ambazo walipaswa kuzifanyia kazi. Katika kuzitaja, mhadhiri huyo alikuwa akitaja kwa Kiswahili na Kiingereza. Yaani dhana moja ya fonolojia ilitajwa kwa Kiswahili na Kiingereza. Kwa upande wa kipindi cha saa mbili, hali ilikuwa tofauti zaidi. Darasa hili lilionekana kuathiriwa zaidi na Kiingereza, dhana zilizo nyingi zilionekana kueleweka zaidi zilipoelezwa kwa kuchanganya Kiingereza. Katika darasa hili, ilionekana uwili lugha ni kawaida kwa mhadhiri na wanafunzi wake. Hii ni kwa sababu, wanafunzi wengi walioonekana kushiriki kujibu maswali au kufafanua, hawakumaliza mchango wao bila kuweka kurejea dhana za Kiingereza.

Kupitia mahojiano, wanafunzi wote walidai kuwa wanatumia vitabu vya Kiswahili katika kujifunza au kujisomea fonolojia. Miongoni mwao, wachache walidai hujisomea vitabu vya fonolojia vilivyoandikwa kwa Kiingereza na wengi wao walisema hawasomi vitabu vya Kiingereza na miongoni mwao wengine walidai hawavijui kabisa vitabu hivyo.

Walipoulizwa kama walimu wao hutumia lugha ya Kiingereza katika vipindi vya Kiswahili hususani Fonolojia ya Kiswahili, wote walikubaliana na hilo na kwamba wanapendezwa na matumizi ya uwili lugha katika ufundishaji na ujifunzaji wa fonolojia darasani. Sababu kubwa waliyoitaja ni kwamba wanaelewa kwa urahisi zaidi istilahi au dhana za fonolojia kwa Kiingereza na kwamba istilahi nyingi za kifonolojia hazijaelezwa ipasavyo katika Kiswahili. Pia, walidai kuwa wanapata ugumu katika kujifunza fonolojia kwa Kiswahili kwa sababu wanalazimika kusoma kwa Kiingereza kisha wahawilishe maarifa hayo kwa Kiswahili.

Kwa upande wa wahadhiri, walipoulizwa ikiwa wanatumia Kiswahili wakati wote wa vipindi vya Kiswahili hususani Fonolojia, wote walikataa na kudai kuwa huwa wanalazimika kutumia Kiingereza kwa lengo la kufanikisha malengo ya kipindi. Sababu nyingi walizozitaja hazikuwa tofauti sana na sababu zilizokwisha kutajwa na watafiti wengine. Miongoni mwa sababu hizo ni kusisitiza jambo au dhana fulani, kumudu darasa, kuhamisha mada ya mazungumzo.

Kwao, tofauti na sababu zilizotajwa katika tafiti zingine, sababu iliyoonekana kubwa zaidi ni kwamba wanakosa msamiati wa Kiswahili kueleza baadhi ya dhana za fonolojia. Hii ni kwa sababu katika Kiingereza, dhana na istilahi za fonolojia zimefafanuliwa vizuri sana na maandiko yake ni mengi na tofauti tofauti ukilinganisha na Kiswahili ambapo vitabu vya fonolojia ni vichache na vilivyopo vimeeleza mambo juu juu na kuna baadhi ya dhana hazieleweki sawa na zilivyozoeleka katika Kiingereza. Kwa mfano, mmoja wao aliuliza istilahi sahihi za Kiswahili zenye kusawiri dhana kama *"suprasegmental", "autosegmental", "Optimality Theory"* huku akiuliza maneno yanayotumika kama yanaendana sawa na kinachorejelewa.

Tatizo lingine lililotajwa kuwa linawaletea ugumu kutokana na matumizi ya uwili lugha katika kufundisha fonolojia kwa Kiswahili ni wanafunzi kutokuwa na msingi mzuri wa Kiingereza katika ngazi za chini. Hili huwapa wakati mgumu wahadhiri kulazimika kutafsiri dhana na istilahi za Fonolojia kutoka Kiingereza kwenda Kiswahili. Waliongeza kuwa kutokana na tatizo la lugha ya Kiingereza kwa wanafunzi wao, wahadhiri hao hujikuta wakitimiza majukumu mara mbili, yaani majukumu yao na wakati huo huo kutimiza ya wanafunzi. Hii ni kwa sababu,

kama walivyosema wahadhiri watatu kati ya wanne, wanafunzi wao hugeuka tegemezi na hawajisomei kwa mapana zaidi ya kusubiri kukariri kile kinachokuwa kimetafsiriwa na mwalimu na kuwasilishwa darasani. Waliongeza kuwa ni wanafunzi wachache sana wanaojitahidi kujitafutia maarifa katika vitabu vya Kiingereza.

Kwa hivyo, wahadhiri hao hujikuta wakipoteza muda mwingi kufanya tafsiri badala ya kujikita kwenye jukumu la kuwezesha ujifunzaji. Kadhalika, ilidaiwa kuwa changamoto hii huathiri mbinu za ufundishaji na ushiriki darasani kwa kuwa wanafunzi hubaki wakimtegemea mwalimu na kubakia kuwa watu wa "kutafuniwa na kumeza."[27]

Waaidha, athari nyingine iliyotajwa kuwa inawaletea wahadhiri hao ugumu inatokana na tatizo la istilahi za fonolojia zilizopo katika lugha ya Kiswahili kuwa hazijasawazishwa. Baadhi yao walifafanua kuwa vitabu vya Fonolojia vya Tanzania vinatofautiana katika baadhi ya dhana au ufafanuzi wa istilahi. Kadhalika, vitabu vya mataifa mengine vilivyoandikwa kwa Kiswahili bado, pia, vinatofautiana. Kutokana na changamoto hii, wahadhiri walitaja jukumu za kusawazisha kusahihisha dhana zinazowakanganya wanafunzi wao kama ugumu mwingine wanaokumbana nao na kuwapotezea muda darasani. Pia, msamiati wa Kiswahili katika taaluma za Fonolojia haujasanifishwa ukilinganisha na istilahi zingine.

Jambo lingine lililobainishwa na wahadhiri walioshiriki katika utafiti huu ni tofauti za muhtasari wa fonolojia katika vyuo ngazi za chini. Katika hili, walidai kuwa kutokana na kutokuwepo kwa muhtasari unaofanana katika kiwango cha shule za upili wa juu, astashahada, stashahada na shahada; wanafunzi wanaojiunga na kiwango cha umahiri wanapata tabu sana kwa sababu baadhi ya istilahi za fonolojia wanakuwa hawazijui na zile wanazozijua zinakuwa zinatofautiana na wakati mwingine zinakuwa si sahihi ukilinganisha na kinacholengwa.

Jambo la mwisho, wahadhiri hao walidai kuwa sababu nyingine inayochangia ni wanafunzi wengi kutokuwa na msingi wa fonolojia katika ngazi za chini. Walioeleza kuhusu jambo hili walidai kuwa hili linasababishwa na mifumo ya baadhi ya vyuo ambapo kozi ya Fonolojia haifundishwi na katika vingine kozi hiyo ni ya hiyari.

Lengo la pili la utafiti huu lilikuwa kujua kama vitabu na kazi za wanafunzi za fonolojia ya Kiswahili zimeandikwa kwa Kiswahili fasaha.

Katika sehemu ya lengo hili, watafiti walipitia kazi za wanafunzi watano (5) walizoandika kama kazi za nyumbani kuona namna na kwa kiasi gani zoezi husika limejibiwa kwa kutumia Kiswahili sanifu. Kwa kiasi fulani, wanafunzi walionekana kuandika insha zao kwa Kiswahili sanifu. Pale walipopata ugumu na/ au walipohisi dhana mahususi haielezeki kwa ufasaha walichanganya na lugha ya Kiingereza au walitohoa kutoka lugha ya Kiingereza na kuwa katika lugha ya Kiswahili, kimuundo na kimpangilio wa silabi zake kama inavyojionesha katika sehemu ya majibu kimatini hapa chini:

… kuhusu parameta za…

…nadharia **ya gridi…**

…uwasilishaji wa **mora** alioupendekeza huundwa …….

[27] Kama lilivyotajwa na wahusika.

…..katika **gridi**, silabi **nyepesi** … **mora**…

…uziada Mizani **(Extrametricality)** …

…Kiimbotoni Msingi (Basic Tone Melody)…

Hapa katika matini haya (a-f), neno *mora, gridi* na *parameta* yametoholewa na dhana za kiimbo toni msingi na uziada mizani yamewekewa pia mbadala wake katika lugha ya Kiingereza. Jambo linalotoa hisia kwamba dhana hizo zinakosa tafsiri bayana katika lugha ya Kiswahili ama inaonekana tafsiri zilizowekwa zinapoteza maana ya dhana ama zinakosa uangavu. Paomoja na mapungufu haya, bado waandishi wa Makala haya, tunaona kwamba wanafunzi wamepiga hatua nzuri katika jitihada ya kukitumia Kiswahili katika kujifunzia fonolojia katika kiwango cha umahiri.

Eneo jingine ambayo watafiti waliangalia matumizi ya uwili lugha katika maandalizi na/au sehemu ya kufundisha ni nukuu za somo ambazo mwalimu anazitumia katika ufundishaji. Katika Chuo Kikuu A, tulipata nafasi ya kuangalia nukuu zilizoandikwa kwa Kinuruweo. Kiujumla, nukuu ziliandikwa katika Kiswahili sanifu isipokuwa katika maeneo machache ambayo mwalimu alisisitiza dhana ama aliona haja ya kuwa na dhana iliyoandikwa katika lugha ya Kiingereza kwenye mabano kama inavyojionesha katika baadhi ya matini yaliyodondolewa hapa chini:

…kuna uwezekano mkubwa wakati wa Mame Bantu ***(Proto–Bantu)*** lugha …

… katika lugha ya Kiingereza ni "accent" ikiwa na maana kwamba hubainishwa na kuwepo kwa msikiko wa ziada kwenye silabi inayohusika kuliko silabi nyingine **(relative prominence).**

…neno husemwa kuwa ina **"accent" au "stress".**

…(signifier) na 'kitajwa', yaani **(signifié)…**

… de Saussure alikuja kuiita 'utendaji' **(parole)** na **'lugha' (langue)…**

…uchanganuzi fulani wa data tuliyopewa ni bora zaidi kuliko uchanganuzi mwingine wowote tunaoweza kupewa **(explanatory adequacy).**

… utoshelevu wa uchunguzi **(observational adequacy)**.

…utoshelevu wa maelezo kutokana na jinsi unavyoiona na kuielewa data yako **(descriptive)**

Katika matini (a-h) hapa tunaona kwamba maneno yaliyokolezwa wino yameandikwa kwa lugha ya Kiingereza. Swali la msingi linakuwa ni je lugha ya Kiswahili haijitoshelezi kuzielezea dhana hizo ama tafsiri ya Kiswahili iliyotolewa inaonekana ina uvuguvugu? Hata hivyo bado mwalimu amejitahidi kuandika nukuu ya kozi ya fonolojia kwa lugha ya Kiswahili. Jambo linaloonesha namna Kiswahili kinavyoweza kutumika kufundishia na kujifunzia fonolojia ya Kiswahili.

Lengo la tatu la utafiti huu lilikuwa kujua iwapo kuna vitabu vya kutosha vilivyoandikwa kwa Kiswahili vinavyotumika katika kujifunzia na kufundishia kuhusu fonolojia ya Kiswahili.

Katika lengo hili, moja ya nyenzo iliyosaidia kupata mrejesho ni kuangalia vitabu vilivyopendekezwa katika mihtasari kwa kozi ya fonolojia kwa vyuo vyote viwili, chuo A na Chuo B. Katika chuo A, vitabu vilivyopendekezwa kwenye muhtasari ni hivi vifuatavyo:

Contini-Morava, E. (1997). "Swahili Phonology" katika *Phonologies of Asia and Africa,* Allan Kaye, Winona Lake, Eisenbrauns (wah)

Goldsmith, J.A. (mh) (1996). *The Handbook of Phonology*. Cambridge, Massachusetts: Blackwell Publishers Inc.

Halle, M. na G. N. Clements (1983). *Problem Book in Phonology: A workbook for Introductory Courses in Linguistics and in Modern Phonology.* Cambridge Massachusetts: The MIT Press.

Hogg, R. na C. B. MacCulley (1987). *Metrical Phonology: A Course Book* Cambridge University Press.

Lass, R. (1984). *Phonology: An Introduction to Basic Concepts:* Cambridge, Cambridge University Press.

Massamba, D. P. B. (1996). *Phonological Theory: History and Development.* Dar es Salaam: Dar es salaam University Press.

Massamba, D. P. B. (2011). *Maendeleo katika Nadharia ya Fonolojia.* Dar es Salaam: Dar es salaam University Press.

Massamba, D. P. B. (2012). Misingi ya Fonolojia: Dar es Salaam: Dar es salaam University Press.

Mpiranya, F. (1995). *Swahili Phonology Reconsidered in a Diachronical Perspective: the impact of Stress on Morphophonemics and Syllable Structure.* E. A. L. D. Series, Juz. 4. Colobne.

Tunapoangalia kwa makini katika orodha ya marejeo yanayotolewa kwa wanafunzi wa Umahiri

Katika chuo Kikuu A tunaona kwamba kati ya marejeo 9 yaliyotolewa, ni marejeo matatu tu ndio yanaonekana tu yameandikwa kwa lugha ya Kiswahili. Mengine yote yaliyobaki yameandikwa kwa lugha ya Kiingereza. Watafiti walipata nafasi ya kujadiliana kuhusu upatikanaji wa marejeo hayo na kama wanafunzi wanayasoma na kuyaelewa. Wanafunzi watatu (3) tu kati ya (20) walijibu kwamba wanasoma marejeo mengine yaliyoandikwa kwa lugha ya Kiingereza lakini changamoto imekuwa ni vigumu kwao kuelewa dhana kwa kuwa lugha iliyotumika inawatatiza. Hata vitabu vilivyoandikwa kwa Kiswahili upo mchanganyiko ama baadhi ya dhana ,pamoja na kuandikwa kwa Kiswahili lakini yamefafanuliwa kwa kuwekewa katika lugha ya Kiingereza kwa njia ya mabano.

Katika chuo Kikuu B, vitabu vilivyopendekezwa kwenye muhtasari ni hivi vifuatavyo:

Archangel, D. and D. Terence. 1997. *Optimality Theory: An overview*. Oxford Blackwell.

Hayes, B. 1995. Metrical stress theory: Principles and Case studies. Chicago; University of Chicago Press.

Hays, B 2009. Introductory phonology. Oxford: Wiley- Blackwell.

Kenstowicz, M. 1994. Phonology in Generative Grammar. Cambridge: Blackwell.

Kager, R. Harry van Hulst, and Wim Zonneveld (eds.) 1999. The Prosody- Morphology Interface Cambridge: Cambridge University Press.

Massamba, D.P.B 1996. Phonology Theory: History and Development> Dar es salaam: Dar es salaam.

Massamba, D.P.B 2005.The role of Suprasegment phenomenon in the Analysis of Bantu of Bantu languages: With special Reference to Ci-Ruuri: in LOT Occasional Papers in Linguistics 1. Dar es salaam.

Massamba, D. P. B. (2011). Maendeleo katika Nadharia ya Fonolojia: Dar es Salaam: Dar es salaam University Press.

Massamba, D. P. B. (2012). Misingi ya Fonolojia: Dar es Salaam: Dar es salaam University Press.

McCarthy, J (ed.). (2004). *Optimality Theory in Phonology.* Victory: Blackwell.

Mc Carthy, J. (2008). *Doing Optimality theory: Applying Theory to Data.* Oxford: Blackwell.

Katika chuo B tunaona kwamba kati ya marejeo 11 yaliyotolewa, ni marejeo mawili (02) tu ndio yameandikwa kwa lugha ya Kiswahili. Mengine yote yaliyobaki yameandikwa kwa lugha ya Kiingereza. Watafiti walipata nafasi ya kujadiliana kuhusu upatikanaji wa marejeo hayo na kama wanafunzi wanayasoma na kuyaelewa. Wanafunzi watatu (5) tu kati ya (15) walijibu kwamba wanasoma marejeo mengine yaliyoandikwa kwa lugha ya Kiingereza lakini changamoto imekuwa ni vigumu kwao kuelewa dhana kwa kuwa lugha iliyotumika inawatatiza. Hata vitabu vilivyoandikwa kwa Kiswahili upo mchanganyiko ama baadhi ya dhana ,pamoja na kuandikwa kwa Kiswahili lakini pia, kama ilivyokuwa kwa Chuo A yamefafanuliwa kwa kuwekewa katika lugha ya Kiingereza kwa njia ya mabano.

Picha gani tunaipata kutokana na hali ya marejeo ya namna hii? Zipo hisia mbalimbali zinazoweza kujengwa kutokana na hali hii ya uwepo wa marejeo machache sana yaliyoandikwa kwa lugha ya Kiswahili:

Inawezekana havijaandikwa kwa Kiswahili vitabu vya kutosha vya fonolojia ya Kiswahili

Kuna uwezekano kwamba kuna wataalamu wachache wa fonolojia katika taasisi za elimu ya juu hapa Tanzania ambao wangejishughulisha na utafiti wa fonolojia ya Kiswahili na hatimaye kuiandikwa kwa lugha ya Kiswahili

Fonolojia ya Kiswahili haijatiliwa mkazo katika programu za shahada za awali hasa kwa Chuo Kikuu B, imekuwa kama mada moja wapo katika kozi ya Utangulizi wa Isimu kwa ujumla. Hivyo mada za fonolojia ya Kiswahili zimefichama kwatika mwamvuli wa isimu kwa ujumla.

Kwa upande wa wanafunzi, kuna madhara ya hali ya kuwa na marejeo mengi yaliyoandikwa kwa lugha ya Kiingereza ni kwamba mwanafunzi hulazimika kutumia muda

mwingi kusoma ili ahamishe dhana hizo katika lugha ya Kiswahili, hivyo kumpotezea muda. Baadhi ya dhana za msingi katika mada mahususi huenda zisieleweke au kutafsiriwa ipasavyo, hivyo kurudisha ari ya kusoma fonolojia ya Kiswahili au kuonekana kama kozi ngumu yenye udhahania uliopitiliza.

Kwa upande wa wafundishaji, hupata ugumu wa ufundishaji hasa kulazimika kufanya tafsiri ya dhana zilizopo katika lugha ya Kiingereza na kuziakisi katika lugha ya Kiswahili, hivyo ufundishaji kuchukua taswira kana kwamba ni somo la tafsiri wakati ni somo la fonolojia ya Kiswahili. Hali hii ilijionesha kwenye Chuo B, Zaidi ambapo marejeo ya msingi yaliyo kwenye lugha ya Kiingereza ilionekana imetafsiriwa kwenye *powerpoint*. Hali hii pia humchosha mwalimu kufanya majukumu zaidi ya ufundishaji na kufanya tafsiri zaidi.

HITIMISHO

Kulingana na data zilizopatikana kupitia mbinu ya ushuhudiaji na ile ya mahojiano. Tunahitimisha kwamba wahadhiri na wanafunzi wa kozi za Fonolojia katika ngazi ya Uzamili hutumia uwili lugha kwa kiasi kikubwa. Ingawa Kiswahili hubaki kama lugha kuu ya mawasiliano, kufundishia na kujifunzia katika vipindi vya kozi hiyo, Kiingereza pia hutumika wakati wa ujifunzaji ndani na nje ya darasa na hutumiwa na washiriki wote (wahadhiri na wanafunzi).

Tofauti na sababu zingine za uwili lugha zilizozoeleka, matumizi ya uwili lugha (Kiswahili na Kiingereza) katika ufundishaji wa kozi hii hayachangiwi na sababu za kimawasiliano kwa kiasi kikubwa bali changamoto lukuki zinazoikumba kozi hiyo katika ngazi ya umahiri. Hii ni kusema kwamba wahadhiri na wanafunzi wa kozi ya Fonolojia katika ngazi ya Uzamili wanalazimika kutumia mtindo wa uwili lugha ili kufanikisha uelewa na malengo ya kozi hiyo. Changamoto kubwa zinazopelekea mtindo huu ni uhaba wa matini za fonolojia zilizoandikwa kwa Kiswahili, matini za fonolojia zilizoandikwa kwa Kiswahili hazifanani si katika kiwango cha kitaifa wala kimataifa. Changamoto nyingine ni kwamba istilahi na dhana nyingi za fonolojia hazijafanyiwa tafsiri. Kadhalika, wanafunzi wanaojiunga katika programu hii (Uzamili) wanakuwa hawana msingi mzuri wa Fonolojia kwa kuwa hakuna muhtasari unaofanana katika vyuo.

Kutokana na matumizi ya uwili lugha, athari mbalimbali zinaukumba mchakato mzima wa ufundishaji na ujifunzaji wa Fonolojia katika kiwango cha Uzamili. Athari kubwa zaidi ni kwamba uwili lugha kukwamisha uelewa kwa wanafunzi na kupoteza muda kwa kuwa wahadhiri na wanafunzi hujikuta wakiishia kufanya tafsiri badala ya kujikita kwenye kufafanua istilahi na dhana za fonolojia. Hii ni kwa kuwa kupitia mbinu hii watu hao hujikuta wakilazimika kupitia hatua tatu zaidi. Mosi, kusoma matini za Kiingereza na kuzielewa. Pili, kuhawilisha maarifa waliyoyapata kutoka Kiingereza kwenda kwenye Kiswahili. Tatu, kuhakikisha msamiati uliotumika kueleza maarifa hayo kwa Kiswahili ni sanifu. Jambo hili hupoteza muda na kukwamisha upataji maarifa kwa haraka na pia huleta mkanganyiko na mwisho hupelekea wanafunzi kukariri dhana na istilahi badala ya kuelewa. Athari zingine ni kuathiri mbinu za ufundishaji, kukwamisha malengo ya kozi au wahadhiri, pamoja na kutilia maanani maarifa yanayoegemea katika ujenzi wa kumbukumbu badala ya ujuzi kama inavyokusudiwa katika kiwango cha umahiri.

Kwa ujumla, pamoja na changamoto za tafsiri na ukosefu wa vitabu vya rejea vilivyoandikwa kwa lugha ya Kiswahili, upo mwanga mkubwa kwamba lugha ya Kiswahili inaweza kutoa maarifa ya kutosha kuhusu taaluma ya fonolojia kwa ujumla wake. Hata hivyo, bado ipo haja

kusaidia kuona namna ambavyo maboresho yanaweza kufanyika hasa katika kipengele cha tafsiri za istilahi za fonolojia yanavyoweza kusaidia kukuza taaluma ya fonolojia na lugha ya Kiswahili kwa ujumla kwa kuwa vitabu mbalimbali vya fonolojia (vingi) vimeandikwa kwa lugha ya Kiingereza ambayo huwatatiza wajifunzaji na wafundishaji.

Mapendekezo

Kulingana na data zilizopatikana na mjadala katika makala haya, utafiti huu unapendekeza yafuatayo.

Kuhamasisha zaidi wataalamu wa Fonolojia kuandika vitabu vya fonolojia kwa Kiswahili vingi na vyenye ubora zaidi katika taaluma hiyo.

Kuandikwa kwa kamusi ya istilahi za taaluma za Fonolojia.

Kuhamasisha wanafunzi wa umahiri kusoma vitabu vilivyoandikwa kwa Kiingereza ili kupanua maarifa yao.

Somo la Fonolojia lifanywe kama somo la lazima kwa vyuo vyote vinavyotoa kozi zinazohusiana na isimu ya lugha.

Kuwepo kwa muhtasari wa fonolojia ya Kiswahili uliosawazishwa kwa vyuo vyote ili kuepusha changamoto za sasa.

Somo la Fonolojia lifundishwe ipasavyo kuanzia ngazi za chini ili kuwajengea wanafunzi msingi mzuri kwa ngazi zinazofuata.

MAREJELEO

Bhatti, A., Shamsudin, S. na Said, S. B. M. (2018). Code-Switching: A Useful Foreign Language Teaching Tool in EFL Classrooms. *English Language Teaching,* 11(6), 93-101.

Brisk, M. E. (2000). Education Quality Bilingual Defining Success. *LAB Working Paper No. 1*

Brown, G. na Atkins, M. (1988). *Effective Teaching in Higher Education.* London na New York: Routledge.

Contini-Morava, E. (1997). "Swahili Phonology" katika *Phonologies of Asia and Africa,* Allan Kaye, Winona Lake, Eisenbrauns (wah)

Du Plessis, T. (2006). From Monolingual to Bilingual Higher Education: The Repositioning of Historically Afrikaans-Medium Universities in South Africa. *Language Policy,* 5(2006), 87-113.

Flyman-Mattsson, A. na Burenhult, N.(1999). Code Switching in Second Language Teaching of French. Lund University, Dept. of Linguistics. *Working Papers,* 47 (1999), 59-72

García, O., na Wei, L. (2014). *Trans-languaging: Language, bilingualism and education.* Basingstoke: Palgrave Macmillan.

Goldsmith, J.A. (mh) (1996). *The Handbook of Phonology*. Cambridge, Massachusetts: Blackwell Publishers Inc.

Halle, M. na G. N. Clements, (1983). *Problem Book in Phonology: A workbook for Introductory Courses in Linguistics and in Modern Phonology.* Cambridge Massachusetts: The MIT Press.

Hogg, R. na C. B. MacCulley, (1987). *Metrical Phonology: A Course Book* Cambridge University Press.

Ibrahim, E. H. E., Shah, M. I. A. na Armia, N. T. (2013). Code-Switching in English as a Foreign Language Classroom: Teachers' Attitudes. *English Language Teaching*, 6(7),139-150.

JMT. (2014). *Sera ya Elimu na Mafunzo.* Dar es Salaam: Wizara ya Elimu na Mafunzo ya Ufundi.

Johanes, J. (2017). *The Influence of Code-Switching and Code-Mixing on Learning English Language in Secondary Schools: The Case of Rombo District.* Utafiti usiochapishwa.

Langner, M. na Imbach, R. (2000). The University of Freiburg: A Model for a Bilingual University. *Higher Education in Europe*, 25(4), 461- 468.

Lass, R. (1984). *Phonology: An Introduction to Basic Concepts:* Cambridge, Cambridge University Press.

Lewis, C. L. (2008). *Teachers' Knowledge of English Phonology and Attitudes toward Reading Instruction as Related to Student Outcomes.* Utafiti Usiochapishwa.

Lin, A. M. Y. (2013). Classroom Code-switching: Three Decades of Research. *Applied Linguistics Review*, 4(1): 195-218.

Madrid, D. and Julius, S. M. (2017). *Quality Factors in Bilingual Education at the University Level.* Haijachapishwa.

Makulloluwa, E. (2013). Code Switching by Teachers in the Second Language Classroom. *International Journal of Arts & Sciences, 6(3):581–598.*

Marie, K. A. (2013). Coping with English as Language of Instruction in Higher Education in Rwanda. *International Journal of Higher Education,* 2(2), 1-12.

Massamba, D. P. B. (1996). *Phonological Theory: History and Development.* Dar es Salaam: Dar es Salaam University Press.

Mpiranya, F. (1995). *Swahili Phonology Reconsidered in a Diachronical Perspective: the impact of Stress on Morphophonemics and Syllable Structure.* E. A. L. D. Series, Juz. 4. Colobne.

Rugemalira, J. (2017). *Language Skills for Higher Education in Tanzania.* Haijachapishwa.

Shartiely, N. E. (2016). Code-switching in university classroom interaction: A Case Study of the University of Dar es Salaam. *Stellenbosch Papers in Linguistics Plus,* 49(2016), 215-231.

Songxaba, S. L., Coetzer, A. na Molepo, J. M. (2017). Perceptions of Teachers on Creating Space for Code Switching as a Teaching Strategy in Second Language Teaching in the Eastern Cape province, South Africa. *Reading & Writing* 8(1), 1-7

Villarreal, A. na Solís, A. (1998*). Effective Implementation of Bilingual Programs: Reflection from the Field.* Haijachapishwa.

Mifanyiko Ya Unyambulishaji Wa Vitenzi Katika Kigĩchũgũ

Magdalene Wangu Gituru

Chuo Kikuu cha Chuka

S.L.P. 109 CHUKA 60400

magdalynegituru@gmail.com

0726 210 121

&

John M. Kobia, Ph.D.

Chuo Kikuu cha Chuka

S.L.P. 109 CHUKA 60400

jkobia2001@yahoo.com

0720 809 725

Ikisiri

Unyambulishaji wa vitenzi ni mojawapo ya masuala yanayoshughulikiwa katika taaluma ya mofolojia katika lugha nyingi za Kiafrika. Makala hii inashughulikia unyambulishaji wa vitenzi katika Kigĩchũgũ, mojawapo ya lugha za kiafrika, kwa kufafanua mifanyiko inayohusika katika utaratibu wa unyambulishaji wa vitenzi katika Kigĩchũgũ na kutathmini kanuni zinazoruhusu au kuzuia mifanyiko hiyo ya unyambulishaji. Katika uainishaji wa Guthrie (1967), Kigĩchũgũ ni mojawapo ya lugha za Kiafrika ambayo hudhihirisha unyambulishaji. Nadharia ya Mofolojia Leksia (Kiparsky 1982 na Katamba 1993) na Kanuni ya Kioo (Baker 1985) zimetumiwa kueleza mfuatano wa mofimu nyambulishi katika vitenzi vya Kigĩchũgũ. Data ya vitenzi sitini (60) vya Kigĩchũgũ ilitumika katika makala hii. Vitenzi hivi viliwekwa katika kauli sita za unyambulishaji na kuainisha mifanyiko inayohusika katika utaratibu wa unyambulishaji kwa kutumia jedwali la mnyambuliko wa vitenzi. Makala hii inachangia katika kuongeza maarifa ya kiutafiti kuhusu sarufi ya Kigĩchũgũ na kuhifadhi lugha ya Kigĩchũgũ kama mojawapo ya lugha za Kiafrika katika maandishi.

Maneno makuu

Unyambulishaji, Mifanyiko, Vitenzi, Kigĩchũgũ

UTANGULIZI

Unyambulishaji ni aina mojawapo ya uambikaji. Kwa mujibu wa Gawasike (2012), uambikaji ni upachikaji wa mofu kabla na baada ya mzizi wa neno na ambao umegawika katika sehemu mbili; uambishaji na unyambulishaji. Anaeleza kuwa mgawanyo wake ni mzizi wa neno. Uambikaji ni dhana ya juu (kiambajengo cha juu) ikiundwa na viambajengo sisisi ambavyo ni uambishaji na unyambulishaji. Unyambulishaji ni mojawapo ya mifanyiko inayotokea katika kitenzi. Waihiga (1999: 152), anafafanua kuwa unyambulishaji hutokana na vitenzi viwili ambavyo ni **nyambua** na **nyumbua**. Anaeleza **kunyambua** kama kukata kitu vipande vipande na **kunyumbua** kama kuvuta vitenzi ili kuvirefusha hivyo kuunda kauli mbalimbali za unyambulishaji. Kwa mujibu wa Kihore, Massamba na Msanjila (2012), unyambulishaji ni upachikaji wa viambishi kwenye mzizi ili kuunda maneno mapya. Wanaendelea kusema kuwa katika lugha ya Kiswahili kuna viambishi nyambulishi ambavyo hutumika katika uundaji wa vitenzi vipya. Kihore, Massamba na Msanjila (wataje) wanafafanua unyambulishaji wa vitenzi kama utaratibu wa uundaji wa vitenzi vipya katika lugha kwa kuongeza viambishi nyambulishi kwenye maumbo ya mzizi. Kwa mfano kitenzi #piga# kinanyambuliwa kwa kufuata utaratibu huu ambao hufanyika katika hatua kama vile:

piga

Pig-w-a

Pig-an-a

Pig-i-a

Pig-i-an-a

Pig-i-w-a

Pig-an-ish-a

(Asili: Kihore, Massamba na Msanjila, 2012: 122)

Kihore, Massamba na Msanjila (2012) wanaeleza kuwa hatua ya kwanza ni ile ya kiambishi kinachofuata mzizi moja kwa moja kama inavyodhihirika katika mifano a), b) na c); na hatua ya pili ni ya kiambishi nyambulishi cha pili kutoka kwenye mzizi kama inavyodhihirika katika mifano d), e) na f

Heine na Mohlig (1980: 20) wanatilia mkazo kuwa lugha nyingi nchini Kenya zina utaratibu fulani wa unyambulishaji wa vitenzi. Wanasema kuwa nchini Kenya lugha zinaweza kugawika katika makundi mawili: Kundi la kwanza ni la lugha zilizopungukiwa katika mofolojia ya uundaji wa maneno ambazo wataalamu hawa wanasema kuwa huwa na kauli chache za unyambulishaji wa vitenzi. Kundi la pili ni la lugha zilizoimarika katika mofolojia ya uundaji wa maneno na ambazo huwa na kauli nyingi za unyambulishaji wa vitenzi. Baadhi ya kanuni za unyambulishaji wanazozitambua ni pamoja na kauli ya kutendwa, kutendesha, kutendea, kutendua, kutendana miongoni mwa zingine.

Kigĩchũgũ ni mojawapo ya lugha za Kikuyu inayozungumzwa katika Kaunti ya Kirinyaga nchini Kenya. Kaunti hii hupakana na Kaunti ya Nyeri upande wa Kaskazini Magharibi, Kaunti ya Murang'a upande wa Magharibi na Kaunti ya Embu upande wa Mashariki na Kusini. Kaunti ya Kirinyaga imegawanywa katika Kaunti ndogo tano; Kirinyaga ya Mashariki, Kirinyaga Magharibi, Kirinyaga ya Kati, Mwea Mashariki na Mwea Magharibi. Kigĩchũgũ huzungumzwa na wakaazi ambao hupatikana katika Kaunti ndogo ya Kirinyaga Mashariki.

Kwa mujibu wa Mutahi (1977) Kigĩchũgũ ni miongoni mwa lahaja za mashariki. Lahaja zingine ni kama vile, Kiembu, Kimbeere, na Kindia. Mutahi (keshatajwa), anasema kuwa wazungumzaji wa lahaja ya Kigĩchũgũ huwa kati ya mto Rupingazi na Thiba. Anasema kuwa Rupingazi huwatenga na Wagichũgũ na Waembu nao Thiba huwatenga na Kindia. Anaendelea kusema kuwa mpaka halisi kati ya Ndia na Gĩchũgũ ni mto Rutui. Kulingana na sensa za mwaka wa 2009, tarafa ya Gĩchũgũ ambayo ndiyo kitovu cha wazungumzaji halisi wa Kigĩchũgũ ilikuwa na wazungumzaji elfu mia moja ishirini na nne, mia sita sabini na mbili (124,672). Kulingana na Mipango ya Maendeleo ya Kaunti ya Kirinyaga mwaka wa 2018-2022, wazungumzaji wa Kigĩchũgũ mwaka wa 2019 wanakisiwa kuwa elfu mia moja arobaini na nne, mia nane arobaini na nane (144,848). Uainishaji wa Guthrie (1967) ulipangilia lugha ya Kikuyu katika kundi la E51. Kwa mujibu wa Nurse na Philippson (2003), lugha ya Kibantu ni kundi la lugha ambalo ni tawi la lugha za Niger-Kongo. Wanatambua kwamba jamii za Kibantu huishi Afrika. Katika maelezo yao, wanatambua Kikuyu miongoni mwa lugha za Kibantu. Wanaendelea kusema kuwa lugha za Kibantu zimeimarika sana katika mofolojia ya uundaji wa maneno na mofolojia ya unyambulishaji wa vitenzi.

Schadeberg (2003) anaeleza kuwa vitenzi vya Kibantu vina uwezo mkubwa wa mzizi kubeba viambishi aidha vya nafsi, njeo, urejeshi na hata viambishi vya unyambulishaji. Kutokana na maelezo yake Schadeberg (mtaje), kitenzi cha Kigĩchũgũ kina uwezo mkubwa wa kubeba viambishi kuliko aina zingine za maneno katika lugha hii. Kama ilivyo katika Kiswahili, vitenzi vya Kigĩchũgũ huchukua viambishi awali na viambishi tamati hivyo basi makala hii inashughulikia viambishi tamati kwani ndivyo hupachikwa baada ya mzizi wa vitenzi katika mfanyiko wa unyambulishaji.

Lengo la Makala

Makala hii iliongozwa na lengo la kufafanua mifanyiko inayohusika katika utaratibu wa unyambulishaji wa vitenzi katika Kigĩchũgũ.

Unyambulishaji wa Vitenzi katika Lugha za Kiafrika

Suala la unyambulishaji wa vitenzi limeshughulikiwa na wataalamu kama vile; Kiango (2008) anasema kwamba, michakato yote ya unyambulishaji katika Kiswahili inatawaliwa na kanuni za kifonolojia na kimofolojia. Anaendelea kusema kuwa kanuni za unyambulishaji vitenzi ambazo zinatumiwa katika mizizi au mashina ya vitenzi zinazalisha aina mbalimbali za unyambuaji tenzi. Baadhi ya aina hizo ni kama vile; unyambuzi- tendea, unyambuzi- tendana, unyambuzi- hali, unyambuzi-tendeshana unyambuzi-tendwa.

Unyambulishaji wa vitenzi ya Kigryama umeshughulikiwa na Ngowa (2008) huku akionyesha jinsi Kigryama ni lugha ya Kibantu kwa kurejelea dhana ya kitenzi. Katika utafiti wake, anatumia mtazamo wa fonolojia leksishi ambao unatambua kuwa uambishaji wa maneno unaandamana na mageuzi au sheria za kifonolojia za kiwango kimoja. Katika utafiti wake anashughulikia muundo wa ndani wa kitenzi akiegemea pia katika eneo la mofolojia. Anatambua kwamba kitenzi cha Kigryama kina uwezo mkubwa wa kubeba viambishi kuliko aina zingine za maneno. Amezingatia kikamilifu jinsi kanuni za fonolojia leksishi zimetumiwa ili kuongoza unyambulishaji wa vitenzi.

Akishughulikia unyambulishaji wa vitenzi katika lugha ya Runyankole, Asiimwe (2011), alijadili mofimu za Utendea, Usababishi, Utendeka na Utendwa. Alibainisha kuwa unyambulishaji wa vitenzi katika Runyankole, mojawapo ya lugha za Kiafrika, unahusisha mizizi ya vitenzi ambapo mofimu nyambulishi hupachikwa. Anatambua kwamba mofimu nyambulishi za usababishi hupokezwa kitenzi kwanza kabla ya utendwa. Anaeleza kuwa usababishi huunda kitenzi elekezi kutokana kile ambacho sielekezi kwa sababu vitenzi elekezi tu ndivyo vinaweza kupokea utendwa.

Charwi (2013), alishughulikia unyambulishaji wa vitenzi katika Kikuria akiwa na lengo la kueleza matokeo ya vitenzi vya Kikuria baada ya unyambulishaji na idadi ya viambishi vinavyoweza kuwekwa pamoja kwenye kitenzi. Alichanganua unyambulishaji wa vitenzi ili kuonyesha dhana ya uelekezi unavyojitokeza na kuonyesha upekee na ufanano wa lugha ya Kikuria na lugha nyingine za Kibantu kama vile, Kinyambo, Kinyamwezi, Kibosho miongoni mwa lugha zingine. Utafiti wa Charwi (mtaje) ulilenga kufafanua athari za unyambulishaji kisintaksia. Aidha, anagundua kuwa vitenzi vya Kikuria kama ilivyo kwenye lugha nyingi za Kibantu huwa na sifa tofauti tofauti kulingana na aina ya kitenzi. Kwa mfano, anasema kuwa vitenzi si elekezi havihitaji yambwa wakati vitenzi elekezi huhitaji yambwa moja au mbili kulingana na asili ya kitenzi chenyewe. Katika kazi yake anatambua kauli ya utendea, usababishi, utendano, utendwa na utendeka. Anaeleza kuwa athari ya vitenzi hivi hutofautiana kutokana na aina za viambishi vilivyopachikwa kwenye mizizi ya vitenzi hivyo.

Akishughulikia Mofosintaksia katika vitenzi vya Keiyo, Jepkoech (2018) alitambua na kujadili mofimu ambishi na nyambulishi. Alilenga kutambua ruwaza za upachikaji katika mpangilio wa vitenzi na kuchanganua kanuni za kimofosintaksia zinazoathiri upachikaji wa viambishi katika kitenzi cha Keiyo. Mtafiti aliongozwa na Nadharia ya Kioo. Katika kazi yake, Jepkoech (keshatajwa) alitambua kwamba mofimu ambishi hutokea mwanzoni mwa kitenzi cha Keiyo isipokuwa zile ambazo huonyesha wakati uliopo na hali ya kuendelea. Alitambua pia kuwa mofimu nyambulishi hutokea mwishoni baada ya mzizi. Katika kazi yake, mtafiti alionyesha kuwa mofimu ambishi hufuata utaratibu wa wakati → ukanusho → hali → nafsi → mzizi. Kwa upande mwingine, alionyesha kuwa mofimu nyambulishi huchukua taratibu mbalimbali.

Misingi ya Kinadharia

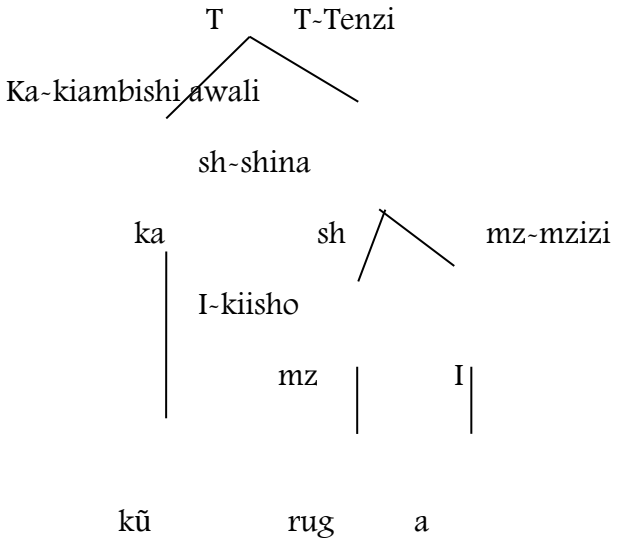
Utafiti huu ulijikita katika misingi ya nadharia ya Mofolojia Leksia (ML). Kwa mujibu wa Kiparsky (1982) na Katamba (1993) nadharia ya Mofolojia Leksia iliibuka kufidia mtazamo wa Chomsky wa sarufi zalishi (SZ) ambao haukutambua kiwango cha mofolojia kama kiwango mahususi cha lugha. Katamba (mtaje) amefafanua Nadharia ya Mofolojia Leksia kwa kuzingatia uambishi wa maneno kwa jumla ikiwemo vitenzi. Nadharia ya Mofolojia Leksia (ML) inatambua viwango viwili vya sheria: sheria leksia na sheria kirai. Sheria Leksia ni zile ambazo zinafungamana na kanuni za kifonolojia katika kuunda neno husika kwa namna ambavyo umbo

la mzizi hubadilika linapoongezewa viambishi katika neno. Sheria Kirai huathiri kiambishi katika neno kwa kukipitisha mageuzi yanayohusu vokali zinazopatikana.

ML inahusisha mihimili sita ya uamilifu wa sheria mahususi za kisarufi. (Katamba 1993). Mihimili hii ni; ngazi leksia, mzunguko wa sheria, kufuta mabano, kwingineko, kuhifadhi muundo na ufinyu wa sifa. Mihimili minne ndiyo iliyotumika katika uchanganuzi wa unyambulishaji wa vitenzi katika Kigĩchũgũ.

Kwanza, mhimili wa ngazi leksia unazingatia kwamba umbo la neno linaweza kuelezwa kupitia maumbo ya kisarufi yaani mofimu zenye daraja za mahusiano. (Kiparsky, 1982 na Katamba (1993). Kwa mfano, kitenzi cha Kigĩchũgũ [kuruga] (kupika) kina maumbo kama yafuatayo:

Ngazi leksia katika kitenzi [kuruga]



Maumbo haya yametenganishwa kwa kuzingatia ngazi ambapo kila umbo lina maana bainifu ya kisarufi. Ngazi hizi huwa zenye mahusiano na zinapotenganishwa haziwezi kutoa maana yoyote. Kwa mfano /rug/ peke yake haina maana yoyote mpaka iunganishwe na kiambishi awali /kũ/ pamoja na kiishio /a/ ili kutoa maana ya #kũruga# (kupika). Aidha kiishio /a/ na kiambishi awali /kũ/ havina maana yoyote hadi pale ambapo vinapounganishwa na mzizi /rug/ wa kitenzi husika. Umuhimu wa kanuni hii katika makala ni kuwa unyambulishaji hufanywa kwa utaratibu ambao hufanyika kwa hatua.

Pili, mhimili wa kufuta mabano unazingatia kwamba wakati sheria ya kiwango kimoja ya kifonolojia imetumika, mabano yake hufutwa mpaka mwishowe neno lenye umbo kamili na maana ya kileksia pamoja na umbo la kimofolojia hupatikana. Mhimili huu umetumika kwa sababu umeonyesha kwamba hata baada ya mageuzi ya unyambulishaji wa vitenzi, maumbo mbalimbali huungana na kuwa kitenzi kimoja kamili.

Tatu, mhimili wa kuhifadhi muundo hutambua kwamba baada ya mageuzi ya kifonolojia, muundo wa lugha mahususi sharti uhifadhiwe (Katamba 1993). Kwa mfano, muundo wa lugha za Kibantu ukiwemo Kigĩchũgũ ni ule wa mfuatano wa Konsonanti-Vokali (K-V). Kitenzi cha Kigĩchũgũ /kũ+iya/ [kwiya] (kuiba) kimeweza kutoa kielelezo bora. Uchopekaji wa kiishio {a} unafunga mzizi wa kitenzi kwa vokali. Uyeyushaji wa vokali /u/ katika kiambishi awali unazalisha fonimu changamano {kw} ambayo inatamkwa kama fonimu moja hivyo basi umbo bora la K-V linadumishwa.

Nne, mhimili wa kwingineko hutumiwa pale ambapo sheria mbili huonekana kushindania nafasi moja. Hali hii hudhihirika katika mofolojia ambapo baada ya uambishi awali katika vitenzi vokali mbili huwa zinafuatana. Jambo hili litokeapo, udondoshaji wa vokali na uyeyushaji wa vokali hutumikizwa (Katamba, 1993). Hata hivyo, mhimili wa kwingineko unapendekeza uyeyushaji wa vokali kwa sababu udondoshaji hutumika katika mazingira mengi. Mfano wa kitenzi [kwina] (kuimba) unadhihirisha uyeyushaji wa vokali. Hii ni kwa sababu kitenzi hiki kina vokali mbili ambazo zinafuatana yaani: [kuina]. Vokali /u/ inapitia uyeyushaji na kuwa /w/ badala ya kudondoshwa.

Nadharia ya ML ilifaa katika makala hii kwani ilisaidia kuonyesha jinsi kanuni za kifonolojia na kimofolojia hushirikiana katika unyambulishaji wa vitenzi katika Kigĩchũgũ. Kanuni ya kioo ilitumika katika makala hii kwani kulingana na Baker (1985) kanuni hii ni kanuni sarufi inayopendekeza kuwa unyambulishaji ni lazima uakisi mfuatano wa kisintaksia na kinyume chake. Kwa mujibu wa Baker (mtaje) unyambulishaji wa vitenzi katika lugha za Kibantu hufuata mpangilio maalum wa unyambulishaji wa vitenzi. Kanuni hii inafaa makala hii kwani ilisaidia katika kushughulikia mifanyiko inayohusika na unyambulishaji wa vitenzi katika Kigĩchũgũ mojawapo ya lugha za Kibantu.

Ukusanyaji wa Data

Ili kupata data ya unyambulishaji wa vitenzi vya Kigĩchũgũ, watafiti walishiriki katika kutunga sentensi ambapo walichagua vitenzi sitini (60) katika lugha ya Kigĩchũgũ ambavyo walivipanga katika jedwali la usaili wa vitenzi vya Kigĩchũgũ kwa kushughulikia kauli sita za unyambulishaji na kuainisha kanuni za mageuzi katika Kigĩchũgũ. Idadi hii ilichaguliwa kutumika katika makala hii kwa sababu kulingana na Milroy (1987), tafiti za kiisimu, kama ilivyo makala hii, zinajulikana kuzalisha data yenye uradidi mwingi. Maoni yake ni kuwa kadri data ilivyo kubwa ndivyo kuna uwezekano wa uradidi. Aidha, kwa mujibu wa Chomsky (1957) mzawa wa lugha ana uwezo wa kuzalisha sentensi nyingi sahihi na zisizo na kikomo hivyo basi watafiti kama wazawa na wazungumzaji wa Kigĩchũgũ waliweza kuzalisha vitenzi ambavyo vilitumika katika makala hii na kuvithibitisha kupitia kwa data ambayo walipata kutoka kwa wazungumzaji wengine wa Kigĩchũgũ .

Uchanganuzi wa Data

Kwa mujibu wa Wesana- Chomi (2013), unyambulishaji ni mchakato au mfanyiko wa kuambatisha kiambishi kimoja au zaidi kwenye mzizi wa vitenzi ili kuunda vitenzi vingine. Vitenzi vya Kigĩchũgũ vina uwezo wa kuambishwa viambishi kwenye mzizi ili kudhihirisha maana tofauti. Vitenzi vya Kigĩchũgũ hurusu uambishaji tamati katika vitenzi husika. Viambishi tamati ni mofimu ambazo hupachikwa baada ya mzizi wa vitenzi katika mfanyiko wa unyambulishaji. Makala hii imeshughulikia unyambulishaji wa vitenzi vya Kigĩchũgũ kwa

kujadili kauli sita za unyambulishaji: kutendea, kutendwa, kutendesha, kutendana, kutendeka na kutendua kwa kutilia maanani mifanyiko inayohusika katika unyambulishaji wa vitenzi. Katika kazi hii, nadharia ya mofolojia leksia (Kiparsky 1982 na Katamba 1993) na Kanuni ya Kioo (Baker 1985) zimetumiwa ili kueleza mfuatano wa vinyambulishi katika lugha ya Kigĩchũgũ na kutathmini kanuni zinazoruhusu na kuzuia mifanyiko hiyo ya unyambulishaji. Vitenzi hivi vimewekwa katika kauli sita ili kudhihirisha kanuni na sheria zinazotawala mifanyiko ya unyambulishaji katika Kigĩchũgũ. Kauli hizi ni pamoja na:

Kauli ya Kutendea (TDA)

Kauli ya kutendea katika Kigĩchũgũ huweza kuwa na viambishi nyambulishi viwili kutegemea irabu zilizo kwenye mzizi wa kitenzi. Viambishi hivi ni kama vifuatavyo:

Kinyambulishi { -ĩr-}

Katika Kigĩchũgũ, kauli ya TDA huchukua mofimu {-ĩr-} kabla ya irabu ya mwisho kwenye vitenzi katika unyambulishaji. Mofimu hii hutumika iwapo mzizi wa kitenzi una irabu /a/, /i/, / ĩ /, /ũ/au /u/. Kwa mfano,

	Kitenzi	maana	Kauli ya Kutendea
1	thak-a	cheza	thak-**ĩr**-a
2	bing-a	funga	bing-**ĩr**-a
3	rĩm-a	lima	lim-**ĩr**-a
4	rũg-a	ruka	rug-**ĩr**-a
5	bur-a	panguza	bur-**ĩr**-a

Kinyambulishi {-er-}

Katika Kigĩchũgũ, kinyambulishi {-er-} huchopekwa kwenye unyambulishaji wa vitenzi iwapo mzizi wa vitenzi una irabu /e/ na /o/. Kwa mfano,

	Kitenzi	maana	Kauli ya Kutendea
6	thom-a	soma	thom-**er**-a
7	tem-a	kata	tem-**er**-a
8	boy-a	omba	bo-**er**-a

Kupitia maelezo haya katika kauli ya TDA, viambishi {-ĩ-} na {-e-} vimetumika katika unyambulishaji. Hata hivyo kiambishi {-r-} kimetumika pia ili kuhifadhi muundo wa Kigĩchũgũ wa Konsonanti-Vokali (K-V) kama inavyopendekezwa na Katamba (1993) kwamba baada ya mageuzi ya kifonolojia, muundo wa lugha mahususi sharti uhifadhiwe. Kwa upande mwingine, kama anavyosema waithaka (2010), irabu ya mzizi katika kauli ya TDA hukubaliana na kiambishi nyambulishi kinachofuata. Hali hii ya ukubalifu anairejelea kama uwiano wa vokali. Kutokana na maelezo ya kauli ya TDA katika Kigĩchũgũ, inabainika kuwa iwapo mzizi wa kitenzi una irabu ya juu yaani /i/ na /u/, basi kinyambulishi cha kati-juu yaani /ĩ/ kilitumika. Vilevile, mzizi wenye irabu ya chini /a/, kinyambulishi cha kati-chini /e/ kilitumika.

Kauli ya Kutendwa (TDW)

Vitenzi katika Kigĩchũgũ, hupachikwa kiambishi {-w-} katika unyambulishaji ili kudhihirisha kauli ya utendwa. Kiambishi hiki hupachikwa baada ya mzizi wa vitenzi vinavyoishia kwa konsonanti. Kwa mfano,

	Kitenzi	maana	Kauli ya Kutendwa
9	men-a	chukia	men-**w**-a
10	nyit-a	shika	nyit-**w**-a
11	cor-a	chora	cor-**w**-a
12	mund-a	dunga	mund-**w**-a

Mifano iliyoonyeshwa hapo juu inadhiihirisha kwamba irabu /u/ inayeyushwa na kuwa /w/ baada ya unyambulishaji. Kwa mfano,

men-u-a (men-w-a)

nyit-u-a (nyit-w-a)

mund-u-a (mund-w-a).

Hii ni kulingana na mhimili wa kwingineko katika nadharia ya ML, ambao unapendekeza kuwa, iwapo katika mofolojia irabu mbili zinafuatana na kushindania nafasi, uyeyushaji utumikizwe (Katamba 1993).

Kwa upande mwingine, baadhi ya vitenzi vya Kigĩchũgũ vinavyoishia kwa irabu /i/, hupachikwa kinyambulishi {-u-} katika kauli ya kutendwa. Kwa mfano,

	Kitenzi	Maana	Kauli ya Kutendwa
13	Giri-a	zuia	Gir-**u**-a
14	Tini-a	kata	Tin-**u**-a
15	Tongori-a	ongoza	Tongor-**u**-a
16	Kethi-a	salimu	Keth-**u**-a

Katika mifano hii ya vitenzi vya Kigĩchũgũ, irabu /i/ inadondoshwa na /u/ kuachwa kama kiambishi cha kauli ya kutendwa. Irabu /i/ inadondoshwa kwa sababu Kigĩchũgũ hakikubali mfuatano wa irabu tatu. Baada ya udondoshaji, irabu /u/ huyeyushwa na kuwa /w/. Hii ni kwa msingi wa Nadharia ya ML

Kauli ya Kutendesha (TSH)

Kauli ya kutendesha katika Kigĩchũgũ huonyeshwa kwa kiambishi {-ithi-} katika unyambulishaji wa vitenzi. Kwa mfano,

	Kitenzi	Maana	Kauli ya Kutendesha
17	ak-a	jenga	ak-**ithi**-a
18	end-a	penda	end-**ithi**-a
19	tum-a	shona	tum-**ithi**-a
20	ken-a	furahi	ken-**ithi**-a
21	rĩb-a	lipa	rĩb-**ithi**-a

Vilevile, kauli ya kutendesha katika Kigĩchũgũ huonyeshwa kwa kiambishi {-i-} katika baadhi ya vitenzi ambavyo kisemantiki huonyesha anayesababisha kitendo kama mshiriki. Vitenzi hivi kwa kawaida ni vitenzi si elekezi. Kwa mfano,

	Kitenzi	Maana	Kauli ya Kutendesha
22	rwar-a	ugua	rwar-**i**-a
23	in-a	imba	in-**i**-a
24	tet-a	teta	tet-**i**-a
25	nor-a	nenepa	nor-**i**-a
26	gamb-a	toa sauti	gamb-**i**-a

Kutokana na mifano iliyotolewa katika kauli ya TSH, kiambishi nyambulishi {-ithi-} hutumika katika vitenzi elekezi ilhali kiambishi nyambulishi {-i-} hutumika katika vitenzi vya Kigĩchũgũ ambavyo si elekezi. Hata hivyo wakati mwingine, kiambishi {-ithi-} huweza kutumika na vitenzi si elekezi pia. Kiambishi {-ithi-} cha kauli ya TSH kinaonekana kuwa kizalishi kwa kiasi kikubwa kuliko kiambishi {-i-} ambacho kinatumika kwa vitenzi vichache.

Kauli ya Kutendana (TDN)

Kauli ya kutendana katika Kigĩchũgũ huonyesha kuwa wahusika wawili au zaidi kufanyiana kitendo kimoja. Kauli ya kutendana katika unyambulishaji wa baadhi ya vitenzi katika Kigĩchũgũ huonyeshwa kwa kiambishi {-an-} kama inavyodhihirika katika mifano ifuatayo.

	Kitenzi	Maana	Kauli ya Kutendana
27	bũr-a	chapa	bũr-**an**-a
28	kuu-a	beba	ku-**an**-a
29	rũg-a	ruka	rũg-**an**-a
30	thik-a	zika	thik-**an**-a
7	tem-a	kata	tem-**an**-a

Kauli ya Kutendeka (TDK)

Kama ilivyoelezwa katika kauli ya kutendea, kauli ya kutendeka pia huweza kuwa na viambishi nyambulishi viwili kama ifuatavyo;

Kinyambulishi {-ek-}

Kinyambulishi {-ek-} katika unyambulishaji wa vitenzi vya Kigĩchũgũ huchopekwa kabla ya kiambishi tamati iwapo mzizi wa vitenzi hivyo una irabu /o/ na /e/. Kwa mfano,

	Kitenzi	Maana	Kauli ya Kutendeka
31	kom-a	lala	kom-**ek**-a
32	oc-a	chukua	oc-**ek**-a
9	men-a	chukia	men-**ek**-a
33	meny-a	fahamu	meny-**ek**-a

Kinyambulishi {–ĩk-}

Vitenzi katika Kigĩchũgũ huchopekwa kiambishi {-ĩk-} kabla ya kiambishi tamati katika unyambulishaji iwapo mzizi wa vitenzi hivyo una irabu /a/, /i/, /ĩ/, /ũ/ na /u/. Kwa mfano,

	Kitenzi	Maana	Kauli ya Kutendeka
34	tham-a	hama	tham-**ĩk**-a
10	nyit-a	shika	nyit-**ĩk**-a
35	rĩr-a	lia	rĩr-**ĩk**-a
36	kũnj-a	kunja	kũnj-**ĩk**-a
37	ug-a	sema	ug-**ĩk**-a

Kama ilivyo katika kauli ya kutendea, kiambishi {-e-} na [-ĩ-} vimetumika katika unyambulishaji. Hata hivyo, kiambishi {-k-} pia kimetumiwa ili kuhifadhi muundo wa Kigĩchũgũ wa Konsonanti-Vokali.

Kauli ya Kutendua (TDU)

Vitenzi katika kauli ya kutendua katika Kigĩchũgũ hutoa maana iliyo kinyume cha kitenzi katika kauli ya kutenda. Viambishi vya unyambulishaji katika kauli ya kutendua katika Kigĩchũgũ ni {-ũr-} na {-or-}. Mofimu {-ũr-} hupachikwa kwenye vitenzi vyenye mzizi wenye irabu /a/, /i/, /u/ na /ũ/ ilhali {-or-} hupachikwa kwenye vitenzi vyenye mzizi wenye irabu /o/. Kwa mfano,

	Kitenzi	Maana	Kauli ya Kutendua
38	bing-a	funga	bing-**ũr**-a
39	ak-a	jenga	ak-**ũr**-a
19	tum-a	shona	tum-**ũr**-a
30	thik-a	zika	thik-**ũr**-i-a
36	kũnj-a	kunja	kũnj-**ũr**-a
40	ob-a	funga (kwa mfano kamba)	ob-**or**-a
41	rog-a	roga	rog-**or**-a

Ingawa vitenzi vya Kigĩchũgũ katika kauli ya kutendua huonyesha kinyume, ni muhimu pia kutambua kuwa vitenzi hivi vinaweza kunyambulishwa zaidi katika kauli zingine. Kwa mfano,

tendua	tendea	tendwa	tendesha	tendeka
kũnjũra	kũnjũrĩra	kũnjũrwa	kũnjũrithia	kũnjũka
obora	oborera	oborwa	oborithia	oboka

Mfuatano wa Viambishi Nyambulishi katika Kigĩchũgũ

Unyambulishaji katika vitenzi vya Kigĩchũgũ huweza kuchukua mwambatano wa viambishi vingi vya unyambulishaji kwa wakati mmoja. Kama wanavyosema Kihore, Massamba na Msanjila (2012:127), viambishi nyambulishi huandamana na mizizi hatua kwa hatua. Hii ina

maana kuwa kiambishi huandama kiambishi nyambulishi na kingine au vingine kufanya vivyo hivyo. Wanasema kuwa vitenzi vya Kiswahili vinaweza kufikia hadi hatua nne za unyambulishaji.

Kwa mujibu wa Wesana-Chomi (2013), kitenzi kimoja kinaweza kuchukua vinyambulishi viwili au zaidi. Hata hivyo, anaeleza kuwa vinyambulishi hivi havitokei ovyo bali huongozwa na kanuni mbalimbali ambazo zinahusika katika unyambulishaji huo.

Hyman (2003) anasema kuwa mizizi ya vitenzi katika lugha za Kibantu huweza kuchukua viambishi nyambulishi mbalimbali ili kuwakilisha maana tofauti. Hyman (keshatajwa), anapendekeza mfuatano wa CARP yaani C- causative (usababishi), A- Applicative (utendea), R- Reciprocal (utendano) na P- Passive (utendwa) ambao hutambua hatua nne za unyambulishaji katika lugha za Kibantu. Makala hii ilifafanua mifuatano ya mofimu nyambulishi katika Kigĩchũgũ ili kubaini iwapo inaaafiki au kukiuka ule mfuatano uliopendekezwa na Hyman (mtaje).

Kigĩchũgũ kama lugha zingine za Kibantu hufuata mwambatano wa viambishi vinyambulishi viwili au zaidi. Mifano iliyojadiliwa katika kauli sita za unyambulishaji, inahusu hatua ya kwanza ya viambishi nyambulishi vya Kigĩchũgũ vinavyofuata mizizi moja kwa moja. Mifano inayofuata imezingatia unyambulishaji wa vitenzi vya Kigĩchũgũ katika hatua ya pili, ya tatu na ya nne.

Mfuatano wa Viambishi Nyambulishi Viwili

Kama anavyopendekeza Waweru (2011) kuhusu mifuatano nyambulishi katika Gĩkũyũ, Kigĩchũgũ pia kinaweza kuwa na viambishi nyambulishi viwili. Mifuatano hii ni pamoja na;

Kauli ya Kutendea na Kutendwa (TDA+TDW)

Mofimu zinazowakilisha kauli ya kutendea katika Kigĩchũgũ ni {-ĩr-} na {-er-} na kauli ya kutendwa ni {-w-}. Mifano ifuatayo inaonyesha kuwa Kigĩchũgũ hukubali mfuatano huu kama ilivyo katika lugha nyingine za Kibantu. Kwa mfano,

42. andik –ĩr –w -a

andik –TDA –TDW -I

andikiwa

men -er –w -a

men –TDA –TDW -I

chukiwa

ob –er –w -a

ob –TDA –TDW -I

fungiwa

Mfuatano huu katika Kigĩchũgũ unakubaliana na mfuatano wa Kiolezo kama anavyourejelea Asiimwe (2011) jinsi ulivyopendekezwa na Hyman (2003) yaani kauli ya kutendea hutangulia kauli ya kutendwa. Hii ina maana kuwa mofimu katika kauli ya kutendea hufanganishwa kwenye mzizi kwanza ikifuatwa na mofimu katika kauli ya kutendwa. Mfuatano huu katika Kigĩchũgũ ulitumiwa kuonyeha kuwa kitendo fulani kilifanywa kwa niaba ya mtu au kitu.

Kauli ya Kutendea na kauli ya Kutendua (TDA+TDU)

Kigĩchũgũ huambikwa mofimu {-ĩr-} na {-er-} katika kauli ya kutendea na mofimu {-ũr-} na {-or-} katika kauli ya kutendua. Mofimu hizi huweza kufuatana katika Kigĩchũgũ ingawa mfuatano hukiuka uliopendekezwa na Hyman (2003). Hii ni kwa sababu Hyman (mtaje) alipendekeza mfuatano wa utendea kuja kabla kutendua lakini mfuatano huu katika Kigĩchũgũ huanza kwa kauli ya kutendua ikifuatwa na kauli ya kutendea. Kwa mfano,

ob –or –er -a

ob –TDU –TDA -I

fungulia

bat –ũr -ĩr -a

bat –TDU –TDA -I

kwamulia

tum –ũr –ĩr -a

tum –TDU –TDA -I

shonolea

Kutokana na mifano hii, ni dhahiri kwamba Kigĩchũgũ hukubali mfuatano wa kauli ya kutendea na kutendua. Kimantiki, kauli ya kutendua katika Kigĩchũgũ hutokea kabla ya kauli ya kutendea.

Kauli ya Kutendesha na Kutendea (TSH+TDA)

Mfuatano huu huchukua mofimu {-ithi-} na {-i-} katika kauli ya kutendesha katika Kigĩchũgũ na mofimu {-ĩr-} katika kauli ya kutendea. Kwa mfano,

end –ith –ĩr –I -a

end –TSH –TDA –tsh -I

pendezea

rĩm –ith –ĩr –i -a

rĩm - TSH – TDA - tsh-I

lim-ish-i-a

bũr –ith –ĩr –i -a

bũr –TSH –TDA –tsh -I

pigishia

Katika mifano iliyotolewa, mofimu nyambulishi katika TSH inatengwa na mofimu ya TDA. Hii ni kwa sababu TSH huishia kwa irabu na vilevile kauli ya TDA huanza kwa irabu.

Kigĩchũgũ pia huwa na usababishi mfupi ambao huwakilishwa na mofimu {-i-}. Katika mfuatano huu kauli ya kutendea hutokea kabla ya kauli ya kutendesha kinyume na uliopendekezwa na Hyman (2003). Kwa mfano,

kom –er –i -a

kom –TDA –TSH -I

lalishia

unan –ĩr –i -a

unan –TDA –TSH –I

katishia

Kauli ya Kutendea na Kutendana (TDA+ TDN)

Katika Kigĩchũgũ, mofimu za TDA ni {-ĩr-} na {-er-} na mofimu za TDN ni {-an-}. Kama anavyoeleza Mburu (2011) lugha ya Gikuyu hukubali mfuatano wa TDA na TDN ingawa mfuatano huu hukiuka ule uliopendekezwa na Hyman (mtaje). Katika Kigĩchũgũ, maumbo haya hujitokeza kama ifuatavyo;

tem –an –ĩr -a

tem –TDN –TDA -I

katiana

gũr –an –ĩr -a

gur –TDN –TDA -I

nunuliana

rũg –an –ĩr -a

rũg –TDN –TDA -I

pikiana

Kauli ya kutendana huja kabla ya kauli ya kutendea katika Kigĩchũgũ. Kulingana na mfumo wa Hyman (2003), ingetarajiwa kuwa kauli ya kutendea ingetokea kabla ya kauli ya kutendana. Hii haiwezekani kwa kuwa kisemantiki vitenzi hivi havingeleta maana iliyokusudiwa ya kuonyesha kuwa watu fulani wametendeana kitendo kile kimoja. Mfuatano huu katika Kigĩchũgũ unadhihirisha kuwa mofimu moja pekee {-ĩr-} ya utendea ndio hutumiwa.

Kauli ya Kutendesha na Kutendwa (TSH+ TDW)

Kauli ya TSH na TDW huwakilishwa kwa mofimu {-ith-} na {-w-} katika Kigĩchũgũ. Kama ilivyobainika katika sehemu ya 4.4.2, irabu /u/ ambayo ndio umbo la ndani katika kauli TDW huyeyushwa na kuwa /w/. Hata hivyo, ilibainika kwamba irabu /u/ hutumiwa kama kinyambulishaji cha TDW katika vitenzi ambavyo mizizi yake huishia kwa irabu /i/. Mfuatano wa TSH na TDW katika Kigĩchũgũ ulionyeshwa ifuatavyo;

thom –ith -w -a

thom –TSH –TDW -I

someshwa

kiny –ith –w -a

kiny –TSH –TDW -I

fikishwa

rũgam –ith –w -a

rũgam -TSH –TDW -I

simamishwa

Mfuatano huu wa TSH na TDW unaaafiki uliopendekezwa na Hyman (2003) kimofolojia na kisemantiki.

Kauli ya Kutendesha na Kutendua (TSH+ TDU)

Mofimu nyambulishi za kutendesha na kutendua katika Kigĩchũgũ ni { -ith-} na {-ũr-} au {-or-}. Kisemantiki na kimofolojia, kauli ya kutendua huja kabla ya kauli ya kutendesha katika vitenzi vya Kigĩchũgũ. Kwa mfano,

bing –ũr –ithi -a

bing -TDU -TSH -I

fungulisha (mlango)

ob –or –ithi -a

ob –TDU -TSH -I

fungulisha (kamba)

rog -or –ithi - a

rog –TDU -TSH -I

rogoesha

Katika mifano hii, mfuatano uliopendekezwa na Hyman (keshatajwa) wa kauli TSH kuja kabla ya kauli TDU umekiukwa ili kudumisha maana.

Kauli ya Kutendesha na Kutendana (TSH+ TDN)

Mfuatano wa kauli tendeshi na tendana hukubalika katika Kigĩchũgũ. Mofimu {-ithi-} na { -i-} hutumiwa katika TSH na mofimu {-an-} katika TDN. Kwa mfano,

ak –ith –an –i -a

ak –TSH –TDN –tsh -I

jengeshana

nyu –ith –an –I -a

nyu –TSH –TDN –tsh -I

nyweshana

nyit –ith –an –I -a

nyit –TSH –TDN –tsh -I

shikishana

Kutokana na mifano hii, ni dhahiri kwamba Kigĩchũgũ hukubali mfuatano wa TSH na TDN. Mfuatano wa mofimu hizi katika Kigĩchũgũ unakubali Kiolezo kuwa kauli tendeshi hutangulia kauli tendana kama unavyopendekezwa na Good (2005).

Kauli ya Kutendua na Kutendwa (TDU+ TDW)

Kauli ya TDU na TDW huwakilishwa na mofimu nyambulishi {-ũr-} au {- or-} katika kauli ya kutendua na {-w-} katika kauli ya kutendwa katika Kigĩchũgũ. Mifano hii inadhihirisha mfuatano huo.

kũnj –ũr –w -a

kũnj –TDU -TDW -I

kunjuliwa

bing –ũr –w -a

bing –TDU –TDW -I

funguliwa

ob –or –w -a

ob –TDU –TDW -I

funguliwa

Kutokana na mifano hii, kauli ya kutendwa huja baada ya kutendua katika unyambulishaji wa vitenzi vya Kigĩchũgũ. Hata hivyo, mfuatano huu wa TDU na TDW haukubaliki katika baadhi ya vitenzi.

Kauli ya Kutendua na Kutendana (TDU+TDN)

Kigĩchũgũ, huruhusu mfuatano wa kauli ya TDU ambayo mofimu zake ni {-or-} na {-ũr-} na kauli ya TDN ambayo huwakilishwa na mofimu {-an-}. Katika mfuatano huu, kauli ya TDU huja kabla ya TDN. Mofimu hizi yaani {-or-} na {-an-} hujitokeza zikifuata vitenzi sielekezi katika Kigĩchũgũ kama inavyodhihirika katika mifano ifuatayo;

ob –or –an -a

ob –TDU –TDN -I

funguana

Rog –or –an -a

Rog –TDU –TDN -I

rogoana

Thik –ũr –an -a

Thik –TDU –TDN -I

Zikuana

Kauli ya kutendua na kutendeka

Mofimu nyambulishi katika kauli ya TDK na TDU ni {-ĩk-} au {-ek-} na {-or-} au{-ũr-}. Katika mfuatano wa vinyambulishi hivi katika Kigĩchũgũ, kauli ya TDU huja kabla ya TDK kama inavyoonyeshwa kwenye mifano ifuatayo;

ob-or-ek-a

ob-TDU-TDK-I

funguka

rog-or-ek-a

rog-TDU-TDK-I

rogoka

Kauli ya kutendesha na kutendeka

Kauli ya TSH huwakilishwa kwa viambishi {-ithi-} na kauli ya TDK huwakilishwa kwa viambishi {-ĩk-} au {-ek-}. Katika mfuatano wa vinyambulishi katika lugha ya Kigĩchũgũ, kauli ya TSH hupachikwa kwanza ikifuatwa na kauli ya TDK. Kwa mfano,

rĩm-ith-ĩk-i-a

rĩm-TSH-TDK-I

limishika

thom-ith-ĩk-i-a

thom-TSH-TDK-I

somesheka

Mfuatano wa Viambishi Nyambulishi Vitatu

Kigĩchũgũ vilevile hukubali mfuatano wa kauli tatu katika kitenzi kimoja kwa wakati mmoja. Mfuatano huu ulielezwa kama ifuatavyo;

Kauli ya Kutendesha , Kutendea na Kutendana (TSH+TDA+TDN)

Katika mfuatano wa kauli tatu, Kigĩchũgũ kinakubaliana na pendekezo la Hyman (2003) la TSH, TDA na TDN. Hata hivyo, mfuatano wa viambishi nyambulishi tatu katika Kigĩchũgũ unapingana na wa Hyman (kehatajwa) kwa kiasi kwa vile unaruhusu mpishano. Tokeo la mfuatano huu katika Kigĩchũgũ unakuwa TSH, TDN na TDA hivyo basi kuathiri maana ya kitenzi kama ilivyo katika mifano ifuatayo.

tham –ith –an –ĩr –i -a

tham –TSH –TDN –TDA –tsh -I

hamishiana

taar –ith –an –ĩr –i -I

taar –TSH –TDN –TDA –Tsh -I

chagulishiana

men –ith –an –ĩr –i -a

men –TSH –TDN –TDA –tsh -I

chukishiana

Kanuni ya utokeaji ya mfuatano huu ni kwamba TSH inajitokeza baada ya mzizi wa kitenzi ikifuatwa na TDN na baadaye TDA.

Kauli ya Kutendesha, Kutendana na Kutendwa (TSH+ TDN+ TDW)

Kauli ya TSH, TDN na TDW zinaweza kufuatana kama Waweru (2011) anavyopendekeza. Katika mifano ifuatayo ya Kigĩchũgũ, pendekezo la mfuatano wa Hyman (2003) limeafikiwa. Hii ina maana kwamba kimofolojia kauli ya TSH huja baada ya mzizi, ikifuatwa na TDN kisha TDW ambayo huja mwishoni mwa kitenzi. Kwa mfano,

men –ith –an –w -a

men –TSH –TDN –TDW -I

kosanishwa

bũr –ith –an –w -a

bũr –TSH –TDN –TDW -I

piganishwa

andĩk –ith –an –w -a

andĩk –TSH –TDN –TDW -I

andikanishwa

Kauli ya Kutendesha, Kutendua na Kutendana (TSH+ TDU+ TDN)

Kigĩchũgũ hutumia mofimu nyambulishi {-ithi-} kuwakilisha kauli tendeshi, mofimu {-ũr-} na {-or-} katika kauli ya kutendua na mofimu {-an-} katika kauli ya kutendana. Mfuatano huu ni ule uliopendekezwa na Hyman (keshatajwa) ingawa kimofolojia Kigĩchũgũ kinaruhusu mpishano huru. Matokeo ya mfuatano huu kimofolojia katika Kigĩchũgũ ni kwamba kauli ya TDU huja baada ya mzizi wa kitenzi, ikifuatwa na kauli TSH na baadaye kauli ya TDN kama inavyodhihirika katika mifano.

ob –or –ith –an –i -a

ob –TDU -TSH –TDN –esh -I

fungulishana

thik –ũr –ith –an –i -a

thik –TDU –TSH -TDN -esh-I

zikulishana

kunj -ũr –ith –an –i -a

kunj –TDU –TSH –TDN –esh –I

kunjulishana

Kauli ya Kutendesha, Kutendea na Kutendwa (TSH+ TDA+TDW)

Kimofolojia, mfuatano wa kauli hizi ni TSH, TDA na TDW kama tu ilivyobainika katika Kigĩchũgũ. Kauli hizi huwakilishwa na mofimu tofauti kama ilivyoelezewa katika sehemu ya

4.4. mofimu hizi ni {-ithi-},{- ĩr-} au {-er-} na {-w-} ambayo muundo wake wa ndani ni {-u-} lakini hupitia uyeyushaji ili kuzuia mfuatano wa irabu mbili.Mfuatano huu katika Kigĩchũgũ ulionyeshwa kwa mifano ifuatayo;

ak –ith –ĩr –w -a

ak –TSH –TDA –TDW -I

jengeshewa

coker –ith –ĩr –w -a

coker –TSH –TDA –TDW -I

rudishiliwa

kũnj –ith –ĩr –w -a

kunj –TSH –TDA –TDW -I

kunjishiwa

Kauli ya kutendesha, kutendua na kutendwa (TSH+ TDU+ TDW)

Mfuatano huu unakubalika katika Kigĩchũgũ ingawa sio katika vitenzi vyote. Mfuatano huu huwa na mofimu ya TSH {-ith-}, TDU {-or-}m au {-ũr-} na TDW {-w-}. Mfuatano wa kimofolojia kama unavyodhihirishwa na mifano ya vitenzi katika Kigĩchũgũ ni kwamba kauli ya TDU hupachikwa kwanza baada ya mzizi, ikifuatwa na kauli ya TSH na baadaye kauli ya TDW. Kwa mfano,

bing –ũr –ith -w -a

bing –TDU –TSH –TDW -I

fungulishwa

kũnj –ũr –ith –w -a

kũnj –TDU -TSH –TDW -I

kunjulishwa

thik –ũr –ith –w -a

thik –TDU –TSH –TDW –I

*zikulishwa

Kauli ya Kutendesha , Kutendua na Kutendea (TSH+ TDU+ TDA)

Kigĩchũgũ hukubali mfuatano wa kauli ya TSH, TDU na TDA. Utaratibu wa mfuatano huu katika Kigĩchũgũ ni kwamba kauli ya TDU hujitokeza kwanza ambapo hupachikwa baada ya mzizi, ikifuatwa na kauli TSH na baadaye TDA. Mifano ifuatayo inadhihirisha mfuatano huo katika Kigĩchũgũ.

bing –ũr –ith –ĩr –i -a

bing –TDU –TSH –TDA -I

fungulishia

kũnj –ũr –ith –ĩr –i -a

kũnj –TDU –TSH –TDA -I

kunjulishia

ob –or –ith –ĩr –i -a

ob –TDU –TSH –TDA -I

fungulishia

thik –ũr –ith –ĩr –i -a

thik –TDU –TSH – TDA -I

zikulia

Kauli ya Kutendua, Kutendea na Kutendwa (TDU+ TDA+TDW)

Katika unyambulishaji wa vitenzi vya Kigĩchũgũ, mfuatano huu hukubalika ambapo TDU hufuata moja kwa moja mzizi wa vitenzi. TDA hufuata TDU kwani huonyesha yambwa tendewa na baadaye TDW kama ilivyoonyeshwa katika mifano hii:

bing –ũr –ĩr –w -a

bing –TDU –TDA –TDW -I

funguliwa (mlango)

ob –or –er –w -a

ob –TDU –TDA –TDW -I

funguliwa (kamba)

tum –ũr –ĩr –w -a

tum –TDU –TDA –TDW -I

shonolewa

kũnj –ũr –ĩr –w -a

kunj –TDU –TDA –TDW -I

kunjuliwa

Kauli ya Kutendea, Kutendana na Kutendwa (TDA+ TDN+TDW)

Kigĩchũgũ hukubali mfuatano wa kauli TDA ambayo huwakilishwa kwa mofimu nyambulishi {-ĩr-} na {-er-}, kauli TDN ambayo mofimu yake ni{-an-} na kauli TDW ambayo huwakilishwa kwa mofimu {-w-}. Ingawa mfuatano huu ni kama ulivyopendekezwa na Hyman (2003), Kigĩchũgũ imeruhusu mpishano huru ambapo kauli ya TDN hufuata mzizi moja kwa moja , ikifuatwa na TDA na kisha TDW. Mfuatano huo umeonekana katika vitenzi kama ifuatavyo:

bũr –an –ĩr –w -a

bur –TDN –TDA –TDW -I

piganiwa

andĩk-an-ĩr-w-a

andĩk –TDN –TDA –TDW -I

andikaniwa

rum –an –ĩr –w –a

rum –TDN –TDA –TDW –I

tusianiwa

Kauli ya kutendua, kutendea na kutendana (TDU+ TDA+ TDN)

Mfuatano huu huwa na mofimu ya TDU {-ũr-} au {-or-}, TDA {-ĩr-} au {-er-} na TDN {-an-}. Mofimu hizi huambishwa kwenye mzizi wa vitenzi vya Kigĩchũgũ kwa mfuatano wa TDU – TDN -TDA. Mfuatano huu unakubalika katika Kigĩchũgũ ingawa sio katika vitenzi vyote kwani

kauli ya TDU ambayo huonyesha kinyume cha kauli ya kutenda haijitokezi katika vitenzi vingi. Mifano ifuatayo inaonyesha mfuatano huo.

an –ũr –an –ĩr -a

an –TDU –TDN –TDA -I

anuliana

rog –or –an –ĩr -a

rog –TDU –TDN –TDA -I

rogoleana

tum –ũr –an –ĩr -a

tum –TDU –TDN –TDA -I

shonoleana

bing –ũr –an –ĩr -a

bing –TDU –TDN –TDA -I

funguliana

Mfuatano wa Viambishi Nyambulishi Vinne

Kigĩchũgũ ni mojawapo ya lugha za Kibantu zinazokubali mfuatano wa kauli nne. Kauli hizi ni kama vile;

Kauli ya Kutendesha, Kutendana, Kutendea na Kutendwa (TSH+ TDN+ TDA+ TDW)

Mfuatano wa vinyambulishi hivi katika Kigĩchũgũ ni TSH –TDN -TDA-TDW. Mfuatano huu ni kinyume na uliopendekezwa na Hyman (2003) na Good (2005) wa TSH –TDA -TDN na TDW. Mpishano huru katika Kigĩchũgũ umetokea ili kuleta kuhifadhi maana ya vitenzi. Mifano ifuatayo inadhihirisha hilo:

men –ith –an –ĩr –w -a

men –TSH –TDN –TDA –TDW -I

koseshanwa

bũr –ith -an –ĩr –w -a

bũr –TSH –TDN –TDA –TDW -I

pigishianwa

andĩk -ith -an –ĩr –w –a

andĩk –TSH –TDN –TDA –TDW –I

andikishianwa

Katika mifano hii, mofimu {-u-} ambayo huwa ni mofimu ya ndani katika kauli ya TDW imepitia uyeyushaji na kuwa {-w-} kwa vile imefuatana na irabu. Mifano hii husababisha kitenzi kuonekana kama vitenzi viwili vinavyokwenda sambamba hasa ikitumiwa katika sentensi. Kwa mfano,

3. (a) Mwana wa Kamau nĩandikithanĩrwa nĩ Njoroge na Muthoni makĩandĩkana.

(b) Mtoto wa Kamau ameandikishianwa na Njoroge na Muthoni wakati wanapoandikana.

Katika sentensi hii, inaonekana kuwa Njoroge na Muthoni wanaandikana lakini wakati huohuo wanafanya kazi ya kumwandika mtoto wa Kamau.

Kauli ya Kutendua, Kutendesha, Kutendea na Kutendwa (TDU+ TSH+ TDA + TDW)

Kigĩchũgũ vilevile hukubali mfuatano wa kauli ya TDU –TSH -TDA na TDW kama inavyoonyeshwa katika mifano hii:

ob –or –ith –ĩr –w -a

ob –TDU -TSH –TDA –TDW -I

funguanishiwa (kamba)

kũnj –ũr –ith –ĩr –w -a

kũnj –TDU –TSH –TDA –TDW -I

funguanishiwa

ak –ũr –ith –ĩr –w -a

ak –TDU –TSH –TDA –TDW -I

jengulishiwa

Mifano hii inadhihirisha wazi kuwa kauli mbalimbali zinaweza kufungamanishwa katika kitenzi kimoja na kuleta athari kisemantiki.

Kanuni za Mfuatano wa Viambishi Nyambulishi

Mfuatano wa viambishi nyambulishi kama wanavyosema Kihore, Massamba na Msanjila (2012) huongozwa na kanuni mbalimbali. Kanuni hizi ni kama vile:

Kanuni ya Kiambishi Nyambulishi {-w-}

Kama wanavyosema Kihore, Massamba na Msanjila (2012: 129), katika miandamano yoyote ya viambishi nyambulishi na mzizi wa vitenzi, kiambishi nyambulishi {-w-} lazima kitokee kama kiambishi nyambulishi cha mwisho pale inapobidi kitokee katika umbo la kitenzi. Hali hii ni sawa katika Kigĩchũgũ ambapo ilibainika kuwa kauli ya TDW ilitokea mwishoni mwa vitenzi katika mifuatano iliyojadiliwa. Kwa mfano,

andĩk-ĩr-**w**-a

caka-ith-an-**w**-a

cagũr-ith-an-ĩr-**w**-a

Mifano hii inaonyesha mfuatano wa kauli mbili, tatu na nne na katika mifuatano yote, kiambishi nyambulishi {-w-} kimetokea mwishoni mwa vitenzi.

Kanuni ya Viambishi Nyambulishi {-ĩr-} na {-er-}

Kanuni inaeleza kuwa mofimu {-ĩr}- na {-er-} hutumika baada ya mizizi ya vitenzi vinavyoishia kwa konsonanti katika vitenzi vya Kigĩchũgũ. Kwa mfano,

thom-**er**-a

thukum-**ĩr**-a

twar-**ĩr**-a

Vinyambulishi hivi vya kauli ya TDA hufauatana na kauli mbalimbali kama ilivyofafanuliwa

Kanuni ya Viambishi Nyambulishi Radidi

Kama wanavyosema Kihore, Massamba na Msanjila (2012: 130), kanuni ya viambishi nyambulishi radidi inasema kwamba upo uwezekano wa baadhi ya viambishi nyambulishi kurudiwa katika mwandamano katika umbo moja. Hali hii pia inajitokeza katika Kigĩchũgũ hasa mwandamano unaohusisha kauli ya TSH. Kwa mfano katika sehemu ya 4.5.1 (c)) TSH inapoandamana na TDA na TDN, urudiaji wa TSH hutokea. Kwa mfano,

andĩk –ith -ĩr -i -a

andĩk –TSH –TDA –TSH -I

andikishia

50. nyw –ith –an –i -a

nyw –TSH –TDN –TSH -I

nyeshana

Vilevile katika sehemu ya mfuatano wa viambishi nyambulishi vitatu, (a) na (c), hali ya urudiaji wa TSH inajitokeza katika mfuatano wa TSH -TDN -TDA na TDU –TSH -TDN. Kwa mfano,

51. tham –ith –an –ĩr –i -a

tham -ESH –AN -EA -ESH -I

hamishiana

36. kũnj –ũr –ith –an –i -a

kunj -UA –ESH –AN –ESH -I

kunjulishana

Katika urudiaji huu mofimu {-i-}, ambayo huonyesha usababishi mfupi katika Kigĩchũgũ ndiyo iliyorudiwa. Kama anavyoeleza Wesana-Chomi (2013:73), kinyambulishi cha kauli ya TSH kinafaa kutokea kabla ya kinyambulishi cha kauli ya TDA na pia kabla ya kauli ya TDN.

Kanuni ya Kiambishi Nyambulishi {-an- }

Kama anavyosema Wesana-Chomi (2013:72), kiambishi kinyambulishi {-an-} hupachikwa kwenye vitenzi vyenye sifa maalumu tu ambavyo mizizi yake inaweza kupokea kinyambulishi {-an-}. Sifa hiyo ni kwamba kitenzi sharti kitaje tendo linalohusisha wahusika wawili au zaidi. Kila mhusika ni mtenda tendo na pia ni mtendwa. Katika vitenzi vya Kigĩchũgũ, kinyambulishi hiki kinaweza kutanguliwa na TDA, TSH na TDU katika mfuatano wa viambishi nyambulishi viwili kama ilivyoonyeshwa katika mfano (d), (g) na (i) au kikafuatana na viambishi nyambulishi vitatu na vinne kama ilivyo katika mifano wa mfuatano wa viambishi nyambulishi vitatu a,b na c.

Hitimisho

Makala hii imechanganua mofolojia ya unyambulishaji wa vitenzi katika Kigĩchũgũ. Lengo kuu lilikuwa ni kufafanua mifanyiko iliyotumika katika unyambulishaji wa vitenzi hivyo, kujadili mfuatano wa viambishi nyambulishi na kutathmini kanuni zinazoruhusu au kuzuia mifuatano hiyo. Viambishi tamati katika unyambulishaji wa vitenzi vya Kigĩchũgũ vilijadiliwa katika kauli sita; kutendea, kutendwa, kutendesha, kutendana, kutendeka na kutendua. Katika uchanganuzi wa data, imedhihirika kwamba viambishi {-er-} na {-ĩr-} vilitumika katika kauli ya kutendea. Katika kauli ya kutendwa kiambishi {-w-} kilitumika kwenye mizizi ya vitenzi vilivyoishia kwa konsonanti na pia kiambishi {-u-} kilitumika katika baadhi ya vitenzi vya Kigĩchũgũ vilivyoishia

kwa irabu. Kwa upande mwingine kauli ya kutendesha ilithihirishwa kwa viambishi viwili ambavyo ni {-ithi-} na {-i-}. Kiambishi {-an-} kilitumiwa katika kauli ya unyambulishaji ya kutendana. Kauli ya kutendeka ilitumia viambishi viwili vya unyambulishaji ambavyo ni {-ek-} na {-ĩk-}. Mwishowe kauli ya kutendua ambayo huonyesha kinyume cha vitenzi vya Kigĩchũgũ katika kauli ya kutenda ilijadiliwa. Ilithihirika kuwa kiambishi {-ũr-} ilitumika kuonyesha kauli hii.

Ilibainika kuwa kuna uchopekaji wa fonimu kama vile /r/ katika kauli ya unyambulishaji ya kutendea na /k/ katika kauli ya kutendeka. Uchopekaji huu ulitumikizwa ili kuhifadhi muundo wa K-V katika Kigĩchũgũ. Vilevile, uyeyushaji na udondoshaji wa irabu umetumikizwa ambapo katika kauli ya kutendwa irabu /u/ inayeyushwa na kuwa /w/ katika baadhi ya vitenzi vya Kigĩchũgũ vilivyoishia kwa irabu /i/ na kufuatwa na irabu /u/. Kwa upande mwingine katika kauli ya kutendwa, irabu /i/ ilidondolewa na irabu /u/ kuachwa kama kiambishi cha kauli hiyo ili kuzuia mfuatano wa irabu tatu na pia kuhifadhi maana ya vitenzi husika.

Vitenzi vya Kigĩchũgũ huweza kuambikwa viambishi vinyambulishi viwili, vitatu na vinne kwa wakati mmoja. Hali hii ni tofauti na lugha nyingine za Kibantu ambazo hukubali mfuatano hadi viambishi vitatu. Mifuatano iliyokubalika katika Kigĩchũgũ ilielezwa kulingana na kanuni ya Kioo kwa mujibu wa Baker (1985). Hata hivyo mpishano huru umeruhusiwa ambao ni kinyume na mfuatano wa Hyman (2003) ili kuhifadhi maana ya kitenzi.

MAREJELEO

Asiimwe, C. (2011). Unyambulishaji wa Vitenzi katika Lugha ya Runyankole. Tasnifu ya Uzamili. (haijachapishwa) Chuo Kikuu cha Dar es Salaam.

Baker, M. (1985). The Mirror Principle and the Morpho-Syntactic Explanations. Linguistic Inquiry 16.3:373-415

Charwi, Z.M. (2013). Unyambulishaji na Dhana ya Uelekezi katika Lugha ya Kikuria, katika Omari, S na Peterson, R (wah). Kioo Cha Lugha. Vol 11, 2013. Taasisi ya Taaluma za Kiswahili: Dar es Salaam.

Chomsky, N. (1957). Syntactic Structure. The Hague: Muonton

Chomsky, N. (1988). Knowledge of Language, Its nature, Origin and age. New York: Praeger.

Gawasike, A. (2012). Dhana ya Uambikaji katika Kiswahili. Tasnifu ya Uzamili. Chuo Kikuu cha Dar es Salaam. (haijachapishwa)

Good, J. (2005). Reconstructing Morpheme Order in Bantu. The Case of Causativization and Applicativization. Diachronica 22: 3-57

Guthrie, M. (1967). Classification of the Bantu Languages. London: Pall Mall

Heine, B. na Mohlig, W.J.G.(ed) (1980). Language and Dialect Atlas of Kenya. Berlin: Dietrich Reimer Verlag.

Jepkoech, N.S. (2018). The Morphosyntax of the Keiyo Verb. (Unpublished M.A Thesis). Moi University

Katamba, F. and Stonham, J. (1993). Morphology. London: The Macmillan Press Ltd.

Kiango, J.G. (2008). Sarufi ya Vinyambuo Vitenzi vya Kiswahili: Mitazamo Mbalimbali kuhusu Kanuni za Unyambuaji, katika Ogechi, O.N. Shitemi, L.N. na Simala, K.I. (wah). Nadharia katika Taaluma ya Kiswahili na Lugha za Kiafrika. Eldoret: Moi University Press.

Kihore, Y.M, Massamba, D.P.B na Msanjila Y.P. (2012). Sarufi Maumbo ya Kiswahili Sanifu (SAMAKISA) Sekondari na Vyuo.Dar es salaam: TUKI.

Kiparsky, P. (1982). From Cyclic Phonology to Lexical Phonology. In Ver der Hulst and Smith (ed) The Structure of Phonological Representation. Dordrecht: Foris Publications.

Massamba, D.P.B, Kihore, Y.M. na Msanjila, Y.P. (2003). Fonolojia ya Kiswahili Sanifu (fokisa).Dar es Salaam: TUKI.

Milroy, L. (1987). Language and Social Network. Oxford: Blackwell.

Mutahi, K.E. (1983). Sound Change and Classification of Mt. Kenya Dialects. Berlin: Dietrich Reimes.

Ngowa, N.J. (2008). Mnyambuliko wa Vitenzi vya Kigryama. Tasnifu ya Uzamili. Chuo Kikuu cha Kenyatta. (haijachapishwa)

Nurse, D na Philippson, G. (eds.) (2003). The Bantu Languages. London: Routledge.

Schadeberg, T.C. (2003). Derivation, in Nurse,D and Philippson G.(eds.),.The Bantu Languages. London: Routledge.

Waihiga, G. (1999). Sarufi Fafanuzi ya Kiswahili. Nairobi: Longhorn Publishers.

Waithaka, N.M. (2009). Utohozi Mofolojia wa Maneno Mkopo ya Gikuyu kutoka Kiswahili. Tasnifu ya Uzamili.Chuo Kikuu cha Kenyatta (haijachapishwa)

Waweru, N.M. (2011). Gikuyu Verbal Extensions: A minimalist Analysis. (Unpublished PhD Thesis). Kenyatta University.

Wesana-Chomi, E. (2013). Kitangulizi cha Mofolojia ya Kiswahili.: Chuo Kikuu cha Dar es Salaam: TUKI

Linguistics Elements and Meaning: Imagery as a Subtle Communication of Ideologies in Poetry.

Jeremiah Mutuku Muneeni (Kenyatta University)

jermut2000@yahoo.com

Abstract

Language is the vehicle through which ideas are communicated. In order to have a holistic criticism of the works of art, the critic is called upon to break down language into small elements that embody the meaning intended to be communicated. One such an element of language is imagery which encompasses metaphors, similes, images, and symbols. Artists use imagery to appeal to audience's senses. Over the ages, different images have been used to describe the two genders, thus inviting different perceptions. The interrogation of the said elements is a rich repository for analyzing the position each gender occupies as seen from the point of view of the community from which the artist draws his or her materials. As such, gender subjugation and or elevation can be analyzed through interrogating the images that poets employ to bring forth their thematic concerns. By analyzing the images, one is able to identify traces of gender subjugation or otherwise in the poetry of the early East African Poets whose poetry is informed by the (then newly) acquired Western education. This paper interrogates five poems by East African early male poets namely: "The Motoka" by Theo Luzuka, Richard Ntiru's "Rhythm of the Pestle", Jonathan Kariara's "A Leopard Lives in the Muu Tree" Eric Ng'amaryo's "I will Cling to Your Garment" and Austin Bukenya's "I Met a Thief." The paper analyses gendered images employed by the selected East African (male) poets with a view to deconstructing the representation of female gender in their poetry. The poems will be analyzed within the deconstructionist literary theory. The paper aims at finding out whether the images used by male poets in making reference to female characters are chauvinistic.

1.0 Introduction

Language is the vehicle through which creative writers communicate their concerns to their audience. The same language is broken into elements which enhance the effectiveness of passing of the message meant to be communicated. Major among the linguistic elements is imagery. The employment of imagery enables the literary writer, especially the poet, to extend the language at his/her disposal since they use terms in transferred or connotative sense. As John Mugubi observes, metaphors, and to a certain extent, imagery serves to give an item or items vivid description, helps the artist to achieve brevity, helps the author to magnify his/her heart and helps in minifying – biding together the seemingly "unbindable" elements such as notions that seem to be incontrovertible (170).

The major purpose of imagery is, however, to help the creative writers to practice language etiquette. Where the avoidance of profanity is impossible, use of imagery helps the use non-offensive figures of speech to talk about the obscenities respectably or with language that entails some sense of aptness or decorum. When utter frankness is used to refer to taboo words, focus is likely to shift from thematic concerns to the foulness of the language. If the choice of odious words seem to be selectively directed to women, then that could be considered to be a deviation that calls for scrutiny since it approximates to misogyny.

2.0 Deconstructing the Poets' Imagery

Deconstruction literary criticism, built on the ideas of Jacques Derrida, more than any other tool of analysis helps to provide a window through which critics peer through the meaning of the text(s). Derrida points out that all texts are mediated (or in the process of being mediated) thus truth, meaning and knowledge is held by cultural systems, ideologies, symbols (signs), intertexuality, structure of ideas and practices which we call reading. Literature relies on deconstruction because of multiple of meanings, exclusions, substitutions or intertexuality. Deconstructionists argue that meaning circulates and since it relies on difference, then, the 'other' can only stimulate it, when it comes before it. The process of deconstruction always reveals an underlying authority beneath prior authority and that way it brings depreciation or displacement of a text or narrative. In deconstruction the inferior is elevated and the superior imploded giving rise to extended and expanded horizons (Mboya, 2010).

Deconstruction then becomes a system of inquiry which tries to identify meaning in areas which are marginal or deferred as opposed to the proclaimed authorial intention. All those ideas decentred by a text are privileged in a deconstruction so that the difference between the centre and periphery is explored.

Since the kind of imagery that an author adopts to aid them in communicating meaning embodies their (author's) ideologies, then through deconstructing the imagery used by the author, one can be able to ascertain the subtle meaning inherent in the authors' works of art. As such, deconstructing the imagery employed by the author to depict women vis-à-vis those that depict men is thus an avenue through which critics can find out whether, in a subtle way, one gender has been subjugated as the other is elevated.

3.0 The Relationship between Imagery in Poetry and Gender Ideologies

Ada Uzoamaka Azodo argues that:

Issues of gender and language, discussions center around theories of dominance and difference, masculinity and language, power and identity, notions of completion and cooperation, and the fluidity of masculine subjectivity (50).

While the element I am examining in this paper is not centered on masculinity (or its absence), it is important to note that, the male dominance or female subjugation encapsulated in imagery which this paper examines cannot be detached from masculinity.

Poets, due to the nature of verse form which demands economy of words, are among the major consumers of imagery. The use of images enlivens and dignifies the poets' works of art and offers an opportunity to give a vivid description of what is being communicated especially given that, the main purpose of poetry is to communicate one's experiences, feelings ideas, and emotions.

The images that writers use are drawn from their socio-cultural backgrounds from where they draw their writing materials as well as their experiences as they interact with different people and perhaps races during their sojourns occasioned by different reasons. As such, the images carry with them the nuances of the society's ideologies which are perpetuated by the authors who are agents of the communities from which they write. Where the poet presents personal worldview, the same can be said to have been shaped to a great extent by both the nurturing the

poet undergoes as he/she grows as a unit of the community. With regards to the kind of images and choice of vocabularies a poet uses, A.D. Amateshe observes that an effective communication between the poet and the reader can be achieved through:

[use of] … precise description, appropriate choice of words, meaningful relationship of images, vivid portrayal of an activity which an artist captures with his poetic eye and [employment of] noteworthy vocabularies (6)

It is the meaningful relationship of images being referred to above that poets employ in their works of art which, if closely examined, can reveal whether the author subjugates or elevates a certain gender.

Gender representation has been an ongoing debate among literature scholars for some time now with some feeling that women subjugation has a historical base in earliest literature ever written by mankind, especially done by male writers. Florence Stratton in her essay: "How Could Things Fall Apart For Whom They Were Not Together", a chapter appearing in her book *Contemporary African Literature and Gender Politics* is a leading light in decrying women (mis)representation by male-dominated writers from Africa in general. Stratton is of the opinion that, male writers deliberately use images that are derogative to women in order to depict them negatively (25). Thus Stratton isolates use imagery among the male creative writers as an avenue through which they perpetuate their biased representation of female gender while elevating masculinity and male chauvinism.

As argued elsewhere in my MA thesis:

(T)he roles and positions of women within a body of literature can serve to systematically analyze that society and societal attitudes towards women. The duties and activities assigned to a particular gender can demonstrate its respective position in the overall power structure in that particular society (Muneeni, 32).

In addition to the above assertion, it is also true that images used to depict one gender as opposed to the other can also be systematically analyzed in order to establish that society and societal attitude towards that genders involved.

We need to ask ourselves, is it possible to establish the place of women through evaluation of gender related images that the poets have used? Did these early writers deliberately choose images that were demeaning when it came to women representation and tone down the same when representing their male counterpart? Can the subtle negativity inherent in the images used to represent women be used as the base to brand the early poets male chauvinists? Through juxtaposing poems that have images for both genders, we can respond to these pertinent questions. This paper examines five poems published in *An Anthology of East African Poetry.*

The first poem this paper examines is entitled "The Motoka" by Theo Luzuka. (Page 101). The first stanza reads:

You see that Benz sitting at the rich's end?

Ha! That Motoka is motoka

It belongs to the Minister for Fairness

Who Yesterday was loaded with a doctorate

At Makerere with whisky and I don't know what

Plus I hear the literate *thighs* of an undergraduate (my emphasis, line 1-6)

Luzuka's poem demonstrates an enormous success with regards to adopting a form of conversation which borrows from the ordinary speech flavoured with the appropriate diction in order to make an immediate impression on the reader and or the audience. It is worth noting that the poet's choice of a woman - a tomato seller - as the speaker helps him to effectively employ pragmatics aspect to satirize the kind of leaders whose moral standing is questionable.

That notwithstanding, the "unapologetic" use of metonymy (thighs) in reference to women is, by all means, offensive to the dignity of women.

The second poem under examination here is by a renowned poet Richard Ntiru entitled: "Rhythm of the Pestle" (page 92). The poet employs images that call for scrutiny with regards to gender representation:

In stanza one he writes:

Listen – listen-

listen to the palpable rhythm

of the periodic pestle,

plunging in proud perfection

into the cardinal cavity

of maternal mortar

like the panting heart

of the virgin bride

with the silver hymen,

or the approaching stamp

of the late athleting cows

hurrying home to their bleating calves (my emphasis, lines 1-12)

The poet's artistic employment of alliteration and the achievement of rhythm has been lauded by many poetry critics and it makes his poem a reference point for discussion whenever critics are called upon to analyze the two sound patterns in poetry. Further, the diction the poet uses captures the literal meaning absolutely – that of pounding maize meant for preparing *githeri* using the traditional mortar and pestle. As for the deeper meaning, the writer seems to be alluding to the sexual activity, an aspect that he has presented in a perfect artistic manner. Nevertheless, he, like many others has not resisted the temptation of referring to aspects related to female organs distastefully. Use of imagery that compares the act of pounding of the grains to a "virgin who is panting as she loses her virginity and therefore her hymen" is indeed mortifying to female fraternity. Perhaps this kind of depiction is in line with Ernest N. Emenyonu's assertion that there is a critical imbalance and lack of objectivity in the appreciation and the image of womanhood depicted by male authors (xi)

Austin Bukenya in his poem "I met a Thief", (page 96) faithfully follows the footsteps of his fellow male poets in using unapologetic images in reference to women. The title betrays his intention even before we interact with the poem itself. The "thief" in this context refers to the woman who is not the poet's wife but whom the poet meets at the beach and succumbs to her sexual overtures. How come then that it's only the woman who is a thief but the persona is "innocent" despite the fact that it takes two to tango? Actually the persona, in stanza one, says (the woman) thought he had a heart to steal. In stanza one Bukenya writes:

On the beach, on the coast

Under the idle whispering coconut towers,

Before the growling, foaming, waves

I met a thief who guessed I had

An innocent heart for her to steal (lines 1-5)

Use of the image of a thief denotes evil and thus female fraternity is depicted as an evil gender. If what makes the persona to call the woman involved a thief is the fact that she was trying to engage a married man into sexual activity, the male persona is "more of a thief" than the woman because he is the one who possesses the secret – that he is a married man. Use of such a derogative term to refer only to the woman and presenting the man as a victim is, thus, a distortion of images aimed at denoting women as the originators of evil bedeviling the society.

In stanza two, Bukenya furthers the derogatory depiction of the female gender by using images to describe their womanhood:

She took my hand and led me under

The intimate cashew boughs which shaded

The downy grass and peeping weeds

She jumped and plucked the nuts for me to suck

She sang and laughed and pressed close.

The persona here uses images that refer to women's pubic hair as "the downy grass and the peeping weed". Though he has avoided the blatant reference to the private parts, he has all along cast the woman as the evil one as "she takes the poet's hand" and "leads him…" Thus despite Bukenya restricting himself to etiquette with regards to diction, he remains guilty of bedeviling the womenfolk as the initiators of the evil and for dragging the otherwise "holy" men into it.

Eric S. Ng'maryo has employed rare artistry to present a poem "I will cling to Your Garment." Which offers the analyst an opportunity to view from both literal and symbolic points of view. Ng'maryo writes:

I will cling to your garment like a wild grass seed

I will needle your flesh

And pray that my insistent call for you

Be not met with

A jerky removal

From your garment

And a throw into the fire,

But that

You will drop me into the fertile ground of

Your favour (Lines 1- 10)

Indeed the artistry in Eric Ng'maryo's, especially the diction is appealing. A critic who chooses to read the poem literally may argue that the poet's imagery is referring to a louse or any other vermin in somebody's garment which is seeking protection, warmth and survival being closer to its host; the human body. Hidden in the literal meaning, however, is a deeper meaning which can be interpreted as that of a man in love with a woman pleading with her not to betray, let him down or mistreat him because of these strong feelings he has towards her. He seems to be pleading with her to reciprocate his love by agreeing to his marriage proposal. There is no doubt this is a wonderful composition. Nevertheless, a critic's keen eye detects some images that the poet has employed which are demeaning to the artist. The first two lines of the poem reads:

I will cling to your garment like a wild grass seed

I will *needle your flesh* (my emphasis)

Owing to the fact that the speaker in the poem is a male addressing himself to a woman, then the images of needling one's flesh connotes sex. While it is remarkable that the poet conceals the intention by using a very descriptive image, he cannot be absolved from the guilt of depicting women negatively by using an image that may suggest that women are just "injected" while in the real sense they are also partakers of the act.

In the same poem, Ng'maryo, in lines 9 and 10 writes:

You will drop me into the *fertile ground* of

Your favour (my emphasis)

"Fertility" or "fertile ground" in this context can be deconstructed to mean the woman's womb. Once more, the poet succeeds in concealing the disparaging aspect that could have been depicted by using the term in its literal sense. Observably though, the womenfolk is demeaned as the term seems to mean that, the man's ultimate aim is to access the fertile ground.

The overt use of images to misrepresent, subjugate and subvert women discussed above can be juxtaposed against the images that represent male gender. To achieve the objectives of imagery juxtaposition, I will use two poems: one whose imagery that point to womanhood has already been considered and another one that centers on images that seem to elevate manhood.

Leo Luzuka's poem: "The Motoka" which has already been discussed with regards to the kind of images that the poet adopts while referring to women totally metamorphosis in the subsequent stanzas when the poets uses images to represent their male counterparts. When the poet decides to refer to male private parts, he chooses a less offensive metaphor – as demonstrated in stanza three of the same poem:

Look at the driver chasing the children away

They want to see *the pistol in the door pocket*

Or the button that lets out bullets from the machine

Through the eye of the car shhhhhhhhhhhhhhh

Let's not talk about it (my emphasis, 15-19)

Euphemism is inherent in the metaphorical reference to the male organs in the stanza above. One may, therefore, wonder whether the poet could not attack the immorality inherent in the leader's action but still maintain the dignity of both genders in an equal measure. Why couldn't the poet find an equally less offensive imagery to represent women? Why did he have to be so blatantly offensive?

Another poem that can be used to point out this disproportion in images employed is Jonathan Kariara's "A Leopard Lives in A Muu Tree", (page 110) which predominantly employs images that are widely in reference to manhood. A disparity in terms of the dignity accorded to the two genders is evident. The first six lines read:

A leopard lives in a *muu* tree

Watching my home

My lambs are born speckled

My wives tie their skirt tight

And turn away

Fearing mottled offspring (line 1-6)

The above poem, at literal level would simply be referring to the owner of a homestead whose lambs are not safe because there is a leopard that lives next to his home on a *muu* tree. However, when the idea of his wives comes in, the critic is forced to dig deeper into the imagery used in order to explore the sexual images that the poem evokes. It turns out that leopard is an outsider, perhaps a neighbor or a relative who takes advantage of the persona's infertility to sleep with his wives. The resulting offspring are "speckled" resembling their father – the "leopard" which is indicative of the outsider having sired "mullato" children as a result of the extramarital affair.

In the subsequent lines, the poet laments the contempt with which the "leopard" treats him and lets the audience know the reason as to why, other than cutting the *muu* tree, he cannot rescue himself from the derision.

I am besieged

I will have to cut the tree

I am besieged

I walk about stiff

Stroking my loins

A leopard lives outside my homestead

I have called him elder, the-one-from-the-same-womb

He peers at me with slit eyes

His head held up

My sword has rusted in the scabbard (Line 11-21)

From the metaphor that the poet employs in the last line, we get to know why he cannot perform his conjugal duties – simply because he can no longer "rise to the occasion" so to speak. We sympathize with him for his condition and perhaps support his intention of cutting the *muu* tree. The poet further reveals to the audience the contempt he has to endure from his wives

because of his condition and then blabs out the reason: that he is incapacitated in sexual terms by old age:

My fences are broken

My medicine bags torn

The hair on my loins is singed

The upright post at the gate has fallen (lines 28 -31)

Of my interest here is how the imagery used in reference to male organs compare with those (images) used where the female sexual organs are involved. The poet refers to the man who cohabits with his wives as the "leopard". This image has two identifiable attributes: the specks that characterize the leopard's appearance which is transference to the half casts that the other man begets. Again, there is an image that alludes to the slyness that is associated with the leopard, which likewise, is transferable to the behaviour of this man who has an affair with the speaker's wives. In line 21, the poet uses a decorous image: "the sword that has rusted in the scabbard" to refer to the male sexual organ that is dysfunctional. Further, the poet refers to the speaker's manhood as "medicine bags" and "a gate" which he symbolically says it has fallen meaning it can no longer perform its duty.

In a nutshell, the images that the poet uses in the poems above are characterized by demureness. Luzuka tries his best to sound casual, if not normal with regards to the uncivilized behaviour that the revered leader in the poem is involved in. The "gun-bullet" image employed here is not only symbolic of the organ being referred to but also, as Joseph Walunywa argues, a symbol of manhood, of power, the strength that goes with masculinity (35). Thus the poet, perhaps unconsciously, through diction elevates male gender to reverence while subjugating women through the images he uses.

Kariara also approaches the subject at hand with a lot of prudence. He avoids blatant description especially because the situation the speaker is in is, by all means, the most regrettable to male guild. Use of imagery here appears to be less offensive to the manhood since the ability to function sexually is, arguably, what makes a man. Imagery also affords the poet an opportunity to euphemistically handle an otherwise highly odious topic. The decorum the male fraternity is afforded by Kariara invites any critic interested in female gender (mis)representation to start questioning the rationale behind the overt bias demonstrated by other poets where female gender is involved.

4.0 Conclusion

Collectively analyzed, the five poems above depict a representation of a generation of poets whose use of images show commonality. They appear to have a skewed diction as well as images that they use for different genders. Women seem to be the major victims of iniquitous representation across board as presented by male poets. Through the diction and choice of images that are gender specific, the early male poets misrepresent women by deviating from the morally acceptable choices of images that are derogatory to women but maintaining etiquette where men are involved. The early poets, just like their prose fiction counterparts, can be said to have practiced inequality where the two genders were concerned - not necessarily through the

subjects they handled in their creative works - but through the language they chose to represent the different genders.

Works cited

Amateshe, Kisa (eds) *An Anthology of East African Poetry*. Longman. UK, 1988. Print

Azodo, Uzoamaka. "Masculity, Power and Language in Chinua Achebe's *Things Fall Apart*."

Emerging Perspectives on Chinua Achebe Vol.1 Emeneka: The Master

Artist. Ed. Emenyenu Ernest. African World Press inc. Trenton: 2004, (49-63) Print.

Emenyonu, Ernest. "Introduction, New Women's Writing: A phenomenal Rise" New Women Writing in African Literature. (Ed.) Emenyonu. London: James Currey 24, (2004) : xi-xiii. Print

Kivai, Georgiads."The Female Voice and the Future of Gender Relationships in the Nigerian

Nation in Chimamanda Adichie's *Purple Hibiscus* and *Half of a Yellow Sun*. Unpublished MA Thesis, Kenyatta University,(2010)15-16. Print

Muneeni, Jeremiah."The Nneka Principle in the Fiction of Chinua Achebe: A Study of Mother

Archetype in his Selected Novels . Unpublished MA Thesis, Kenyatta University, (2014) 32-33. Print

Stratton, Florence. "How Could Things Fall Apart For Whom They Were Not Together?"

Contemporary African Literature and Politics of Gender. London. Routledge, (1994) 22-38. Print.

Walunywa, Joseph. "Patriarchy in Chinua Achebe's *Things Fall Apart*: Okonkwo's Wrestling

Match with Unoka" *Egerton Journal of Humnities, Social Sciences and Education* Vol. 5 No2/3 Kenya. Egerton. (2006). 35-62. Print.

The Legacy of Cecil John Rhodes: His Role in the expansion of the British Empire

By

Paul Kombo

Machakos University

Email: plkombo@yahoo.com

dss@mksu.ac.ke

info@machakosuniversity.ac.ke

ABSTRACT

This paper sets out to describe the character, philosophies and guiding beliefs of the bigger-than-life personality of Cecil John Rhodes, the diamond magnate, as seen by different researchers and writers. It also explains how these were shaped by his attempts at grammar school in England and much later by his long stint due to absences in class-attendance in Oxford University. His father dispatched him to South Africa at a young age of seventeen in 1871 and on arrival he lived with his elder brother Herbert in Natal who was a cotton farmer. Both later relocated to Kimberley Diamond Fields after one year. Rhodes' entry into diamond mining that saw him acquire complete diamond mining rights not only in Southern Africa but in the whole world with funding from the N.M. Rothschild bankers and other London financiers, is examined. The article also examines the magnate's entry into politics and becoming Prime Minister of the Cape Colony and his convincing the Queen to grant him a charter for creation of the British South Africa Company (BSAC). For purposes of the expansion of the British Empire, the two Boer republics, Transvaal and Orange Free State, were viewed by Rhodes as a stumbling block that needed to be removed by whatever means possible with the full backing of the British Colonial Secretary Joseph Chamberlain. Rhodes' handling of the subsequent conflicts with the already established Boers in the light of the discovery of diamonds in 1866 and later gold in 1886 is discussed. Rhodes believed strongly that the 'gold of Ophir' had been mined somewhere in territory further north occupied by the Matabele and the Shona. He subsequently dispatched the Pioneer Column to conquer the territory not only driven by a desire for Empire expansion but also to discover the sources of the famed gold. His tenuous relations with the Boers and Afrikaners in the face of his expansionist schemes and confrontations are discussed and so are the so-called concessions agreements with King Lobengula Khumalo of the Ndebele who controlled these lands. A brief look is made of his duplicitous friendships with the Matabele chief in order to manipulate their good intentions towards him to acquire the land concessions in Zimbabwe. We examine Rhodes' fervent belief in the superiority of the British race and therefore its rightness to perpetuate British hegemony throughout the world. To further these beliefs, he made elaborate plans for the creation of a secret society, carefully put down in writing in his seven Wills, aspects of which he mentions in his book 'Confession of Faith' as the basis for his quest to expand the British Empire in Africa and the eventual creation of a one-world government. Supporters of Rhodes such as Professor Basil Williams (Professor of Imperial History in Oxford University) and other prominent British writers and historians saw him as a great

man who had rendered "good service to mankind and what was best for England and the world". MacDonald likened Rhodes to Cromwell in that he was possessed of a singular idea-a global empire controlled by the British Empire. This overriding idea had earlier been propagated by prominent late nineteenth and early twentieth century British personalities and scholars strongly proposing the establishment of a world federation or commonwealth, ideas that gave birth later first to the League of Nations and to the United Nations. Critics of the so-called "civilizing and good for mankind" character of the British Empire government however, have raised issue with Rhodes' racist and deceptive methods of wealth acquisition and colonial expansion seen as questionable at best and despotic, comparable to that of Adolf Hitler. This paper further looks at how the Rhodes scholarships and the round table movement, both of which he was the key originator and funder, have shaped the world since the beginning of the 20st Century.

Key Words: The Cape Colony, Matabele, Shona, Kimberley, character, philosophies, diamonds, mining, Boers, expansionist, British empire, secret society, scholarships, round table movement, Milner's Kindergarten, League of Nations.

PART 1

Rhodes Early Life

Cecil John Rhodes, the British mining magnate and politician who made great wealth in Southern Africa and became Prime Minister of the Cape Colony, was one of the greatest influences that helped to shape British foreign policy and practice over time. Owing to poor health as an adolescent, the father determined that Rhodes needed a change to a better climate and hence made arrangements for him to be moved to Natal, South Africa in 1870. He landed on African soil in September of that year, at the age of seventeen, where he joined his elder brother Herbert who was already settled there. The brother was farming cotton in the Umkomazi Valley, Natal, an endeavor that soon proved unsuitable forcing them to migrate to the growing town of Kimberley where the recent discovery of diamonds in 1871 was drawing many prospectors from many parts of the world. Upon arriving in Kimberley, the young Rhodes started off amongst these small-scale prospectors by similarly engaging in small-scale diamond mining to earn a living before he grew into big business. Kimberley Mine was then known as New Rush which is in today's Northern Cape Province of South Africa. Three years after arriving in South Africa, in 1873, he bought shares in the Kimberley Diamond Mining Company and later in De Beers Consolidated Mines Limited, being financially bankrolled by London bankers N.M. Rothschild. In the same year, he decided to enter university and therefore went to England and enrolled at Oxford University. At university he was enthralled by a lecture by Professor John Ruskin is quoted as stating the following at the end of his arts lecture:

…..There is a destiny now possible to us … We are still undegenerate in race; a race mingled of the best northern blood … We are not yet dissolute in temper … Will you youth of England make your country again a royal throne of kings? … This is what England must do or perish, she must found colonies as far and as fast as she is able.[3]

Control of Diamond Mining in South Africa

to migrate to the growing town of Kimberley where the recent discovery of diamonds in 1871 was drawing many prospectors from many parts of the world amongst whom the younger Rhodes did small-scale diamond mining to earn a living, before he grew into big business.

Kimberley Mine was then known as New Rush which is in today's Northern Cape Province of South Africa. In 1873, Rhodes bought shares in the Kimberley Diamond Mining Company and later in De Beers Consolidated Mines Limited, being financially bankrolled by London bankers N.M. Rothschild. However, he had serious competition from a rival, fellow Englishman, and diamond businessman known as Barney Barnato (his true name was Barnett Isaacs) who controlled Barnato Diamond Mining Company. In the end, Rhodes outwitted Barnato through financial support of the bankers N.M. Rothschild and diamond magnate Alfred Beit to buy one-fifth controlling shares in the Kimberley Central Mine and enticing Banarto's shareholders to sell their shares to him. At this point Barnato capitulated and signed an agreement to amalgamate the two companies into De Beers Consolidated Mines Limited with Rhodes as chairman and also agreeing that profits from the company can be used for expansion of the British Empire. Rhodes went on to found the British South Africa Company, that later grew to comprise a group of companies that included De Beers Diamond Company, Rio Tinto and the Anglo-American companies through the financial support of Rothschild bankers and other financiers of London. Although there is no record of Rhodes receiving other formal education beside his early grammar school education in Stortford, he was able to later in life enroll in Oxford University presumably as a mature student, because the period when he was in the university coincides with the period he was acquiring and expanding his wealth and political life in the Cape Colony.

Being a strong believer in the rightness and infallibility of the British Empire and the superiority of the Anglo-Saxon race, he fervently advocated for the creation of a world-wide government ruled by the British Empire. He made these views in his 'Confession of Faith' that he penned as a student at Oxford even as he was acquiring his great wealth. Similar strong advocacy and material support for a one-world government was shared by many notable English contemporaries, many of whom held the believe that the upper classes of the Anglo-Saxon race possessed special blood (genes) that made them to be more successful than other races, a belief that had been given scholarly underpinning by a study of genealogies of English aristocracy and upper classes by Francis Galton in 1883 (Galton, 1884). Born on 5th July 1853 in Stortford, Hertfordshire, England in a family with strong Christian values since his father was the vicar of the Church of England in Stortford, Rhodes was equipped with religious concepts early on in life. He received his early childhood education in Bishop's Stortford Grammar School up to the age of nine after which he joined Winchester Secondary school but also intermitedly tutored privately by his father being reported to have had health problems at the time.

Key British intellectuals of the time who were supporters of British Empire were in agreement that the British system of empire was the best that human beings had developed up to that point in history because of its 'civilising' characteristics. Key among them Kerr, Alfred Zimmern, Hobson argued in scholarly articles that the Empire was good for humankind and therefore needed to be expanded to cover the entire world. These arguments were justified by assertions that the British interests were the "most available and realistic system of international morality" available to mankind. As justification of these assertions, Niall Ferguson (2003) asserts that the British Empire was "the nearest thing there has ever been to a world government" based on the freeing of markets and removal of trade barriers in a process he terms 'Angloglobolisation'. Due to this process, areas controlled (colonized) by the British Empire achieved impressive economic performance compared to those controlled by "corrupt, socialistic, protectionist regimes". Those who questioned the British world power and its methods were often dismissed as supercilious internal liberal critics. These arguments and proposals were the background to the formation of the League of Nations in 1919 and later after World War Two, to the formation of the United Nations. compared to others notably the German Reich of the time. It is therefore natural for Rhodes to view other races as inferior based on these assumptions.

Rhodes' Secret Society

The Society of the Elect: The Junta

Professor Quigley asserts that at the outset, Rhodes met with William T. Stead and Brett to set up the Society of the Elect. This secret organization was deliberately organized so that the very top was occupied by the Junta headed by Rhodes himself as the General of the Junta while below it was the Inner Circle and the Outer Circle members that included members from British closely-affiliated countries namely Australia, New Zealand, Canada, United States of America, South Africa and Germany. It must be noted that secret societies had dominated Europe for many centuries and much later were created in the United States principally through Freemasonry. Although Cecil Rhodes was already a member of the Freemasons at the time that he was proposing for the creation of this other new secret society, it was because he wanted it to be modelled on the Catholic Jesuits society which he thought was more secretive and effective than the Freemans. The new secret society financed by Rhodes, according to author Jim Marrs in his book Rule by Secrecy (pp.83), later came to be known as the Round Table movement with chapters in the United States and other countries. A veteran of the South African Boer War, Lionel Curtis, who was a protégé of Lord Alfred Milner (member of Milner's Kindergarten), took the lead in the 1919 Paris conference in the formation of the Royal Institute of International Affairs (RIIA) with an American chapter to be called Council on Foreign Relations (CFR). The Rhode's scholarships under his will would sponsor the education of young men from these countries in Oxford University under the stewardship of his loyal friend Sir Alfred Milner. The plan for the creation of secret society was first sketched in his first will as follows:

…..To and for the establishment, promotion and development of a Secret Society, the true aim and object whereof shall be for the extension of British rule throughout the world, the perfecting of a system of emigration from the United Kingdom, and of colonisation by British subjects of all lands where the means of livelihood are attainable by energy, labour and enterprise, and especially the occupation by British settlers of the entire Continent of Africa, the Holy Land, the Valley of the Euphrates, the Islands of Cyprus and Candia, the whole of South America, the Islands of the Pacific not heretofore possessed by Great Britain, the whole of the Malay Archipelago, the seaboard of China and Japan, the ultimate recovery of the United States of America as an integral part of the British Empire, the inauguration of a system of Colonial representation in the Imperial Parliament which may tend to weld together the disjointed members of the Empire and, finally, the foundation of so great a Power as to render wars impossible, and promote the best interests of humanity.

The initial meeting for planning the form of secret society to be created was held in February 1891in which Rhodes discussed with William T. Stead, a well-known writer and editor, and drew up a tentative list of members comprising Rhodes himself, Stead and Nathan Rothschild. In the arrangement, Stead and Rothschild were made trustees of the Rhodes' wills with the latter handling the financial aspects. At this stage of the organizing, the secret society was divided into two levels, namely the Society of the Elect, being the innermost group and the Association of Helpers, the outside circle. It was agreed that the inner level would be made up of the General of the Society (Rhodes) and three junta members namely Stead, Brett and Alfred Milner. This meeting also agreed to establish a magazine known as '*Review of Reviews'* which would be the mouth-piece of the secret society. According to Professor Quigley, Rhodes let those present in this early meeting know that he had also intimated his plans for the formation of the secret society to some other friends notably Rothschild and Harry H. Johnston, a renowned African explorer and administrator. Johnston was involved in the curving out of parts of Kenya, Uganda

and Nyasaland for the British Empire. According to *A Tentative Roster of the Milner Group*, which was evidently part of the will of Rhodes, the Society of the Elect comprised several levels namely The Society of the Elect, The Association of Helpers, The Outer Circle and Members in other countries. Cecil John Rhodes is listed number one on the list of the Society of the Elect suggesting that he was considered the commander of the secret society. This point is supported by Professor Quigley who asserts that Rhodes was placed in the arrangement as the general of the society with the other three as junta members as indicated above.

PART 2

The Idea of a World Federation

In late ninetieth century and early twentieth century, eminent British personalities and scholars proposed the establishment of a world federation or commonwealth. These ideas later gave birth first to the League of Nations and the United Nations. Critics of the so-called "civilizing and good for mankind" character of the British Empire however raised issue with Rhodes' racism and deceptive methods of wealth acquisition and colonial expansion Seen as questionable at best and despotic Some compared his greed for power to that of Adolf Hitler who appeared in the world scene years later Key British writers and scholars of the time who were supporters of British empire were in agreement that the British system of empire was the best that human beings had developed up to that point in history because of its 'civilising' characteristics that gave birth first to the League of Nations and later to the United Nations compared to others notably the German Reich of the time. It is therefore natural for Rhodes to view other races as inferior based on these assumptions. Shortly before his death in 1902, Rhodes had bequeathed his vast wealth to the Rhodes Trust for funding his secret society and the Rhodes Scholarship Fund to cater for the education of young men in universities who would later be used for furthering the aims and objectives of the secret society once they returned to their home countries. After university, majority of these young men were employed in the civil services in South Africa, Canada, United States and other Commonwealth countries. The awarding of these scholarships to eligible young men from different countries of the world was seen as the vehicle for creating a pool of like-minded point-men in those countries. These young men would in time be used to achieve the planned one-world government that Rhodes and the like-minded industrialists and magnates were looking to establish, through agitating and championing from within their own countries and governments.

Upon becoming the Prime Minister of the Cape Colony in 1890, Rhodes introduced the Glen Grey Act that was designed to legitimize the removal of blacks from their lands to make way for white settlement and industrialization of those areas. His philosophy was that the blacks had to be removed from their traditional lands in order to transform them to conform to European habits. Rhodes applied discriminatory laws that disenfranchised Africans notably the limiting of the size of land they could own legally while greatly increasing the amount of land that whites could legally hold as noted by Richard Dowden "*most would find it almost impossible to get back to the list (Cape Qualified Franchise) because of the legal limit on the amount of land they could hold".* Rhodes argued that the native African was to be treated as a child and denied the franchise. This line of thinking and action was not new since it had already been applied in the United States by President Andrew Jackson to legitimize the removal of several thousand Cherokee Indians from their native lands using the Indian Removal Act in 1829. President Jackson, who professed friendship to the Indians, justified his actions by claiming that the forcing of the Cherokee off their traditional lands would keep them free from the influences of the white

man. Rhodes, like Jackson, professed friendship to the African people yet pushed for the idea that they should only be used for manual labour.

Among the original members of the Milner Kindergarten was Patrick Duncan (Sir Patrick) who had been Milner's assistant in the Board of Internal Revenue (1894-1897) in England. He attended Balliol College, Oxford University in 1890-1894. Later he joined Milner in South Africa as private secretary, later becoming treasurer of the Transvaal in 1901, Colonial Secretary 1903-1906 and acting Lieutenant-Governor in 1906. Later he was Minister of the Interior, Minister of Mines and Governor-General of South Africa (1936-1946). During the whole period he would frequently visit England to consult with the Group. Another prominent member of the Kindergarten was Hugh A. Wyndham who in addition to his having been in the South African Union Parliament between 1910 and 1920, was previously the private secretary to Milner himself. Author of 'Problems of Imperial Trusteeship' (1933), and 'Britain and the World', among some of the books he authored, was heir presumptive to the third Baron Leconfield. Like all other members of the Milner Group, he was also both a member of the Royal Institute for International Affairs (RIIA) and the secret society.

Another key Milner Kindergarten member was Richard Feetham who occupied many high and varied positions notably as chairman of Committee on Decentralization in India (1918-1919), chairman of the Local Government Commission of the Kenyan Colony in 1926 during the governorship of Edward Grigg. He was also chairman of the Transvaal Asiatic Land Tenure Commission (1930-1935), and Vice Chancellor of University of Witwatersrand, among others. He attended New College, Oxford in 1893-1895. Yet another important member of the Kindergarten was John Buchan who authored books such as Nelsons History of the Great War (1915-1919), The Thirty-Nine Steps, The Three Hostages and Greenmantle. He served as correspondent for The Times newspaper as well as military intelligence officer in France in 1916-1917 and as Director of Information for the War Office in 1917-1918.

Lord Alfred Milner, who had been the High Commissioner in South Africa during the Boer War and a close friend of Rhodes, later made concrete steps in the realization of Rhodes' vision by establishing the Round Table movement through what was referred to as Milner's Kindergarten. Milner held similar views about the expansion of the British Empire advocating for "a common civilization, united, not in an alliance-for alliances can be made and unmade and are never more than nominally lasting but in a permanent organic union". These words are contained in his farewell speech to an audience in Cape Town in March 1905 aimed especially at members of Milner's Kindergarten. The Kindergarten refers to the pool of young men trained in Oxford University under the Rhodes scholarships, mostly Englishmen, according to the last will that the mining magnate had prepared before he died in 1902. Milner continued

"…. Our idea is still distant…. the road is long, the obstacles are many, and the goal may not be reached in my lifetime— perhaps not in that of many in this room. You cannot hasten the slow growth of a great idea like that by any forcing process……. I know that the service of that idea requires the rarest combination of qualities, a combination of ceaseless effort with infinite patience. But think on the other hand of the greatness of the reward; the immense privilege of being allowed to contribute in any way to the fulfilment of one of the noblest conceptions which has ever dawned on the political imagination of mankind".

It is worth noting that the idea of forming a secret organization to further British imperial interests was not a new one during this time. Another like-minded British personality, Robert Talbot Gascoigne-Cecil, Viscount Cranborne and third Marquis of Salisbury (1830-1903) had

already developed a similar plan comprised of three elements. The first element involved a method of the secret group penetrating politics, education and journalism. The second level of the plan was the recruitment of men of ability (mainly from Oxford University) who would be assisted to climb up the political and social ladder through matrimonial alliances, titles and positions of power. The last part involved the influencing of public policy by placing these recruited men of ability in positions of power and ensuring that they were protected from public scrutiny. This group came to be known as the Cecil Bloc, one of the factions of the secret organization established for pursuing the cause of expanding the British Empire to cover the entire world just like the Milner Bloc. To illustrate how effective, the methodology was in achieving its objectives, Professor Quigley elaborates that Lord Salisbury (Gascoigne-Cecil), utilizing a similar methodology, was able to hold high and varied positions of power that included fourteen years as prime minister of Britain between 1885 and 1902.

Rhodes Scholarships and The Round Table Movement

Among the original members of the Milner Kindergarten was Patrick Duncan (Sir Patrick) who had been Milner's assistant in the Board of Internal Revenue (1894-1897) in England. He attended Balliol College, Oxford University in 1890-1894. Later he joined Milner in South Africa as private secretary, later becoming treasurer of the Transvaal in 1901, Colonial Secretary 1903-1906 and acting Lieutenant-Governor in 1906. Later he was Minister of the Interior, Minister of Mines and Governor-General of South Africa (1936-1946). During the whole period he would frequently visit England to consult with the Group. Another prominent member of the Kindergarten was Hugh A. Wyndham who in addition to his having been in the South African Union Parliament between 1910 and 1920, was previously the private secretary to Milner himself. Author of 'Problems of Imperial Trusteeship' (1933), and 'Britain and the World', among some of the books he authored, was heir presumptive to the third Baron Leconfield. Like all other members of the Milner Group, he was also both a member of the Royal Institute for International Affairs (RIIA) and the secret society.

Another key Milner Kindergarten member was Richard Feetham who occupied many high and varied positions notably as chairman of Committee on Decentralization in India (1918-1919), chairman of the Local Government Commission of the Kenyan Colony in 1926 during the governorship of Edward Grigg. He was also chairman of the Transvaal Asiatic Land Tenure Commission (1930-1935), and Vice Chancellor of University of Witwatersrand, among others. He attended New College, Oxford in 1893-1895. Yet another important member of the Kindergarten was John Buchan who authored books such as Nelsons History of the Great War (1915-1919), The Thirty-Nine Steps, The Three Hostages and Greenmantle. He served as correspondent for The Times newspaper as well as military intelligence officer in France in 1916-1917 and as Director of Information for the War Office in 1917-1918.

Lord Alfred Milner, who had been the High Commissioner in South Africa during the Boer War and a close friend of Rhodes, later made concrete steps in the realization of Rhodes' vision by establishing the Round Table movement through what was referred to as Milner's Kindergarten. Milner held similar views about the expansion of the British Empire advocating for "a common civilization, united, not in an alliance-for alliances can be made and unmade and are never more than nominally lasting but in a permanent organic union". These words are contained in his farewell speech to an audience in Cape Town in March 1905 aimed especially at members of Milner's Kindergarten. The Kindergarten refers to the pool of young men trained in Oxford University under the Rhodes scholarships, mostly Englishmen, according to the last will that the mining magnate had prepared before he died in 1902. Milner continued

"Our idea is still distant…. the road is long, the obstacles are many, and the goal may not be reached in my lifetime— perhaps not in that of many in this room. You cannot hasten the slow growth of a great idea like that by any forcing process……. I know that the service of that idea requires the rarest combination of qualities, a combination of ceaseless effort with infinite patience. But think on the other hand of the greatness of the reward; the immense privilege of being allowed to contribute in any way to the fulfilment of one of the noblest conceptions which has ever dawned on the political imagination of mankind".

It is worth noting that the idea of forming a secret organization to further British imperial interests was not a new one during this time. Another like-minded British personality, Robert Talbot Gascoigne-Cecil, Viscount Cranborne and third Marquis of Salisbury (1830-1903) had already developed a similar plan comprised of three elements. The first element involved a method of the secret group penetrating politics, education and journalism. The second level of the plan was the recruitment of men of ability (mainly from Oxford University) who would be assisted to climb up the political and social ladder through matrimonial alliances, titles and positions of power. The last part involved the influencing of public policy by placing these recruited men of ability in positions of power and ensuring that they were protected from public scrutiny. This group came to be known as the Cecil Bloc, one of the factions of the secret organization established for pursuing the cause of expanding the British Empire to cover the entire world just like the Milner Bloc. To illustrate how effective, the methodology was in achieving its objectives, Professor Quigley elaborates that Lord Salisbury (Gascoigne-Cecil), utilizing a similar methodology, was able to hold high and varied positions of power that included fourteen years as prime minister of Britain between 1885 and 1902.

As we have stated above, about the time of the death of Rhodes in 1902, there were two distinct secret groups all with very similar goals and objects and operating about the same period, namely the Cecil bloc and the Milner Group. With time however, the distinction between the two groups became blurred with the Cecil bloc apparently being swallowed by the Milner Group. These groups had created parallel research organizations for human psychology research namely the Psychical Research Institute of the Cecil bloc and the Royal Institute for International Affairs based in Chatham House at Oxford University which later moved to London. We will be looking in more detail the activities and objectives of these two organizations later in the paper. It is worth noting that all members of the Milner Group were also members of the Royal Institute of International Affairs (RIIA). The first meeting of members of the Institutes of International Affairs of the Commonwealth was held in Canada in 1933 and was structured along the lines of the Chatham House model. The second conference of this group took place in Sydney, Australia under the Australian Institute of International Affairs in 1938 attended by many delegates from Britain. Canada, Australia with sponsorship of the Commonwealth Government, New South Wales government and the Carnegie Corporation. Prominent British members of the Round Table who attended were Lord Lothian, chair of the Rhodes Trust and later British Ambassador in Washington, Lionel Curtis, and Ernest Bevin. Milner had worked as an assistant editor at the Pall Mall magazine under William T. Stead in England. He had also worked in South Africa following his appointment as High Commissioner in that country. He is described as possessing a keen intellect that had been infused with the singular passion for service to the state by Arnold Toynbee, who he met at Oxford, and is said to have been his mentor and a fellow radical reformer. However, the similarities between the two seems to be in great contrast given that Toynbee was a selfless worker who championed the rights of the less privileged and by the account of Milner himself, a Bible reading person who most likely followed its teachings. Milner, on the other hand, was a member of the secret society which by its own aims and objectives was antithetical to Christin teachings. The similarities of these two Englishmen could lie in the fact

that each of them concentrated almost all their mental powers on service to a particular constituency namely: Toynbee focused his energies in addressing the plight of the poor while Milner, using a similar single-mindedness, focused all his energies on service to the British Empire. John Buchan (Lord Tweedsmuir), who served in many high offices in the British military and equerry to three kings and one-time Governor-General of Canada, described Milner as a person who focused all his energies to the service of the British Empire once the idea was introduced to him. Buchan himself was a close member of the Milner group and therefore understood the relationships between its key members. Buchan explains that Milner's love for the state service was inculcated in him mostly by Arnold Toynbee. But who was Arnold Toynbee and how did it come that he had so much influence in the thinking of Alfred Milner, the chief architect of the Rhodes secret society?

Believer in Superiority of Anglo-Saxon Race over other Races

Among his many achievements are as a politician having become the Prime Minister of the Cape Colony in the years 1890-1896 and regarded as the founder of modern Zimbabwe, Botswana and Zambia (Rhodesia, and Nyasaland then). One of his dearest ambitions, but less well known, is his earnest quest for the expansion of the British Empire to include the United States of America and encompass the entire world. In pursuit of his dream of bringing the United States back into the fold of the British Empire, Rhodes made arrangements as well as put mechanisms in place and the money for the creation of a secret society which he called "The Society of the Elect" comprising of well-educated young men from England and other countries. These men would later come to be known as the Milner's Kindergarten tasked with carrying out his vision for the expansion of the British Empire. Rhodes so strongly believed in British imperialism and the superiority of the Anglo-Saxon race that he wrote in his *Confession of Faith:*

"…..I content that we are the finest race in the world…….just fancy those parts…….at present inhabited by the most despicable specimens of human beings what an alteration there would be if they were brought under Anglo-Saxon influence…..Why should we not form a secret society with one object the furtherance of the British Empire and the bringing of the whole uncivilized world under British rule for the recovery of the United States for the making the Anglo-Saxon race but one Europe".

This was written in the year 1875. The grammatical mistakes are in his original manuscript of June 2, 1875. During his study at Oriel College, Oxford University, Rhodes was greatly influenced by John Ruskin who established the Slade College of Fine Arts and was the first Slade Professor of Fine Art at Oxford University. Professor Ruskin was a writer of literature and fine art, his most famous work being "Modern Painters' which he penned under an anonymous name 'A graduate of Oxford'. Ruskin was well-traveled in Europe accompanying his parents and later his wife Euphemia Chalmers Gray whom he married in 1848. Accounts reveal that his marriage, having been arranged by the parents from both sides who were old friends, did not have real feelings of affection leading to it being annuled since it was never consummated. Rhodes was enthralled by Ruskin's arguments and particularly his inaugural lecture where, among other things, the professor argued that "*the art of any country is the exponent of its social and political virtues".* In order to have a good understanding of the underlying philosophies and belief system

that Rhodes embraced as a student and later in his life, let us look at what Ruskin himself believed. David Icke, author, describes Ruskin as an ardent student of the Bible before he gave up belief in God and instead concentrated in esoteric writings by Plato (The Republic) and Madame Blavatsky (founder of the Theosophy (occult) society and other books on secret societies, notably the Order of the Golden Dawn. The central themes of much of these writings consist of a lack of belief in and questioning of Christian teachings and advocation for an all-powerful and controlling government through a central power base of a few elite people at the top, what can clearly be seen as a socialist or communistic type of government. These, as elaborated by Professor Carol Quigley, were the main philosophies of Ruskin that so enthralled Rhodes at Oxford University that he copied the lectures in longhand for own reference thereafter. It is noteworthy that these same beliefs form the central arguments of older and existing secret societies notably the Knight Templars, Freemasonry and the Theosophist movement of madame Blavatsky as shown by Michael Baigent and Richard Leigh in their book *The Temple and the Lodge*. *The Temple and the Lodge*. Random House). The two authors also point out that since the seventeenth century, no less than six Kings and other British members of the Royal family have been members of the secret society. This is taken to be the part Rhodes assumed fitted well with his own ideas on the expansion of the British Empire as well as the unification of the whole world under the British Monarchy. Some accounts claim that Ruskin's thesis so greatly mentally gripped Rhodes that he copied notes of it in long hand and carried it with him the rest of his life. In his Confession of Faith, Rhodes tells us that he had become a member of the masonic secret society during his stay in Oxford while attributing his acquisition of the great wealth to his membership of the secret group. Despite his masonic affiliations, he still felt that there was need to create an even more elaborate and secretive society modelled on the Jesuit system of the Catholic Church. He argued in his book, through a rhetorical question:

"Why should we not form a secret society with but one object, the furtherance of the British Empire, for the bringing of the whole uncivilized world under British rule for the recovery of the United States, for the making of the Anglo-Saxon race but one empire?.....such a scheme……what a splendid help a secret society would be (that) is not openly acknowledged but who work in secret for such an object".

Rhodes Pushes Northwards: The Anglo-Boer Wars

The Anglo-Boer wars have been characterized as coming out of the desire of the British government to annex and expand the empire into the southern African territories under the Afrikaner/Boer governorship, namely the Transvaal and Orange Free State, which were up to that point independent republics. The first Anglo-Boer war, also known as the First Transvaal War of Independence (1880-1881), resulted from several causes namely, a strong desire by the Disraeli conservative government to expand the British Empire and unite all southern African colonies into a federation, weak governance in the Boer government in Pretoria, poverty, and strong resistance by Boers against British annexation of their country. The attempt to annex Transvaal (also known as South Africa Republic) by Theophilus Shepstone, formerly the Secretary for native affairs in Natal, under instructions from British Secretary of State for the Colonies, Henry Herbert (Lord Porchester), 4th Earl of Carnarvon, was initially successful for a few years up to 1880. Utilizing the conflict raging between the Transvaal government and the Pedi King Sekhukhune I over the latter's refusal to pay taxes, Shepstone declared annexation of Transvaal Republic in Pretoria in 1877 amid protests albeit peaceful in nature by Boer leaders. In the next three years, Boer leaders led several delegations to Britain to plead for restoration of their independence but these were all in vain being turned down by the British government which maintained that the republic should remain a colony of the British Empire. This British

obstinacy in maintaining a position of a clear breach of Boer right of their own country, eventually persuaded them that only war would bring back their independence. In deliberate moves designed to provoke a war with the British authority, Boers met and chose their leaders namely Paul Kruger, Piet Joubert, and M.W. Pretorius to their campaign to reclaim their country back from the British. And soon after on 13th December 1880, they proclaimed the restoration of their Transvaal Republic and raised their flag at Heidelberg rejecting British authority. The resulting war between the Boers and the British ended in total defeat for the latter and cost them two hundred dead soldiers and a similar number injured compared to only a few dead and injured Boer commandos at the battle of Majuba Hill. The Boers on this occasion were able to restore their independence from the onslaught of British empire through the signing of the Pretoria Convention of August 1881. But this gave them only a temporary reprieve for their independence from British colonialism.

Under a decade later, and with better scheming against the Boer republic, the British took charge of the second Anglo-Boer war (1899-1901) resulting in a very different outcome. A desire to control not only the southern African Boers Republics but also the native local tribes notably the Zulu in Natal and the Pedi in the north, the British government now headed by Gladstone, was even more determined to actualize their long-held ambition of control of the whole of southern Africa. With the discovery of gold in Witwatersrand in Transvaal in the early 1886 making it the single biggest gold producer in the world, the South Africa Republic under Paul Kruger, was attaining a new economic clout in the eyes of international business and seemed set to upset the international monetary system controlled by the British Empire. In a related development, the discovery of gold fields in Transvaal Republic had brought international speculators into the country who were from outside Southern Africa, called Uitlanders, who in time started to demand their rights to vote. Believing that the Uitlanders (immigrants) had ulterior motives and were a threat to Transvaal independence, the government tried to control their voting rights by allowing only those who had been in the country for 14 or more years these rights. About this time, it must be noted, Cecil Rhodes had become a very wealthy politician from diamond mining in Kimberley in the Cape Colony and was soon to become the Prime Minister in 1890. Being a strong supporter of British imperialism and holding a fervent believe in the superiority of the British race and empire, Rhodes felt that allowing the South Africa Republic to control the biggest gold wealth in the world would undermine British expansionist aims in southern Africa and hence needed to be stopped.

Back in Southern Africa, in his endeavour to bring under the British sphere new territories, Rhodes worked tirelessly through coercing and cajoling treaties and concessions from the local Ndebele and Shona chiefs in what was then called Zambesia. Early on after arriving in the Cape Colony where he found a resurgent Boer army under Kruger having beaten off a British effort to annex the Transvaal, Rhodes at first kept his feelings to himself because he had a bigger vision of a much bigger and expansive British Empire. But first there were lands to be conquered or somehow brought under British control. These were the territories further north of the Transvaal and Orange Free State in the area that was at that time known as Zambesia. These comprised lands between the south and north of the Zambezi River which would soon after be called Southern and Northern Rhodesia by the white settlers. Despite this strong desire of Rhodes to expand control of more and more territories for the British Empire and hence the need for him to work closely with the local British administration (controlled by the Colonial Office in London), he never-the-less wanted the control of local matters be exercised by the settlers and politicians like himself. It is quite clear that the Rhodes' scheme for the expansion of the British Empire was intended to be carried out through surreptitious ways given that it was to be actualized secretly and in ways designed to be unnoticeable by the ordinary people.

To start with, the plan required the influencing of people without them realizing that they were being fed with information prepared in advance to make them see things in the way of those behind the scheme. Passionately believing in the virtues of British values, culture and ideals, he wanted to spread these far and wide especially to the African natives whom he considered to be like children. At the same time, he was always on the lookout for commercial opportunities that would become available particularly from mining of gold and diamonds in the hinterlands of southern Africa (Green, 1936). Key British writers and scholars, supporters of British empire, agreed that the British system of empire was the best that human beings had developed up to that point in history. Arguments that it's 'civilising' character gave birth first to the League of Nations and later to the United Nations. Better than others notably the German Reich of the time.

Conclusion

We see the lowly beginnings of Cecil Rhodes as a sickly young Englishman shipped to Natal to join his elder brother Herbert, a cotton farmer, and his meteoric acquisition of wealth after moving to Kimberley. In a short period, he become very rich through gold and diamond mining with financing of the Rothschild bank and other London financiers. In the midst of expanding his diamond mining business, he enrolls as a student in Oxford University in 1873 determined to secure a degree, an endeavor that takes about seven years to attain his bachelor's qualification. He enter politics after winning the Barkley West constituency in the Cape Colony. Later he became the Prime Minister of the Colony. In a series of wills before his death in 1902, he bequeathed the entire wealth to the realization of a global British-controlled empire that that he hoped would regain the United States of America. His plans were to utilise the two vehicles for the achievement of this grand idea namely the Rhodes Scholarships and the Round Table Movement. His singular purpose in life was the expansion of the British Empire by whatever means as was fond of asserting to friends and the realization of a world-wide British empire. As Prime Minister of the Cape Colony, he trampled upon African land and voting rights in the Cape Colony.

At the period when he was attending Oxford University, Rhodes appears to have metamorphosed to embrace extreme views of the urgency and right of the British Empire to rule the entire world and also about his own love relationships. From the literature, it is apparent that he came under strong influence of at least one of his lecturers in Oxford, Professor John Ruskin, and also the ideas he gleaned from writings by Marcus Aurelius, Winwood Reade, and other classics, influenced and shaped his thoughts and views about life, love and spirituality.

His critics have accused Rhodes of using unscrupulous methods of wealth acquisition and land concessionary rights to control Ndebele and Shona lands. Lands from Shona and the Ndebele renamed Rhodesia after himself. Rhodes never married but had close relationships with many young men among whom were Hawkins, then Pickering whom it seems was very close to him and the Band of Twelve. Later he also was lose to General Gordon of Khartoum who wrote him several revealing love letters.

REFERENCES

Boddy-Evans, Alistair, (2017). The Origins of Apartheid in South Africa. https://www.thoughtco.com/when-did-apartheid-start-south-afric-43460

Black, E. (2013).

Chandler, D. (2009). Hollow hegemony: Rethinking global politics, power and resistance. London: Pluto Press.

Cloete, S. (1972). A Victorian son: an autobiography, 1897-1922 (Vol. 1). Collins Publishers.

Cotton, James, (2019) Sir Alfred Zimmern lectures Australia, 1938: a utopian on Munich, Cambridge Review of International Affairs, DOI: 10.1080/09557571.2018.1549020

Cotton, 2011;

Ross, 1938;

Round Table, 1938;

Hodson, 1939

D'Souza, Dinesh, 2017; The Big Lie: Exposing the NAZI Roots of the American Left

Dowden, Richard. (17th April 1994). Article in the Independent titled "Apartheid: made in Britain". https://en.wikipedia.org/wiki/cecil-rhodes. Downloaded 17/2/18

Green, J. E. S. (1936). *Rhodes goes north*. G. Bell and Sons, Limited.

John 8: 31-32: New World Translation Bible.

Quigley, Carroll. (1968). The Anglo-American Establishment

Hannan, Ed, (2018). Garbage in, Garbage Out: Tech Journalism, False News and the Russia Threat Narrative. Downloaded 14/2/18

Hargreaves, J.D., (1957). Winwood Reade and the Discovery of Africa, pp. 306-312

Hobson, J. M. (2012). The Eurocentric conception of world politics: Western international theory, 1760-2010. Cambridge University Press.

Hobson, J. A. (2013). Towards International Government (Routledge Revivals). Routledge.

Hobson, J. A. (1916). Towards International Government. London, Allen.

Martin, R. (1968). Fabian freeway: High road to socialism in the U.S.A. Santa Monica, Calif: Fidelis.

O'Neil, S. J. (1986). The origins and development of the Fabian Society, 1884-1900.

Maylam, Paul. (2005). The Cult of Rhodes: Remembering an Imperialist in Africa. New Africa Books.

Maylam, P. (2005). Rhodes University: Colonialism, Segregation and Apartheid, 1904-1970. *African Sociological Review 9*(1), 14-22.

Peatling, G. K. (2004). Globalism, hegemonism and British power: JA Hobson and Alfred Zimmern reconsidered. *History*, *89*(295), 381-398.

Lentin, A. (1984). Lloyd George, Woodrow Wilson and the guilt of Germany: an essay in the pre-history of appeasement (p. 107). Leicester: Leicester University Press.

Flint, J. (2009). *Cecil Rhodes*. Little, Brown.

Lentin, A. (1984). Lloyd George, Woodrow Wilson and the guilt of Germany: an essay in the pre-history of appeasement (p. 107). Leicester: Leicester University Press.

Martin, R. L. (1966). Fabian freeway: high road to socialism in the USA, 1884-1966. Western Islands.

Mikusch, D. V. (1931). Mustqapha Kemal Between Europe and Asia.

Stuart Cleote,

South Africa History Online downloaded 13/2/19

Daniel Gorman, Lionel Curtis, Imperial Citizenship, and the Quest for Unity (2004). The Historian Jostor-Downloaded 13/2/19

Millin, Sarah Gertrude. (1936). The night is long

Millin, S.G., (1933). Rhodes: The Night is Long

Moravcsik, Andrew, (2010). Liberal Theories of International Relations: A Primer

Ratiu Ioan, (2012). The Milner-Fabian Conspiracy

Rhodes, J. C., (1875); Confession of Faith

Quigley, C. (1981). Tragedy and Hope: A History of the World in Our Time (G, S, G, & Associates, 1975);

Quigley, C., (1967). The Anglo-American Establishment. *GSG Associates publishers*, *1*(9), 8.

Mazower, M. (2013). Governing the world: The history of an idea, 1815 to the present. Penguin Group USA.

Marrs, J. (2001). Rule by Secrecy: The Hidden History That Connects the Trilateral Commission, the Freemasons, and the Great Pyramids Paperback

Monteith, (2000); Brotherhood of Darkness

Martin, R. (1968). *Fabian freeway: High road to socialism in the U.S.A.* Santa Monica, Calif: Fidelis.

Peatling, G. K. (2004). Globalism, hegemonism and British power: JA Hobson and Alfred Zimmern reconsidered. *History*, *89*(295), 381-398.

Rotberg, R. I. (1988). *The founder: Cecil Rhodes and the pursuit of power*. Oxford University Press, USA.

South African History: http://www.sahistory.org.za/article/role-cecil-john-rhodes-british-south-african-company-conquest-matabeleland

Rich, P. (2002). Reinventing Peace: David Davies, Alfred Zimmern and Liberal Internationalism in Interwar Britain. International Relations, 16(1), 117–133. https://doi.org/10.1177/0047117802016001008

The Boer War: https://www.thoughtco.com/the-boer-war-1779180. Downloaded 5/2/18

The Bilderberg Group and the Roundtable. http://ww.bilderberg.org/roundtable/histmilner.html

Woodson, C. G. (1937). Rhodes Goes North.

Spengler, Oswold, 1916. The Decline of the West. Translated by Charles Francis Atkinson.

Hargreaves J.D., African Affairs, Vol.56, No.225 (Oct. 1957), pp.306-316.

J.E. Green, (1936)

Verschoyle, F. (1900). Cecil Rhodes: His Political Life and Speeches, 1881-1900. G. Bell.

Rotberg, R. I. (1988). The founder: Cecil Rhodes and the pursuit of power. Oxford University Press, USA.

Rich, P. (2002). Reinventing Peace: David Davies, Alfred Zimmern and Liberal Internationalism in Interwar Britain. International Relations, 16(1), 117–133. https://doi.org/10.1177/0047117802016001008

Weiss, T. G., & Wilkinson, R. (2014). Rethinking global governance? Complexity, authority, power, change. *International Studies Quarterly*, *58*(1), 207-215.

Walker, G. (2016): 'So Much to Do': Oxford and the Wills of Cecil Rhodes, The Journal of Imperial and Commonwealth History, 44:4, 697-716, DOI: 10.1080/03086534.2016.1211295

Ziegler, Philip, (2008). Legacy: Cecil Rhodes, the Rhodes Trust and Rhodes Scholarships

Ziegler, P. (2008). *Legacy: Cecil Rhodes, the Rhodes Trust and Rhodes Scholarships*. Yale University Press.

Zimmern, E., A. (1916). Nationality and Government. The Sociological Review, a8(4), 213–233. https://doi.org/10.1111/j.1467-954X.1915.tb02834.x

Zimmern, A. (1936). The League of Nations and the rule of law, 1918-1935.

The Place of an Applied Linguist in Actualising the Big Four Agenda

Author: Fellis N. Mutune

Affiliation: PhD Candidate Machakos University

Postal Address 2530-990100, Machakos

Email: senseimutune@yahoo.com

Mobile no: 0721-585913

Oral Presentation

Abstaract

The Big Four Agenda, hereafter BFA, is a four-point agenda initiated by His Excellency President Uhuru Kenyatta, the President of Kenya, which outlines his focus in his final Presidential term. The BFA is geared towards improving the living standards of all Kenyans regardless of their social status; grow the economy and leave a long-lasting legacy. The items in the BFA are; manufacturing, food security, affordable housing and universal healthcare. The skills and expertise of all professionals and the government are essential in the actualisation of the Big Four Agenda. All Kenyans should be proactively involved in realising the vision of the president and his government. Applied linguists may think that they are just spectators in the four-point Agenda, but that is not the case. It is important to note that language is a roadmap in the realisation of national development. An applied linguist, therefore, has a role to play since there maybe linguistics problems that if not solved, may hinder the actualisation of the BFA. This means that applied linguists are part of the solution to both local and the global challenges which may stand in the way of actualising the Big Four Agenda. This paper strives to shed some light on the role of the applied linguist in the actualisation of the BFA. Secondly, the article highlights some areas that an applied linguist may research on, which are directly tied to the realisation of the Big Four Agenda. Further, the article compounds the crucial skills that a current (21st Century) applied linguist should have to participate in the realisation of the Big Four Agenda actively. It is hoped that this paper will impact to a large extent on Linguists who may be harbouring the notion that they are just spectators in the ongoing conversation on how best and timely the Big Four Agenda can be made a reality.

Keywords: The Big Four Agenda, applied linguist, actualise, Final Presidential term, 21st applied linguist, Kenyans

1.0 Background Information

Applied linguistics as a discipline is often said to be concerned with solving or at least resolving social problems involving language. Many scholars, writers and researchers have alluded that the urge should drive applied linguists to find solutions to the societal linguistic issues. McCarthy (2001) notes that applied linguistics is essentially a problem-driven discipline rather than a

theory-driven one. This observation implies that the discipline should offer practical solutions to the problems which are faced by business people and professionals whose work involves language. According to him applied linguistics should provide insights and ways forward in resolving contextualised language-related issues. Brumfit (1991:46) points out that applied linguistics should offer solutions to real-world problems in which language is a central issue. Further, Widdowson (1998, 2000, 2004, 2005) advances that applied linguistics is a mediating field or domain of theoretical plane of linguistics and language. He implies that knowledge on the one hand and its applications to problems that arise in several real-world settings. Accordingly, an applied linguist should strive to use the acquired knowledge to solve these problems. Further, research points out that applied linguistics can deal with complex and multi-faceted issues. From the ongoing discussion, it is clear that wherever there are linguistic problems, applied linguistic expertise is required.

Currently, Kenyans are looking forward to the realisation of the BFA. Writers and scholars have had their voice on how best the BFA can be realised. Gichuga (2019) notes that the big four Agenda needs more participants for fast-tracking. According to him, the general public and the upper house (parliament) and lower house (Senate) should strive to support the Big four Agenda. Bankelele (2018) points out that every speech should be channelled towards the realisation of the BFA. Ndemo (2018) gives some insights into how the BFA can be implemented without increasing the tax. He opines that the actualisation of manufacturing and food security requires the goodwill and policy support of the national and county governments. He further notes that 'Biometrically identifying Kenyans can achieve universal Healthcare' while the removal of the middlemen can realise food security. Kamene, B. Ombisi B, Andabwa, T. Mutinda, F. and Ibrahim, A (2019) note that students' role in enabling the government to achieve the Big Four Agenda is to participate in Public Policymaking debates and discussions to come up with different options. As an applied linguist, I wish to be part of the ongoing debate by being part of actualising the BFA. It is important to note that as scholars and researchers, applied linguists should not only be spectators but should be part of the team that will facilitate the actualisation of the BFA.

2.0 The Role of an applied Linguist

Applied linguists may think that they are just spectators in the four-point Agenda, but that is not the case. Language is a roadmap in the realisation of national development. An applied linguist, therefore, has a role to play since there maybe linguistics problems that if not solved, may hinder the actualisation of the BFA. This revelation means that applied linguists are part of the solution to both local and the global linguistic challenges which may stand in the way of actualising the Big Four Agenda.

The section of this paper highlights what an applied linguist can do to be part of the professionals who are involved in the realisation of the big four agenda. The role of an applied linguist would be;

To advocate for the use of an inclusive language, especially when leaders are commenting on BFA in terms of making speeches or statements. This inclusivity can be achieved by the use of the first person subjective plural 'we' and first person objective 'us'. By doing so, all Kenyans will feel part and parcel of the group which would be in the forefront in implementing the BFA. Again, inclusivity can be achieved by using gender-neutral pronouns. Earlier it has been noted that all Kenyans should be involved.

Applied linguists should agitate for the use of gender-sensitive language when issues around BFA are being discussed or commented. Initially, the word 'man' was used to refer to both male and female, but today people must think more carefully in as far as how they apply to express gender to convey their ideas clearly and accurately to their readers or listeners. The gender inclusivity can be achieved by use gendered nouns, alternating genders and pronouns, use of s/he or use of the pronouns we or they. It is important to note that gender-based discrimination starts with language for regular use of gender-biased terminology influences attitudes and expectations and could relegate women to the background or support the stereotyped view of women and roles that many plays. Both males and females have a role to play, and therefore, none should be left out in the discourse around the actualisation of the big four agenda.

Applied linguists should advocate for the use of language that pacifies all the communities in Kenya. Language can brew conflicts, especially when one community feels threatened by another. Article 33(2) subsection d of the constitution states that the right to freedom of expression which does not extend to the advocacy of hatred that constitutes ethnic incitement, the vilification of others or cause harm or is based on any ground of discrimination gender. Further, the National Cohesion and integration commission defines hate speech as 'use of threatening, abusive or insulting words or behavior, displaying of any written, publishing or distribution of written material, presentation or directing the performance of the public performance of a play, distributing, showing or playing a recording or providing or leading a programme that involves the use of abusive language. The threats are packaged in different forms and play a crucial role in resolving such issues which may bring both the disharmony. The BFA cannot be actualised if there are two warring sides.

Applied linguists can also be consultants to different professionals who in one way or another are involved in the actualisation of the BFA. The applied linguist role in this sense would be to voice out their contributions based on their interpretation of the given situation. The consultee is now free to weigh on his own all the contributions provided by the applied linguist and make a decision on the best way out. In achieving the BFA, an applied linguist can be consulted by a site engineer who has noted language barriers between the engineers and the casuals who are involved in constructing houses in Mavoko, Machakos County as proposed in this Agenda. The applied linguist may have different contribution such as; hiring interpreters who are well versed with the languages involved or even introducing the use of sign language. At this point, the site engineer will now consider the two options and decide on the best option.

Again, an applied linguist may take a significant role as an advisor to the cabinet secretaries of the different sectors which are directly involved in the realisation of the BFA. The applied linguist can play this role behind the scenes. Cook (2009) notes that the European Hugo Baetens Beardsmore's work on bilingualism largely shapes the dimension of bilingualism taken in Europe though he has had little impact on public debate or decision-making for most language problems. This example portrays that an applied linguist can impact on resolving related linguistic issues without necessarily publicising his or her role. Therefore, applied linguists should take centre stage in contributing their expertise to the ongoing debate of how best to realise the BFA.

2.0 Skills of the 21ST Century Applied Linguist

An applied linguist in the 21st century should possess the following necessary skills for him or her to remain relevant in the field of applied linguistics and also contribute accordingly in the realisation of the BFA.

First and foremost, the 21st applied linguists should have collaborative skills; that is, they should be in a position to collaborate with others. This means that they should be in a place to work in teams. There are times when the applied linguist will be required to work closely with an economist, an agriculturist, a doctor, a lawyer or even a statistician. In case of issues about healthcare, an applied linguist will need to collaborate with other professionals such as psychologists, the doctors, ICT technical teams, clinical sociologists among others to carry out collaborative research to clearly understand the problems and how best to resolve the issues.

The collaboration skills will enable the applied linguist to work productively on a team and integrate individual expertise and ideas into a coherent solution. This way, it means that there will be strong work relations with others. Grabe (2010) advances that the 21st century applied linguist will direct more attention to issues of motivation, attitudes and affective since all these potentially influence a lot of language-based problems. This skill is essential for an applied linguist who would wish to partner with other professionals and experts in actualising the BFA. Most linguistic issues are multi-faceted, and therefore, they require multidisciplinary approaches to solve them.

Further, applied linguistics will remain interdisciplinary, and therefore, an applied linguist should be knowledgeable in other disciplines which in one way or another inform the issues of interest. This stance is vital since 'the resolution of language-based problems in the real world is a complex, dynamic and complicated process. In this regard, for applied linguists to offer any substantial solutions to the linguistic issues which may hinder the realisation of BFA, there are aspects of other disciplines which should be of interest an applied linguist. Clinical linguistics, for example, is the application of linguistic concepts, theories and methods in clinical situations. In this example for an applied linguist to contribute immensely to realisation of the universal healthcare, he or she should know the issues of disorders which may hinder proper communication and even policies governing the patient-doctor relationship, patient confidentiality among others. All these issues could be impediments to harnessing of universal healthcare, which is among the BFA.

Forensic linguistics, which is the application of linguistics knowledge, methods and insights in the context of law is another subfield of Linguistics whose principles can be significant in the actualising of the BFA. For the realisation of the BFA, all Kenyans should be at peace. In case of any warring communities, an applied linguist can come in handy to interpret the language of the law, could question the interrogation process and also analyse the written statements. This process can be done to ensure that peace prevails by resolving the issues justly.

Again, the applied linguist should be in a position to integrate technology (ICT) in addressing the language-related concern in society. This is facilitated by coming up with new ideas and also displaying an understanding through interpreting, analysing, synthesising or evaluating situations. The 21st applied linguist should incorporate ICT in their research as a way of supporting knowledge construction. ICT, in this case, includes a full range of available digital tools. These include both hardware (e.g. tablets, computers, e-reader, Smartphone) and software

(including engineering applications, internet browser and multimedia development). ICT is an essential tool for it promotes and supports a wide range of 21st-century skills. An applied linguist should, therefore, integrate ICT in addressing language-related concerns in society. Stuart (2013), notes that ICT facilitates the analysis of millions of words automatically and enhances efficiency and accuracy. This fact underscores the fact that armed with the necessary ICT skills; an applied linguist can analyse data from a large corpus with ease, accuracy and efficiency. With the ICT skills, an applied linguist will be in a position to monitor the notions that Kenyans have towards the BFA. This may, in turn, inform research areas that applied linguists can undertake to assist in the actualisation of the same.

Moreover, the 21st century applied linguist should possess excellent written communication skills. This skill is of considerable significance to the applied linguist for he/she will be involved in research and should make the findings known. The research work is generally in the form of a thesis or project. This situation calls for the linguist to be in a position to present the findings understandably so that the beneficiaries of the research get them accordingly. If the applied linguist lacks this skill, then it will be difficult for him/her to disseminate the research findings as expected.

Further, any scholar should be in a position to participate in knowledge extension and creation. An applied linguist is also a scholar in the world of academia; this is harnessed by undertaking research. This assertion means that a scholar should participate in problem-solving by using data or situations from the real world. Therefore, an applied linguist should be able to conduct research and learn about issues and concepts. The study should be aimed at solving real societal problems and also extending knowledge.

Additionally, the 21st century applied linguist should possess critical thinking skills. The essential skills will enable him/her to be sceptical. The fundamental skills are vital in undertaking a literature review. The literature review is itself a critical look at the existing research that is significant to the work that the investigation is carrying out. The essential skills enable the researcher to see the link between what they are doing and what others have done. The critical skills will also allow the linguist to assess the strengths and weaknesses of existing research. This way, the applied linguistics researcher can create a niche in their area of interest. The critical thinking skills will enable the applied linguist to choose which of the four areas highlighted in the BFA can research on and impact positively to the realisation of the big four points.

3.0 Areas of interest for an applied linguist per item of the BFA

The Big Four Agenda is grounded on food security, affordable housing, manufacturing and universal healthcare. His Excellency Uhuru Kenyatta articulated the BFA during Jamhuri Day's celebrations on 12th December 2017.

3.1 Food security

The Global Food Security index, hereafter GFSI, of 2018 ranked Kenya position 77 out of 119 countries. According to GFSI, Kenya is still food insecure for it has dangerous levels of hunger experienced in different parts of the country. Chepkwony (2018) notes that the 2018 ranking by GFSI is a challenge to the government, given that food security is among the issues in the BFA. To achieve food security and proper nutrition for all Kenyans, the government targets to increase

the production of maize from 40 million 90 kg bags annually to 61 million bags by 2022, rice around 125,000 metric tonnes currently to 400,000 metric tonnes by 2022 and potatoes from the current 1.6 million tonnes to about 2.5 million by 2022. The government plans to achieve food security by providing fertiliser, crop insurance, crop diversification, mechanisation of agricultural development and fall armyworm mitigation. An applied linguist could translate the master plan that shows how the government intends to achieve this item of BFA into a language that can be understood by all since the issues to be addressed are designed to benefit all. The farmers are vital in ensuring that Kenya is food secure. The language that is used for packaging this information should be understandable to the farmers. An applied linguist can translate the instructions on how to use the inputs, more so the fertilisers and the necessary chemicals that can mitigate the armyworm. Once the farmers get and interpret the instructions accurately, the outputs will increase, holding all the other variants constant.

3.2 Universal healthcare

The Principal Secretary in charge of research Prof. Hamadi Boga noted that the conversation between policymakers and researchers is very crucial so that research is sustained and policy informs the study and vice versa. The government intends to achieve 100 per cent health coverage for every Kenyan. Universal health coverage is essential in addressing our additional challenges and will go a long way in making the core principal of the Vision 2030 Agenda; that is, the realisation of a society where "no one is left behind". To realise this, the government intends to review the rules governing private insurances to bring the cost of cover within the rich of every Kenya. "Universal" means all are factored on board regardless of their social-educational status.

An applied linguist can fast track the realisation of universal healthcare as dictated in the BFA by following closely on the discourse that goes between the medical practitioner and the service seeker. Sometimes, the medic and the patient may not be of the same linguistic orientation. Effective communication between the service provider and the patient is critical for proper diagnosis and treatment. Any linguistic barrier may lead to misdiagnosis and lack of appropriate prescription. Again the prescription should be in a language that the patient can easily understand for healthcare to be meaningful to him/her.

An applied linguist should get concerned to question how effective communication is achieved if the health practitioner and patient do not share that same language. If for instance, the way to facilitate effective communication is to involve an interpreter, how is confidentiality maintained? Again how is the interpretation made to ensure the health practitioner effectively communicates? Other areas of interest would be; to find out how the Cuban doctors are overcoming the language barriers encountered, especially when interacting with the locals who are not competent in English.

3.3 Affordable housing

The government aims at constructing 500,000 homes in five lots in the next four years. This plan would be achieved by bringing County governments on board and empowering housing associations. Provision of affordable housing is in line with article 43 of Chapter four of the Constitution, which states that 'every person has a right to accessible and adequate housing to reasonable standards of sanitation. This article assures every person in Kenya the right to appropriate and available housing and equitable standards f sanitation. For us, as a country to

achieve affordable housing, construction companies will be brought on board. For the companies to work efficiently, to reduce risks, to make full disclosure in terms of communication and strengthen long-lasting relations, the information should flow freely. An applied linguist can investigate the communication barriers in the construction sites and means of resolving them.

Again, there are times when the professionals (engineers, among others) know, but they lack a proper way of communicating. An applied linguist can work closely with such experts and help them package the knowledge in an understandable way some construction companies may have internationally faced, and there might be a language barrier. To resolve these challenge interpreters will be required to come on board. In such a time, there are applied linguists who have mastery of translation and interpretation. Further, an applied linguist can carry out a study on problems of reading and how such issues can be resolved. Another area which could be of interest to an applied linguist is the interpersonal communication among the experts and workers at the site and whether that could be a hindrance to completing the housing projects accordingly.

Further, an applied linguist can partner with the other stakeholders in coming up with a housing policy which would make the Kenyans support the Agenda. Many Kenyans are not aware of how the government intends to achieve affordable housing. In the same way, an applied linguist would be very instrumental in ensuring that the housing policy is in languages that all Kenyans understand. This situation would call for the translation of such a plan into other languages. Again, the translation will need to be done in such a way that meaning is not compromised. To achieve proper communication, professional translators will be required. This scenario squarely calls for an applied linguist for interpretation and translation is a field in applied linguistics.

3.4 Enhance manufacturing

On this Agenda, the government aims to raise the share of the manufacturing sector from nine to fifteen per cent of the Gross Domestic Product (GDP) by 2022. This development will facilitate the creation of 1.3 million manufacturing jobs by 2022. This Agenda is aligned to four sub-sectors, which include the blue economy, leather and textiles industries and Agro-processing. Again, political stability and harmonious labour relations are the bedrock in boosting the manufacturing industries. This item is linked to Sustainable Development goal number nine, which is on building resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation. Any innovation of a new product has to be done in the language. An applied linguist could research how the manufacturers use a word to reach out to as many potential consumers as possible.

Again scientists should partner with applied linguists, especially when they make discoveries to use language effectively to communicate with them. It is important to note that vocabulary can grow with growth in science and technology. In enhancing manufacturing, there is value addition component, especially of agricultural produce. The farmers need to be talked to in a convincing language to fully embrace adding value to their products before selling them off. Again, the user manuals that come with manufactured products should be done in a style that the users or consumers easily can understand. Applied linguists can focus into the afore issues and do a critical discourse analysis of the conversations those who are mandated to get to the farmers and explain the government's intentions in as far as enhanced manufacturing is concerned how effective it's done.

Conclusion

All Kenyans, regardless of their social class, educational level, age, sex, tribe, political affiliation and religious ideologies, should be brought on board to fast track the realisation of the BFA. For the achievement of the BFA at the scheduled time, necessary policies should be put in place and communicated accordingly to the involved policy actors and stakeholders. Proper media should be used to reach all the concerned for the prompt delivery of information and action. All professionals should come together and devise ways of realising the BFA for all have a role to play. The applied linguists are still part of the debate since their voice and expertise is fundamental in the realisation of the BFA. The applied linguists can do this by collaborating with scholars and researchers from other disciplines to come up with realistic solutions for the problems which may hinder the prompt realisation of the BFA. Thus, applied linguists are part and parcel of the solution to any linguistic issues which may derail the process of actualising of the BFA.

REFERENCES

Cook, V. (2009). Applied linguistics and language teaching in the 21st century in Introduction to Contemporary Applied Linguistics by Vivian Cook and Li Wei (eds.)

Brumfit, C. J. (1995). 'Teacher professionalism and research', in G. Cook and B. Seidlhofer (eds.) Principle and Practice in Applied Linguistics. Oxford: Oxford University Press.

Dornyei, Z. (2007). Research Methods in Applied Linguistics. Oxford: Oxford University Press.

Harmer, J. (2007). The Practice of English Language Teaching. 4th edition.

Harlow: Longman.

Harris, M. (1997). Reference Guide to Grammar and Usage. 3rd Ed. Upper Saddle River, NJ Prentice Hall.

McCarthy, M. (2001). Issues in applied linguistics. Press Syndicate of the University of Cambridge.

Rivers, W.M. (1964). The Psychologist and the Foreign Language Teacher. Chicago University Press.

Ur, P. (1996). A Course in Language Teaching. Cambridge: Cambridge University Press

How much does labour turnover cost? A case study of Kenyan Small and Medium Tour Operators

Dr. Angeline Wambui Wambugu

Management University of Africa

P.O. Box 44 – 00502 Nairobi

Email: angiekinuthia@yahoo.com

Telephone/Mobile No. 0720754262

Abstract

The hospitality industry is a service-based industry, which is highly dependent on a customer-focused approach, and a motivated and knowledgeable workforce. Any shift in human capital therefore is viewed as detrimental as its long term success. Research postulates that employee mobility is a major cost and leakage of human capital. In addition, studies have shown that labour turnover affects organizational performance, customer quality and employee productivity. Despite the adverse effect of labour turnover on growth, survival and sustainability of organizations in the hospitality industry, there is limited research on turnover costs. This paper provides an understanding of the turnover rates and direct financial costs of labour turnover in small and medium tour operators. A descriptive research design was used. Primary data was collected using a self- administered questionnaire. Stratified sampling and simple random sampling technique were used to select 30 respondents. The target populations comprised of human resource managers and owner/managers of small and medium tour operators, which are registered with the Kenya Association of Tour Operators and operating in Nairobi and its environs. The study findings indicated that tour operators experienced acute turnover rates, which are much higher than the average turnover rate in service industries. The study findings also revealed substantial replacement costs are attributed to labour turnover in small and medium tour operators. The implications of these findings for managerial practice and suggestions for further research are discussed.

Keywords:- Labour turnover, turnover costs, tour operators, SMEs, Kenya

Introduction

The hospitality industry is a service-based industry, which is highly dependent on a customer-focused approach, and a motivated and knowledgeable workforce (Choi & Dickson, 2009). The

industry relies heavily on employees in order to achieve its competitive advantage, and any shift in human capital can be detrimental as its long term success (Ton & Huckman, 2008; Chand & Katou, 2007; Harris, Tang & Tseng, 2002). Research studies suggest that a certain amount of labour turnover is necessary, however an excessive turnover is considered a hindrance to competitiveness and efficiency (Long, Perumal & Ajagbe, 2012). Sut and Chad (2011) found that labour turnover increases economic losses and reduces job efficiency. A study by Deery and Iverson (1996) suggests that labour turnover reduces organizational effectiveness and productivity due to loss of valuable skills, experience, knowledge and "corporate memory". Furthermore, labour turnover compromises the quality and high standards of customer service, which negatively impacts on an organization's profitability and long term sustainability (Tracey & Hinkin, 2008).

Hospitality Industry in Kenya

The Kenyan hospitality industry is a bustling industry comprised of various private and public players in various sub-sectors, which ensure that tourists' needs are catered to in a holistic manner. These sub-sectors include: food and beverage services, transportation, accommodation (hotels), tourist attractions and luxury services. All these sectors are connected by the tour operators and travel agents (Bennett & Schoeman, 2005). Thus, tour operators play an important role in the hospitality industry as they influence tourist flows to Kenya from different destinations (Saffery, Morgan, Tulga & Warren, 2007). The main tasks of tour operators include: negotiation of rates with suppliers, booking accommodation for tourist, assisting in itinerary planning and providing local tour services (Bennett & Schoeman, 2005). Tour operators in Kenya are classified according to their owners, that is, foreign owned, locally owned by Kenyans of foreign origins and locally owned by indigenous entrepreneurs. Majority of the tour organizations are SMEs, earning less than $140,000 per annum (UNCTAD, 2008).

The hospitality industry has experienced significant growth since independence. In 2009, the industry recorded the highest growth rate of 18.6% (ROK, 2009).The continued growth of the hospitality industry is attributed to strong participation and encouragement in commercial ventures, pursuit of policy objectives and attention to non-economic ramifications of tourism and the innovations in major source markets by individual tour operators (Dieke, 1992). Various policy initiatives have been formulated in an effort to actualize flagship projects under Vision 2030. Vision 2030 identifies the hospitality industry as one of the top priority sectors with the tasks of making Kenya one of the top ten long-haul tourist destinations globally (ROK, 2008). Apart from developing the Sessional Paper No. 1 of 2010 on Enhancing Sustainable Tourism in Kenya, the Kenyan government has also developed the Tourism Act 2011 which provides for development, management, marketing and regulation of sustainable tourism and tourism related services.

Statement of the Problem

The National Tourism Strategy 2013 -2018 posits that the hospitality industry which is dominated by SMEs experiences acute labour turnover (ROK, 2013). If high labour turnover is

allowed to continue, it will negatively impact SMEs through loss of highly skilled workforce, and ultimately widespread skill gaps among existing staff (Kuria, Wanderi & Ondigi, 2011). This not only results in additional direct and intangible costs for the employer, but also negatively affects the service quality, reputation and the long term survival of SMEs in the hospitality industry (Wafula, Ondari & Lumumba, 2017). The critical shortage of high qualified staff resulting from high labour turnover has prompted considerable research on the causes of high labour turnover and possible solutions for retaining skilled workers (Kuria & Ondigi, 2012).

Cheruiyot, Kimutai and Kemboi (2017) on the effects of employee engagement factors on staff turnover in the Hospitality industry found that organizational justice, leadership and high performance work practices affected employee turnover in hotels within Uasin Gishu County. Korir (2018) in her study on the expected outcome of human resource practices on labour turnover in restaurants in Kenya found that human resources practices (recruitment procedures, promotion and career development, training and development, rewards and benefits, management culture) and socio-demographic factors (age, gender, marital status and level of education) affect labour turnover. Kuria and Ondigi (2012) in a study on assessment of causes of labour turnover in three and five star rated hotels in Kenya found that lack of work-life balance, lack of staff involvement in decision making and creativity, increases of pay in other industries, strong local and regional economy as well as low unemployment on regional economies. Studies on labour turnover amongst tour operators and SMEs are limited (Cavagnaro, Staffieri & Ngesa, 2015; Kim, 2012; Gamage, 2014) and most of these studies in the hospitality industry have been conducted in the accommodation sector, that is, hotels, resorts and restaurants (Hinkin & Tracey, 2006; Derry and Iverson, 1996; Wasmuth & Davis, 1983; Kuria, Ondigi & Wanderi, 2012).

The purpose of this study was therefore to establish the direct costs of labour turnover amongst small and medium tour operators in Kenya. The findings of this study will be critical in shaping HRM practices and the management of labour retention in the hospitality industry. The research findings will also contribute to the development of a policy agenda of the tour and travel operators and the overall Kenyan hospitality industry.

Specific Objectives of the Study

The specific objectives of this study were to:

Assess the extent of labour turnover rate in small and medium tour operators in Kenya.

Establish the direct costs of labour turnover in small and medium tour operators in Kenya.

Concept of Labour Turnover

Labour turnover is defined as "the movement of people into and out of employment within an organization" (Denvir & McMahon, 1992). Labour turnover refers to the proportion of employees who leave an organization over a set period, expressed as a percentage of total

workforce numbers (CIPD, 2014). The term " turnover" is defined by Price (1977) as the ratio of the number of organizational members who have left during the period in consideration divided by the average number of people in that organization during the period. A zero percent labour turnover rate in any industry is rare, and it should not be the priority of management (Reigel, 1995). Researchers argue that regardless of good retention strategies, organizations cannot retain 'all their employees, all the time' due to death, ill health, changes in an employee's personal circumstances or for other reasons that have little to do with the employer organization. However, a high labour turnover may be detrimental to the survival and long term sustainability of an organization (Armstrong, 2009).

Labour turnover in the hospitality industry is mainly voluntary where employees leave employment at their will (Wright & Bonett, 2007). Voluntary turnover is either functional or dysfunctional. Functional turnover occurs when non-performers, relatively expensive employees and those with obsolete skills quit the organization. Some level of functional turnover is desirable as it allows organizations to bring in "new blood" with new innovative ideas and knowledge. In addition, labour turnover creates opportunities for career advancement for existing employees as they grow into roles of greater responsibilities. Dysfunctional turnover, on the other hand, represents an exodus of human capital investment from the organizations as it refers to the exit of effective performers, key individuals, innovators and individuals whose skills are difficult to fill with new hires (Walsh & Taylor, 2007).

Labour turnover "culture" in the Hospitality Industry

The hospitality industry is labour intensive, and around the world, the industry is characterized by excessive labour turnover (Birdir, 2002). The industry experiences a disproportionate amount of turnover in part-time employees and management ranks when compared with other service industries (Dipietro & Condly, 2007). For example, management turnover is lower than that of operational employees (Carbery, Garavan, O'Brien & McDonnell, 2003). A study by Gautam (2005) found that the average turnover rate of non-management horel employees in the US was 50% and 25% for management staff. Several studies have investigated labour turnover levels in the hospitality industry. According to the United States Bureau of Labour Statistics (2006), turnover rates in the hospitality industry was 52.2% compared to an average turnover of 23.4% across all other industries. A study by Denvir and McMahon (1992) found that the turnover levels in London hotels showed annual rates up to 200 or 300 per cent per annum depending on location, HR practices and organization culture. Kuria, Odingi and Wanderi (2012) in their study on the assessment of causes of labour turnover in three and five star rated in Kenya found that labour turnover was 68% in three star-rated hotels compared to 13% in five star-rated hotels.

Calculating the Labour Turnover rate

The rate of turnover is a good indicator of the morale of the employees. Mercer (1988) suggested the following formula for calculating the rate of turnover:

$$\text{Fluctuation rate} = \frac{\text{number of leavers during the calculation period}}{\text{Average number of employees}} \times 100$$

Tangible Costs of Labour Turnover

Labour turnover has wide cost ramifications (Davidson, Timo & Wang, 2009). The cost of turnover varies based on complexity of the jobs, experience, skills, location of the organization, employee relations, HR practices and organizational culture (Fair, 1992). Every time an employee leaves and has to be replaced, an organization incurs a number of direct and indirect costs: costs of separation, cost of replacement staffing, hiring costs, lost sales, low employee morale, pressure on remaining staff and loss of social capital (Hinkin & Traacey, 2006; Dess & Shaw, 2001). In addition to these costs, the organization incurs intangible costs associated with productivity costs (Lashley & Chaplain, 1999). Productivity costs are more difficult to quantify and usually accounf for more than two-thirds of the total turnover cost (Hinkin & Tracey, 2008). This study was based on the turnover costs components model adapted from Cascio (2000) modified as shown in Figure 1. The theoretical model distributes the cost of turnover into several categories: costs of the employees leaving the organization, costs of replacement and costs for employee training and development.

Separation costs included administration costs associated with processing resignations, and dismissals, time taken up with conducting exit interviews, severance pay, benefits and gratuities. Recruitment costs constituted the cost of advertising, employment of job search agencies, time and resources spent in processing applications, staff time, travel costs and re-location for successful applicants; training and start-up costs (Cascio, 2000). Selection costs included HR interview, medical examination, applicant's travel, and background or reference checks. Hiring costs included costs of induction, relocation, orientation, training, uniforms, security, information and literature necessary for new applicant. Productivity costs are defined as costs incurred when "the replacement worker has a lower skill level or needs to learn the job in order to reach the level of productivity of the original worker". Literature on the turnover cost reveal that the cost of replacing workers is high, and that it can unambiguously reduce profits if not managed properly (Kersley and Martin, 1997; Denvir & Mcmahon, 1992). Tziner and Birati (1996) found that it costs at least 30 per cent of annual salary to replace a "base level" employee, rising to 150 per cent of annual salary for professional and managers. A study by Abel-Hamid (1989) found that labour turnover can extend a project's cost and duration by as much as 60 per cent. Hinkin and Tracey (2008) found that lost productivity resulting from labour turnover may account for more than two-thirds of the total turnover cost.

Conceptual Framework of Labour Turnover Costs

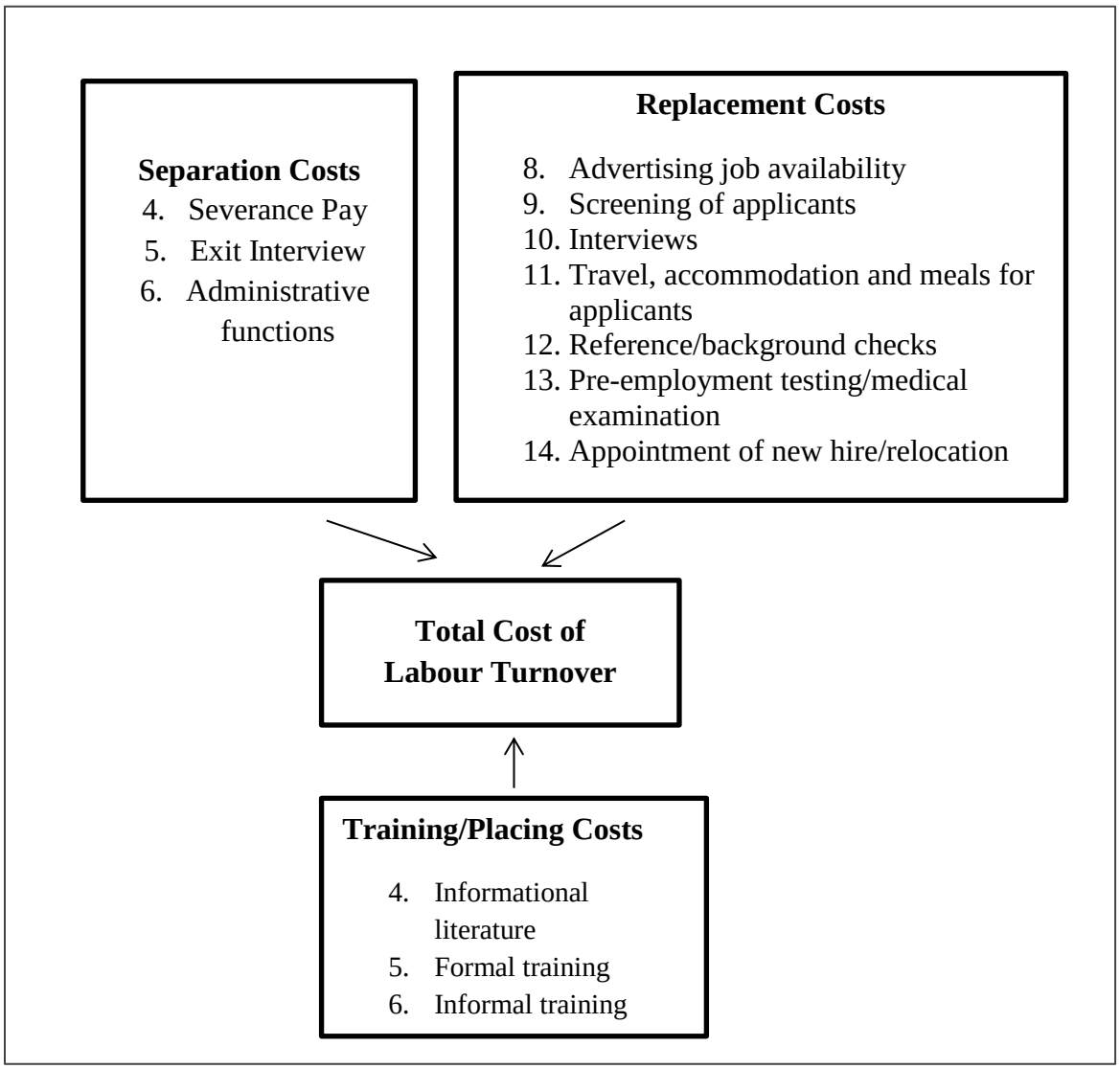


Figure 1: Conceptual Framework. Adapted from Cascio (2000) Costing Model of Employee Turnover

Research Methodology

For purposes of this study, tour operators are defined as intermediaries who organize and put together holiday packages which include: arranging travel services, transport and accommodation booking (Bennett & Schoeman, 2005). The study considered both voluntary turnover and involuntary turnover of employees who left during the period of one year. The study adopted a descriptive research design. The target population included owner/managers and human resource (HR) managers of small and medium tour operators registered with Kenya

Association of Tour Operators (KATO) operating within Nairobi and its environs. Stratified sampling and simple random sampling were used in the study. Stratified sampling was done on the basis of number of employees, that is, small and medium. Simple random sampling was used to select a representative sample of 30 respondents. The sampling frame consisted of 300 tour operators who were active KATO members.

Primary data was collected by means of a self – administered, semi structured questionnaire. The respondents were assured of utmost confidentiality of their responses and anonymity of the source of the information (Kothari, 2004). The questionnaires were pre-tested on 10 enterprises through convenience sampling technique. After the pre-test, any items in the questionnaire that could cause bias were modified or omitted (Mugenda & Mugenda, 2003). The study employed descriptive statistics to analyze the data. Primary data was coded, edited and then analyzed using the Statistical Package for Social Sciences (SPSS) version 20. The findings were presented in form of frequency tables and percentages.

Data Findings and Discussions

Demographic Characteristics of the Respondents

In this study, the data findings indicated that majority of the respondents (67.7%) were male while the minority (33.3%) were female. The majority of the respondents (48.2%) were married, another (37%) were single and yet another 14.8% were divorced. Finally, the majority (33.3%) of the respondents were university degree holders, while 29.6% were diploma holder, another 18.6% were certificate holders while 18.5% were postgraduate degree holders.

Assessment of the labour turnover levels in small and medium tour operators

The study sought to find out the labour turnover rate in small and medium tour operators in Kenya for a period covering 12 months. The study findings revealed that the majority (63%) of the respondents had experienced high levels of labour turnover, while 27% had experienced medium levels of turnover, another 10% had low levels of labour turnover. The study findings also indicated a turnover rate of 66.7% for employees at operational level and a rate of 33.3% for employees at managerial level. The study findings demonstrated that most of the small and medium tour operators in Kenya experienced high labour turnover. In addition, that the turnover rate of employees at operational level was higher than the turnover rate of employees at managerial level. The result is in agreement with the findings in a study by Davidson, Timo and Wang (2009) which found that labour turnover rate of 50.74% in Australian accommodation industry was higher than expected, and that the turnover rate was lower amongst executives, supervisors and departmental managers than in other employment categories.

Employee Turnover Cost Analysis

The study sought to establish the direct costs of the small and medium tour operators within a period of one year. The study findings as shown in Table 1 revealed that replacement costs constituted 57.8% of the total turnover cost compared to separation costs which constituted 22.4% of the total turnover costs. Training costs comprised only 19.8% of the total turnover costs. The study findings showed that the average total cost of turnover was Kshs 57,710,000/=. Finally, the study findings indicate significant difference in two costs: screening and entrance interviewing (17.4%) and formal training (5.2%).

The findings revealed that the average direct cost of labour turnover was substantial which may lead to an increase in administrative costs of small and medium tour operators in Kenya. In addition, the results revealed that small and medium tour operators were spending more money in testing the knowledge, skills and abilities of employees to ensure that a qualified candidate was hired and less money is being invested in formal training of newly hired employees. The study results are inconsistent with the findings of a study by McKinney, Bartlett and Mulvaney (2007) which found that separation costs were higher than replacement costs of employees in Illinois Public Park and recreation offices.

Table 1: **Average cost of replacing employees per annum**

Type	Expense	Costs per annum in KES	Percentage
Replacement costs	Advertisement	6,000,000	10.4
	Screening and entrance interviewing	10, 050,000	17.4
	Interview expenses	4,700,000	8.1
	Reference/background checks	3,450,000	6.0
	Pre-employment testing	5,575,000	9.7
	Appointment procedures for new hires	3,585,000	6.2
Separation costs	Severance pay	5,300,000	9.2
	Exit interview costs	3,400,000	5.9
	Administrative costs	4,200,000	7.3
Training costs	Informative literature	3,600,000	6.2
	Formal training	3,000,000	5.2
	Informal training	4,850,000	8.4
	Total	57,710,000	100

Conclusion and Recommendation

From the study findings, it can be concluded that the overall cost of labour turnover small and medium tour operators is high. It can also be concluded that employees in the operational level are more likely to quit their organizations than employees in the managerial level. Finally, it can

be concluded that high replacement costs are attributed to labour turnover in small and medium tour operators in Kenya. It is recommended that small and medium tour operators need to calculate the costs of labour turnover and deal with wastage levels through reforming internal HR practices.

Suggestions for Further Research

The present study has a number of limitations that need to be addressed in further research studies. First, the study focused on Kenya's small and medium tour operators operating in Nairobi and its environs, which affect generalization of the study findings to other services industries and regions in Kenya. There is need for research in other sectors of the hospitality industry before establishing a general theory on the labour turnover in the hospitality industry. Secondly, whilst this study focused on tangible costs of turnover, there is a need to examine the intangible costs of turnover in further research.

REFERENCES

Armstrong, M. (2009). A handbook of human resource management practices. (11th ed.). London: Kogan Page.

Bartlett, K. R., & McKinney, W. R. (2004). A study of the role of professional development, job attitudes, and turnover among public park and recreation employees. *Journal of Park and Recreation Administration, 22*(4), 62-80.

Bennett, J.A. & Schoeman, L. (2005). *The tourism system and major role-players involved in managing tourism services.* (3rd Ed). Pretoria: Van Schaik Publishers.

Birdir, K. (2002). General manager turnover and root causes. *International Journal of Contemporary Hospitality Management*, *14* (1), 43-47.

Carbery, R., Garavan, T. N., O'Brien, F. & Mc Donnell, J. (2003) Predicting hotel manager turnover cognitions. *Journal of Managerial Psychology, 18(*7), 649-679.

Cavagnaro, E., Staffieri, S., & Ngesa, F. (2015). Looking from a local lens: Inbound tour operators and sustainable tourism in Kenya. *Research in Hospitality Management, 5*(2), 135-145.

Chan, S.H., & Kuok, O.M. (2011). A study of Human resources recruitment, selection, and retention issues in the Hospitality and tourism industry in Macau, *Journal Human Resources in Hospitality & Tourism, 10*(4), 421-441.

Chand, M., & Katou, A. A. (2007). The impact of HRM practices on organizational performance in the Indian hotel industry, *Employee Relations, 29* (6), 576-594.

Chartered Institute of Personnel and Development. (2014). Employee turnover and retention 2014 CIPD, London. (Online)Available from:http://www.cipd.co.uk/hr-resources/factsheets/employee - turnover-retention.aspx (Accessed 27th February 2017)

Cheruiyot, J. K ., Kimutai, G., & Kemboi, A. (2017). Effects of employees engagement factors on staff turnover in the hospitality industry: A survey of rated hotels in Uasin Gishu county. *International Journal of Academic Research and Reflection, 5*(6), 27 -36).

Choi. Y., & Dickson, D. R. (2009). A Case Study into the benefits of management training programs: impacts on hotel employee turnover and satisfaction level, *Journal of Human Resources in Hospitality & Tourism, 9*(1), 103-116.

Cascio, W.F. (2000). *Costing Human Resources*. 4th Ed. Boston: Kent Publishing Company.

Chipunza, C. S. (2009). Employee retention and turnover: Using motivational variables as a panacea. *African Journal of Business Management, 3*(8), 410-415.

Davidson, M.M Timo, N., & Wang, Y. (2009). Putting a cost on labour turnover in the Australian accommodation industry. Proceedings of the 18t CAUTHE Conference. Griffith University. http://hdl.handle.net/10072/31846.

Deery, M. (2002).Labour turnover in international hospitality and tourism in N D'Annunzio – Green, G. Maxwell. *Human resources management: international perspectives in hospitality and tourism continuum.* London.

Deery, M., & Shaw, R. (1999). An investigation of the relationship between employee turnover and organizational culture. *Journal of Hospitality and Tourism Research*, *23*(4), 387-400.

Dess, G. G., & Shaw, J. D. (2001). Voluntary turnover, social capital, and organizational performance. *Academy of Management Review*, *26*(3), 446 – 456.

Denvir, A., & McMahon, F. (1992). "Labour turnover in London hotels and the cost effectiveness of preventative measures", International Journal of Hospitality Management, 11 (2), 143-154.

Korir, J.C. (2018). Expected outcomes of human resource practices on labour turnover in restaurants in Kenya. Kabarak Jouranl of Research & Innovation 30(30), 20 - 35.

Kothari, C. (2004). *Research Methodology; Methods and Techniques*. New Delhi, India: New Age International (P) Ltd.

Kuria, S., Ondigi, A., & Wanderi, P. (2012). Assessment of causes of Labour Turnover in Three and five Star-Rated Hotel in Kenya. *International Journal of Business and Social Science, 3*(15), 311 - 317.

Kuria, S., & Ondigi, A. (2012). Assessment of causes of labour turnover in three and five star rated hotels in Kenya, 3(15) 311 - 318.

Lashley, C., & Chaplain, A. (1999). Labour turnover: hidden problem –hidden costs, *The Hospitality Review*, 1(1), 49-54.

Long, S., Perumal, P., & Ajagbe, M. (2012). The impact of human resource management practices on employees' turnover intention: a conceptual model. *Interdisciplinary Journal of Contemporary Research in Business, 4*(2), 629-641.

McKinney, W. R., Bartlett, K. R., & Mulvaney, M. A. (2007). Measuring the costs of employee turnover in illinois public park and recreation agencies: an exploratory study. *Faculty Research and Creative Activity*, 2, http://thekeep.eiu.edu/recadmin_fac/2

Mugenda, M. O., & Mugenda, A. G. (2003). *Research Method: Quantitative and Qualitative Approaches.* Nairobi: ACTS Press.

Cavagnaro, E., Staffieri, S., & Ngesa, F. (2015). Looking from a local lens: Inbound tour operators and sustainable tourism in Kenya. *Research in Hospitality Management, 5*(2), 135-145.

Ongori, H. (2007). A review of the literature on employee turnover. *African Journal of Business Management,* 049-054.

Price, J.L. (1977).*The Study Of Turnover,* Iowa State University Press: Ames.

Reigel, C.D. (1995). *Turnover: Conceptual model. In D.G. Rutherfold (Ed),Hotel management and operations.* 2nd Ed. New York: Van Nostrand Reinhold.

Saffery, A., Morgan, M., Tulga, O., & Warren, T. (2007). *The Business of Inbound*

Tour Operators. USAID.

Sut , W., & Chad, H. P. (2011). Employee empowerment, job satisfaction and organizational commitment: An in-depth empirical investigation. *Chinese Management Studies*, 5(3), 325 – 344.

Ton, Z., & Huckman, R. S. (2008). Managing the impact of employee turnover on performance: The role of process conformance. *Organization Science, 19*(1), 56-68.

UNCTAD. (2008). *FDI and Tourism: The Development Dimension East and Southern Africa.* Geneva: United Nations Conference on Trade and Development

Wafula, M., Ondari, J.K., & Lumumba, E. (2017). Factors affecting employee turnover in hospitality establishments in Kisii Town, Kenya. *Merit Research Journal of Business and Management, 5*(1), 030-040.

Walsh, K., & Taylor, M. S. (2007). Developing in-house careers and retaining management talent: What hospitality professionals want from their jobs?. *Cornell Hotel and Restaurant Administration Quarterly,* 48(2), 163-182.

Wasmuth, W.J., & Davis, S.W. (1983). Managing employee turnover. *Cornell Hotel and Restaurant Administration Quarterly, 24*(1), 15-22.

Wright, T. A., & Bonett, D. G. (2007). Job satisfaction and psychological wellbeing as non-additive predictors of workplace turnover. *Journal of Management, 33*(2), 141-60

Tathmini Ya Ujumi Mweusi Katika Tamthilia Ya *Mashetani Wamerudi* (S.A.M 2016)

Justus Kyalo Muusya

Idara ya Kiswahili na Lugha za Kiafrika

Chuo Kikuu cha Kenyatta

S.L.P 43844 - 00100

NAIROBI

Barua pepe:*muusyaj@yahoo.co*

IKISIRI

Tamthilia ya Kiswahili ina historia fupi ikilinganishwa na tanzu zingine, hasa ushairi. Tamthilia za kwanza kuwahi kutafsiriwa kwa Kiswahili na zilizoandikwa kwa lugha hii zilizingatia sana maudhui ya kidini, kizalendo, utetezi dhidi ya dhuluma tawala za kigeni na hasa ukoloni mamboleo. Kinyume na hali hiyo, tamthilia ya Kiswahili katika kipindi cha kuanzia 1950 hadi miaka ya 2000 umesheheni wingi wa tungo zinazosifia Uafrika na heshima ya mtu mweusi hapa barani Afrika na kote ulimwenguni. Uchunguzi wa tamthilia hizi unadhihirisha kujitolea kwa dhati kwa watunzi wake kuelezea, kutetea na kuhimiza heshima ya Mwafrika. Maudhui yake yanakiuka yale masuala finyu ya utaifa, uraia na tawala za mataifa ya Kiafrika. Hii ndio maana makala haya yanalenga kufafanua nadharia na maoni ya wanaujumi mweusi na jinsi fikira zao zilivyoathiri na kuongoza mitazamo ya watunzi wa tamthilia. Data ya makala haya ilikusanywa katika tamthilia ya *Mashetani Wamerudi* (Mohamed 2016). Tamthilia hii iliteuliwa kwa kutumia mbinu kusudio. Hii ni kwa sababu usomi awali ulionyesha kuwa tamthilia hii imetumia misingi ya nadharia ya ujumi mweusi. Data yenyewe ilikuwa ya kimaelezo na ilichanganuliwa vilevile kwa njia ya maelezo. Makala yalionyesha namna ambavyo mwandishi ameweka wazi hadhi ya Mwafrika na kudhihirisha kuwa amejitambua na anapaswa kutambuliwa na kuheshimiwa na ulimwengu mzima. Hii ni baada ya Mwafrika kuelewa kwamba watu kutoka mabara mengine sio bora kumliko kama ambavyo watu hawa hutaka ichukuliwe na Mwafrika.

ISTILAHI MUHIMU: ujumi mweusi, uafrika, ukoloni mamboleo, utandawazi, wakoloni na utaifa

Misingi ya nadharia

Kwa mujibu wa Zirimu (1971), ujumi ni vigezo vinavyotumiwa kuainisha urembo wa sanaa. Kila jamii huwa na vigezo vyake maalum vya aina hii. Vigezo hivi ndivyo hutumiwa kuainisha sanaa katika jamii husika. Zirimu anaongeza kuwa, wasomi ambao wanatumia vigezo vya kigeni kuainisha fasihi za kiafrika sio wahakiki bora kwa vile wanaiga tu mambo ya kwingineko. Kwa sababu hii, anapendekeza uhakiki bora wa fasihi ya Kiafrika ni ule unaotokana na jamii yenyewe ya Kiafrika. Hivyo, ujumi mweusi unapaswa kutokana na mazingira ya watu weusi.

Kulingana na Wafula na Njogu (2007), ujumi mweusi ni zao na jaribio la Mwafrika la kushughulikia wema wa utamaduni wake pamoja na kuelewa historia yake. Hii ni kwa sababu Mwafrika amekuwa akibaguliwa na kudhalilishwa kila anapouhusiana na kuingiliana na wageni kutoka nje ya bara la Afrika.

Falsafa za kimagharibi zimekuwa wazi kuhusu uduni na ulaanifu wa Mwafrika tangu kuumbwa kwake. Kwamba, huwezi kutarajia ustaarabu wa aina yoyote kutokana na kiumbe cha aina hii. Akisisitiza kauli hii, Hume, kama alivyonukuliwa na Curtin (1964) anaeleza kuwa Waafrika ni wajinga kwa sababu wazazi wao wa mwanzo walikuwa wajinga. Mawazo haya ndiyo yaliyopalilia na kukuza falsafa ya kikoloni na utumwa. Ikamfanya mtu mweupe kumchukulia Mwafrika kuwa mtumwa wake kwa karne nyingi.

Hivyo, mkoloni alifikiri kwamba Mwafrika hangezingatia mbinu za usanii wa fasihi. Maoni ya wakoloni kama haya ndiyo yamemsukuma Mwafrika kuutetea utu wake, utamaduni wake na sanaa yake.

Ujumi mweusi kwa hivyo, umetokana na mazingira yaliyoshuhudia kukandamizwa kwa Mwafrika katika Nyanja zote za maisha. Ulizuka kama upinzani dhidi ya hujuma zilizofanywa na wakoloni dhidi ya heshima yake. Hujuma hizi ni pamoja na hali ambapo rangi nyeusi, rangi ya Mwafrika inachukuliwa na Wanamagharibi kuwa ishara ya mauti na kuzimu au ishara ya makazi ya shetani.

Katika juhudi za kutetea heshima ya Mwafrika, Waafrika wameweza kuunda istilahi zinazoonyesha ustaarabu, fahari na wema wa Uafrika. Istilahi hizi ni pamoja na: Wamerikani Weusi, Waislamu Weusi, Nguvu Nyeusi na zingine (Wafula na Njogu 2007). Kwa kufanya hivyo, wamedhihirisha kwamba Mwafrika anauonea fahari utu wake, rangi yake na hata matendo yake. Hii ndio maana Senghor anaeleza ujumi mweusi kama jumla ya ustaarabu na mapokezi mengine yanayothaminiwa na ulimwengu wa Kiafrika.

Hata hivyo, ni muhimu kutaja kuwa Mwafrika mwenyewe amekubali kwa hiari yake kujiweka chini ya himaya ya wakoloni kwa njia mbalimbali. Kwa mfano, wasomi wameamini kuwa kila chema kinatoka kwa wakoloni. Hivyo wakaiga moja kwa moja. Dini vilevile imeshadidia ushenzi na giza iliyokuwapo Afrika kabla ya majilio ya Wamishenari.

Katika harakati za kutetea Mwafrika, Senghor aliyachukua mambo yale yaliyotumiwa na Wazungu kuwakashfu Waafrika na kuyapa maana ya heshima na taadhima kuu. Anatumia lugha ya hadhi.

Naye Cesaire (1968) anachukulia kuwa vita vya wanaoteswa dhidi ya watesaji wao ni mithili ya mashua inayoelea kwenye bahari ya mawimbi mengi. Anaamini kuwa, pamoja na udhaifu na uchochole wa wadhulumiwa, ushindi na haki viko upande wao.

Katika nadharia hii, tunabaini kuwa, falsafa zilizokuwa zikitumiwa na Wazungu kuwatawala Waafrika zilikuwa na uongo. Ni nadharia ambayo inatambua matumizi ya lugha za Kiafrika kwa mapana, na kwamba pale ambapo lugha ya Kiingereza itatumika katika kuiandika fasihi ya Kiafrika, inapaswa kufinyangwa na kufungamanishwa na ujumi wa Kiafrika.

Kunayo matapo kadha kuhusu ujumi mweusi. Ipo vilevile mihimili chungu nzima ya nadharia hii ya ujumi mweusi. Kati ya mihimili muhimu ni matumizi ya nyimbo zinazousifu Uafrika na

kutilia mkazo usawa wa watu wote, weupe kwa weusi. Hata hivyo, mihimili ambayo imeongoza uhakiki katika makala haya ni ile ambayo iliongezewa na Asante Molefi (1999). Mihimili ambayo ilichangiwa na Molefi ni kama ifuatavyo:

Kumtibu mtu mweusi kutokana na matatizo ya kisaikolojia yaliyotokana na athari za ukoloni pamoja na kudunishwa.

Kuboresha nafasi ya mtu mweusi kisiasa, kijamii, kiuchumi na kidini.

Kudhihirisha kuwa mtu mweusi ndiye msingi wa ustaarabu wote ulimwenguni.

Utangulizi

Tamthilia ya *Mashetani Wamerudi* (2016) imeandikwa na Said Mohamed. Mohamed ni mwandishi mashuhuri wa fani zote za fasihi zikiwepo riwaya, tamthilia, diwani za hadithi fupi na za mashairi. Lakini ametumia upekee wa aina fulani katika tamthlia hii. Anwani *Mashetani Wamerudi* ameikuza kutokana na anwani ya *Mashetani* (Hussein 1971). Katika tamthilia ya Hussein, tunaona hafla ambapo shetani na binadamu wanacheza na kufurahia ili kuagana kwaheri. Hapa, shetani ni mkoloni na binadamu ni Mwafrika. Kuagana maana yake ni kuondoka kwa mkoloni huku Mwafrika akijipatia uhuru wa bendera. Hii ina maana kuwa hafla hii ilikuwa ni sherehe za uhuru wa Mwafrika.

Kwa misingi hii basi, Mohamed anataka tuamini kuwa ikiwa kweli wakoloni waliondoka kutoka bara la Afrika kufikia mwisho wa ukoloni mkongwe, basi wameweza kurudi kwa taswira tofauti. Kwamba wameweza kurudi kwa taswira ya ukoloni mamboleo katika miaka ya punde baada ya uhuru wa bendera, na kwa mtindo wa utandawazi katika siku za hivi karibuni.

Suala hili la utandawazi lilimchochea sana Mohamed katika kuandika tamthlia hii. Anadokeza kuwa alitarajia kwamba Hussein angeandika tamthilia nyingine baada ya Mashetani kuendeleza usawiri wa unyonywaji wa bara la Afrika na watu wa mabara mengine kupitia utandawazi. Alipoona amelimatia kufanya hivyo, akajitosa katika kuendeleza masimulizi alipoachia Hussein. Kwenye dibaji ya Mashetani Wamerudi, Mohamed mwenyewe anasema hivi:

… mpaka sasa, hajaandika au hajatoa tamthilia inayogonga kwenye usasa mpya wa 'utandawazi', ambao ni mfumo wa dunia wenye mchanganyiko wa siasa, uchumi, usafiri, biashara, uhaulishaji wa fedha kwa kasi, uanahabari, ugenini, ukimbizi wa makundi kwa makundi ya watu kuelekea nchi za ng'ambo (2016:iv)

Ni kana kuwa mwandishi wa *Mashetani Wamerudi* anaendeleza masimulizi na historia ya jamii ya Kiafrika, kisiasa kutoka pale ambapo Hussein alikomea katika *Mashetani*. Haya yanadhihirika bayana kwa njia tofauti. Katika tamthilia ya Hussein, wahusika wakuu ni Juma na Kitaru. Juma alikuwa anawakilisha wakoloni naye Kitaru akawa anawakilisha Waafrika. Hawa walikuwa ni wanafunzi wa chuo kikuu. Inaonekana kuwa naye Mohamed anawafinyanga wahusika wake wawili kutokana na hawa. Hawa ni Mzee Jumai na Mzee Kitarua. Ni kana kuwa anatuambia kuwa hawa waliokuwa vijana mapema miaka ya sabini wamekwishakuwa wazee. Kukomaa huku kwao kunawafanya hata mawazo, falsafa na matendo kubadilika. Zaidi ni kuwa, Juma na Kitaru walikuwa na mchezo wao. Mchezo wa mashetani. Kutokana na mchezo huu, Mohamed amebuni mhusika anayemwita Shetani au kwa kifupi Sheta.

Athari za ukoloni kwa Waafrika

Nadharia ya ujumi mweusi ilinuia kumponya mtu mweusi kutokana na athari alizopata kutokana na ukoloni mkongwe na baadaye ukoloni mambo leo. Athari hizi zilikuwa za kisaikolojia, kitamaduni na kilugha. Ilinuia vilevile kumponya kutokana na aina yoyote ya udunishwaji na watu kutokana nje ya bara la Afrika.

Wakoloni walitufanya tuamini kuwa chochote chenye asili ya Kiafrika ni kibaya na kiovu. Hivyo, kilicho chema kinatokana na Mzungu. Jambo hili lilipelekea Mwafrika kujichukia na kuchukia kila alichokuwa nacho. Lakini tunaona Prof. akiongoza katika kumzindua Mwafrika kutokana na hali hii. Anaonyesha kuwa baadhi ya vitu walivyokuwa navyo Waafrika ni bora kuliko vingine vya Wazungu. Anakunywa togwa ya kiasili (uk. 3). Anaeleza kuwa togwa ilikuwa tamu na bora kwa mwili wa mtu kuliko Coca Cola. Anasema hivi:

> *Aaaaa, togwa tamu hii. Tamu tokea kinywani mpaka damuni. Coca Cola itawezaje kutia fora mbele ya togwa?... kibaya kiwe chetu daima na kizuri kiwe chao daima. Kibaya chao kiwe kizuri chetu! Coca Cola si kwa siha wala si kwa ladha yoyote ikilinganishwa na togwa* (uk. 7-8).

Mwandishi atamzindua Mwafrika apende na athamini alicho nacho na kuelewa kwamba sio kila kitokacho uzunguni huwa kizuri kwa Mwafrika.

Mwafrika ametambua kuwa mkoloni hakuondoka kama alivyodai. Kwamba Mwafrika hakuweza kupata uhuru kamili kama alivyotarajia. Ameweza kutambua kuwa alichopata ni uhuru wa bendera tu. Kijana 1 anauliza kama nchi yake iliweza kusonga mbele tangu sherehe zilipoandaliwa, Mwafrika na Mzungu wakacheza wakisherehekea uhuru wa Mwafrika. Naye Prof. anamwambia kuwa mkoloni alirudi, na wala sio kama walivyodhani hapo awali. Prof. anaeleza namna hii:

> *Tokea shetani alipojidai anaondoka tukadhani eti hatarudi? Kumbe alituchezea shere kwa mchezo wa maneno. Ndani ya miaka mingi ya dhuluma tumegundua kile tulichotiwa vichwani mwetu. Lakini kugundua hakutoshi* (uk. 5).

Anaposema kuwa kugundua hakutoshi anaashiria kuwa Mwafrika anapotambua kuwa amenyanyasa na mkoloni katika kipindi cha ukoloni mkongwe na ukoloni mambo leo ni hatua muhimu kwa vile awali alidhani mkoloni alikuwa mshirika wake bora. Hata hivyo, ukweli ni kuwa mkoloni alikuwa anaangamiza watu na kukana matendo yao maovu, na kwamba analeta athari kubwa kwenye akili za Waafrika (uk. 12-13). Kwa sababu hii Mkoloni anapaswa kufurushwa kabisa (uk. 11).

Elimu ambayo mkoloni alimfundisha Mwafrika haikuwa na lengo la kumwendeleza Mwafrika. Badala yake ilikuwa na azima ya kumnufaisha mkoloni mwenyewe. Hata hivyo, mhusika Sheta anashangaa kuona kuwa elimu hiyo iliweza kumfaa Mwafrika kwa kiwango fulani, jambo ambalo halikudhamiriwa na mkoloni. Anamwambia Prof. hivi:

> *Aa, bado unakumbuka tuliyoyatia vichwani mwenu? Tukayaficha kwa ubaya kumbe mengine mazuri kwenu* (uk. 17).

Baadaye Kijana 1 anamwambia Sheta kuwa wakoloni waliwamezesha Waafrika fikra mbovu katika uchumi, utamaduni na mwenendo wa kijamii katika mifumo ya elimu waliyowaletea (uk. 49). Hii ndio maana Kijana 4 anaweka wazi mfumo mbaya wa elimu katika nchi yake kwa kusema hivi:

Elimu hii tulirithi kutoka kwa wakoloni (uk. 58).

Hii ilijikita katika nadharia bila utendaji wowote. Hivyo ikawa haimpi msomi maarifa muhimu katika ujenzi wa taifa. Utambuzi huu unafaa kuendana na kubadilisha mfumo wa elimu katika mataifa ya Afrika ili kukithi mahitaji ya mataifa haya. Vilevile, mfumo huo wa elimu uliwapa Waafrika kiburi kiasi kuwa aliyesoma kuliko wenzake anawadharau sana. Anajiona kuwa bora kuwaliko. Hata hivyo, hali inabadilika. Prof. anafurahia hali ambapo vijana wanaanza mkutano bila ya kusubiri Prof. mwenyewe kuuanzisha rasmi (uk. 34). Vilevile Prof. alidhamini sana maoni na mchango wa vijana wa madaraja tofauti kielimu.

Tofauti na ilivyokuwa hapo awali, watu weusi wanajiamini. Wanajiona wanaoweza kushindana na Wazungu na wakawashinda. Hili linadhihirika katika mazungumzo kati ya Sheta na Prof. namna hii;

Prof.: Na sisi tunajiamini pia.

Sheta: Mnajiamini?

Prof.: Ndiyo!...

Prof.: Basi hutanipiga kibao wakati huu. Labda utakapojitokeza.

Sheta: Nitakapojitokeza utakubali kupigwa kibao?

Prof.: Labda tupigane vibao.

Sheta: Utaweza?

Prof.: Hukunipiga zamani utanipiga kesho? (uk. 21).

Hapa inaonekana wazi kuwa Mwafrika alikuwa tayari kupigania uhuru, nafsi na haki yake. Suala hili linashangaza Wazungu kwa vile walikuwa hawajazoea ushindani wa aina hii kutoka kwa watu weusi.

Mtu mweusi anajaribu kupigana na sheria ambazo alitungiwa na kuletewa na Mzungu. Mojawapo ikiwa kwamba Prof. na wenzake watakuwa ni sharti wapate kibali cha polisi ili waweze kukutana kujadili mustakabali wao (uk. 25). Kwa Wazungu, sheria kama hizi zitalemaza juhudi zao za kujikomboa kwa vile hawatakuwa wanakutana kila mara watakavyo. Kuthibitisha kuwa walikuwa mbioni kujinasua kutokana na sheria hizi, Prof. anamjibu Sheta kama ifuatavyo:

Sheta: Kwa sababu sheria zetu lazima mzikubali na mzifuate. (Kwa ukavu).

Prof.: Sheria gani? (Kejeli).

Sheta: Kukusanya watu makundi kwa makundi lazima mpate kibali cha polisi.

Prof.: Polisi wanawalinda serikali au wananchi?

Sheta: Serikali ndiyo wananchi na wananchi ndio serikali.

Prof.: Ikiwa sheria ni hiyo, basi wananchi hawahitaji vibali vya polisi . Mkusanyiko wa watu usiokuwa na fujo ni haki ya wananchi na ni halali kabisa (uk. 25-26).

Aidha, suala la ushirikiano na umoja limepewa kipaombele katika kupambana na athari ya ukoloni. Hili ni muhimu kwa vile mkoloni alijaribu kila aliloweza kugawa Waafrika na kuwatawanya ili wasiungane kutetea uhuru na haki zao. Prof. anawahimiza vijana na wananchi kwa jumla washirikiane ili waweze kufaulu katika kupigania athari mbaya za ukoloni mongwe na ule wa mamboleo. Hii ndio maana kila walipokusanyika na kukaa pamoja, Prof. alikuwa anawasisitizia kukaa katika duara kama ishara ya kwamba wameshikamana kabisa. Anasema hivi:

> *Duara ni dunia Kijana. Duara linafinya. Linafumba. Lina taabu kupangua. Linashirikisha. Linalinda. Linafanya tutazamane. Kisha tushirikiane* (uk. 30).

Hapa alikuwa anasisitiza umoja wa dhati uliokamilika. Huu ni umoja ambao haungevunjwa na wakoloni namna walivyozoea kuvunja hapo awali.

Kuboresha nafasi ya mtu mweusi

Nadharia ya ujumi mwesui hudhamiria vilevile kuimarisha nafasi ya mtu mweusi kisiasa, kijamii, kiuchumi na kidini. Mwandishi wa tamthilia ya *Mashetani Wamerudi* ameonyesha kuwa mtu mweusi ameweza kujipatia usemi kisiasa katika mahusiano yake na mkoloni. Hali hii ni tofauti na hapo awali. Mhusika Prof. anaeleza hali hii.

> *Mimi sijali Shetani anayepita au anayekita. Kama alipita jana Shetani ndiyo tulinyamaza. Lakini leo mwache apite. Sisi tutasema na matendo tutatenda! Tulisema wakati wa kutaka nchi yetu. Tutasema wakati huu wa baada ya kutawaliwa* (uk. 4-5).

Baadaye tunaona mkoloni mwenyewe akikubali kuwa kuna mabadiliko katika mahusiano haya ingawa hakukuwa na usawa kamili. Sheta anasema namna hii:

> *Ukweli wa kwamba hatuko katika mfumo wa zamani wa unyonyaji wa ukoloni mamboleo* (uk. 18).

Tunasoma kuwa wakoloni sasa walikuwa wameona haja ya kuwapa Waafrika msaada kidogo ili waendelee kiuchumi. Hata hivyo, kilichokuwa wazi ni kwamba wakoloni walinufaika zaidi kutoka kwa Waafrika kuliko msaada waliotoa.

Tatizo lingine ambalo watu weusi walikuwa sharti wakabiliane nalo ni uongozi wa Waafrika wenzao. Hii ni kwa sababu raslimali za watu weusi zikitwaliwa na wakoloni, natija ambayo inapaswa kuwaendea Waafrika kutokana na raslimali hizo huishia kwenye mifuko ya wachache. Hawa ni wale walio mamlakani na kuwaacha wananchi katika hali ya ukata. Hivyo,

viongozi kama hawa wanashirikiana na wakoloni kuwadhulumu wananchi haki yao. Uongozi huu ni sehemu ya ukoloni mamboleo ambayo sharti ifurushwe ili kuwepo na usawa kamili. Sheta anashangaa ni kwa nini Prof. haigi tabia hii kwa manufaa ya kibinafsi. Anasema hivi:

> *… wewe peke yako ndiye unayekataa ukweli wa maisha mazuri yatayotazamiwa karibuni* (uk. 19).

Baadaye Prof. anamjibu hivi:

> *Hizo pesa mnazotupa ni tone la asali analofyonza chozi. Kisha kasma kubwa zinaliwa na wakubwa.* (uk. 19).

Angaa hii ni hatua murua kwamba Mwafrika amepata sauti ya kusimama kidete na kusema ukweli mchungu kwa wakoloni na washirika wao Waafrika.

Kwa kinywa kipana Mwafrika anasema kuwa yeye na Mzungu wanafaa kuwa sawa katika biashara na maingiliano mengine ya kiuchumi. Hivi kwamba, Mzungu asitoe kidogo kwa Mwafrika kwa kingi apatacho. Anashauri namna hii:

> *Bora tuheshimiane kwa haki za pande mbili. Lazima pande zote zipeane vipimo vya urari* (uk. 20).

Wakati huohuo inawekwa bayana kwamba uchumi wenyewe wa nchi haujapiga hatua tangu uhuru. Masuala ya uchumi wa taifa yakawa yamevumbika giza kutokana na uongozi wa kikoloni mamboleo uliorithishwa kutoka kwa wakoloni. Hii ndio maana Kijana 3 anashauri kwamba ni bora taifa lijinasue kutokana na mkwamo huo wa kiuchumi. Kwa kufanya hivyo, litakoma kutegemea msaada na ufadhili kutoka kwa wakoloni. Hii ndio njia bora ya kukwepa athari za kikoloni katika mataifa huru. Hivi ndivyo Kijana 3 anavyosema:

> *Suala la kwenda mbele ni suala la kukataa kutegemea mapato kutoka nje kwa njia ya sadaka na ufadhili… ukweli ni kwamba wao (Wazungu) ndio wahitaji wakubwa wa raslimali na pia wahitaji wa kuuza bidhaa zao zinazotoka kwenye viwanda* (uk. 57).

Baadaye Sheta anamwambia Kijana 1 kwamba upungufu ulioko nchini umesababishwa na viongozi wa nchi yenyewe, kwa hivyo si vyema kuwalaumu wakoloni kila mara (uk. 49). Naye kijana anasema,

> '*Hao pia tutapigana nao mpaka watakapoanguka*'.

Anachopigania hapa mwandishi ni uhuru wa kiuchumi. Anatambua kuwa tuna uwezo mkubwa wa kiuchumi, na kwamba tukiutumia vizuri tutakuwa wa kutegemewa na Wazungu kuliko vile tunavyowategemea.

Mfumo wa kisiasa wa mataifa ya Afrika ulirithishwa kutoka kwa Wazungu. Mfumo huu ulikuwa umebuniwa kwa lengo la kuwanufaisha wao na wala sio Waafrika. Waafrika wamepata usemi wa kuelekeza namna ambavyo utungaji wa sheria hizo na matumizi yake yanapaswa kuwa. Suala hili linajitokeza vyema katika majibizano kati ya Askari na wananchi. Angalia mfano huu:

Askari: … Wananchi… wananchi… wananchi. Simameni! Simameni! Maandamano haya si ya halali.

Kijana 1: (Kwa sauti kali na ya juu) Maandamano ya amani yasiyokuwa na fujo yana uhalali (uk. 75).

Kijana 3: Hatutaki sheria za mashetani.

Umma: Hatutaki… hatutaki… hatutaki sheria mbovu zinazomkuza shetani (uk. 75).

Kusuhu suala hilo la sheria naye Prof. anasema kuwa katika kutunga sheria bungeni, kusiwe na nguvu za chama tawala bali pia nguvu za upinzani. Hii ni kwa sababu kwa kushirikisha pande zote, wananchi watakuwa wameshirikishwa ipasavyo. Hata hivyo, Sheta anakataa kuamini uwezo wa Waafrika wa kujitungia sheria zozote kwa kusema hivi:

> *Nyinyi wanagenzi hamwezi kutunga sheria madhubuti* (uk. 26).

Ili kuboresha uongozi na mahusiano ya kijamii, vijana wamepewa nafasi kubwa na usemi mkubwa kuliko ilivyokuwa hapo awali. Awali ilikuwa kwamba ukweli ulikuwa ni milki ya wazee. Hivi kwamba, vijana walikuwa wa kuambiwa na wazee kile ambacho walidhani ndicho ukweli unaostahili. Hii ndio maana Prof. anatueleza hali hiyo namna hii:

> *Zamani ukweli ulikuwemo kichwani na kinywani mwa wazee na vijana waliwasikiliza na kufuata amri zao. Siku hizi vijana ndio walio na ukweli ambao wazee hawaukubali. Wanajua ukweli wa vijana ni ukweli thabiti kwa namna fulani!* (uk. 35).

Kutokubali huku kwa vijana kunazua mvutano wa kitabaka, jambo ambalo linatinga mafanikio ya Mwafrika ya kuwa huru.

Mafaniko makubwa ya mwandishi wa tamthilia hii katika kukuza ujumi mweusi ni pale ambapo anaonyesha kuangamiza matabaka yaliyozuka katika jamii ya Kiafrika punde baada ya uhuru. Kulikuwapo na tabaka la mabwanyenye waliokuwa wamepoteza mamlaka na mali yao wakati wa mapinduzi. Nalo tabaka lililokuwa limepata mamlaka lilikuwa katika harakati za kujikusanyia mali nyingi kwa njia zisizo halali zaidi iwezekanavyo.

Kisha kulikuwapo na tabaka la chini la umma maskini. Hawa waliumia sana kwa kuongozwa vibaya katika mvutano wa matabaka haya mawili. Mzee Jumai anasema kuwa wakati umefika wa kuongea wazi na kinaganaga. Ndipo Mzee Kitarua akamwambia hivi:

> *Mzee Kitarua: Aaa, nilifundishwa na fikra za ushetani ili kwenda mbele kusikokuwa na mwisho: kunyonya, kubana, kukandamiza, kudhalilisha, kuchukua vitu vya watu, kulimbikiza, kuvunja sheria…*
>
> *Mzee Jumai: Hayo yote si umesahau? Si unajua kwamba kabla ya nyinyi, sisi tulikuwepo katika kunyonya, kubana, kukandamiza, kudhalilisha, kuchukua vitu vya watu, kulimbikiza…* (uk. 41-42)

Kijana 1 anasema athari za mvutano uliokuwapo wakati huo kwao ni *…nchi yetu na sisi kuongozwa kama punguani au mabwege* (uk. 62).

Kwa makundi haya kukubali tofauti zao na kuzizika, basi inamaanisha kuwa tumepiga hatua katika kufikia usawa kiuchumi na kujivua athari za ukoloni walizotuachia za kujigawa kimatabaka. Baadaye Mzee Jumai na Mzee Kitaru, ambao sasa wameishia kuwa marafiki wa dhati, wanaenda kumtembelea Prof. katika mazungumzo yao, wanamhakikishai kuwa walimaliza kabisa mfarakano uliokuwapo baina yao kwa sababu ya tajriba waliokuwa wamepata. Tajriba hiyo iliwafungua macho wakatambua ukweli (uk. 64-5).

Waafrika wanatambua pia kwamba namna mpya ambayo kwayo Mzungu anamtawala Mwafrika ni kupitia utandawazi. Utandawazi unachukua nafasi ya ukoloni mambo leo. Tofauti na ilivyokuwa awali, Mwafrika anauelewa ujanja huu wa kubadilisha mbinu kuendeleza maslahi ya awali. Tunabainisha haya katika majibizano kati ya Prof. na Sheta.

Sheta: … Kwani umesahau kwamba utandawazi ndio remote control zaidi kuliko ukoloni mamboleo?

Prof.: Utandawazi ni remote control yenu una ukweli, lakini pale tu watu wanapokuwa wajinga. Werevu una nguvu zaidi kuliko remote control (uk. 61).

Prof. ana imani kuwa wao watashinda katika makabiliano haya mapya. Anamweleza Sheta kuwa anashangaa ni kwa namna gani wao Waafrika walidanganyika hapo awali wakadhani Mzungu alikuwa na uwezo mkubwa waliouona kama miujiza. Kwamba wameamka na kile walichodhani ni ustaarabu wa hali ya juu (utandawazi) wakautambua kuwa mazingaombwe tu (uk. 72). Nao wananchi wanamhakikishia Prof. kuwa hawatachoka. Wataendelea na juhudi zao hadi mwisho pale ambapo watamshinda adui kikamilifu (uk. 76).

Wananchi wanajitolea kwa kila hali kutaka haki yao kutoka kwa wakoloni Wazungu na kwa viongozi wao wakoloni. Wanaamua kuandamana njiani huku wakitoa kauli mbalimbali kushinikiza watakacho. Wanasema:

Umma: Sisi ni wananchi… Hii ni nchi yetu… Hatutaki kutawaliwa kwa remote control… rasilimali zetu ziwe mikononi mwa wenyeji… Biashara iwe nipe nikupe. Viongozi wetu wawe macho… Viongozi wetu wawe na sisi wasiwe na mashetani… (uk. 74).

Kwa kudai kuwa viongozi wao wawe nao, wasiwe na mashetani wanaashiria kuwa wanajua na kutambua kuwa viongozi wao walikuwa wanashirikiana na wakoloni Wazungu kuwanyanyasa wananchi. Hivi ni kusema kuwa kulikuwapo na viwango hivyo viwili vya ukoloni, jambo ambalo lilidhihirisha mzigo mkubwa kwa mwananchi.

Huku Wazungu wakija Afrika kuwapora raslimali zao, Waafrika wenyewe hawaendi kupora raslimali za Wazungu. Badala yake, wakienda huko wanaenda kunyanyaswa nguvu zao zaidi kwa manufaa ya wenyeji wa huko. Matokeo ya jambo hili ni Waafrika kuendelea kuwa maskini jinsi ambavyo Wazungu wanaendelea kutajirika. Lakini wale Waafrika waliozinduka na kung'amua hali hii wanaamua kubakia nchini mwao. Tunasoma hivi:

Prof.: … sijapanga kwenda pahali pengine. Nitaselelea papa hapa petu.

Sheta: Ndiyo maana utabakia maskini (uk. 78).

Maneno ya Sheta yananuia kumshawishi Prof. aamini kuwa kule Uzunguni ndiko kwenye utukufu na utajiri. Kwamba kilichoko Afrika ni maovu na umaskini.

Mtu mweusi kama msingi wa ustaarabu

Nadharia ya ujumi mweusi inaadhimisha wazo kwamba mtu mweusi ndiye msingi wa ustaarabu kote ulimwenguni. Hii ina maana kuwa maendeleo na uimarikaji wa Uzunguni kiuchumi ni zao la matumizi ya nguvu za Waafrika. Prof. anamkumbusha Sheta ukweli huu alipokuwa akimjibu madai yake kwamba Wazungu wamekuza uchumi wao kwa juhudi zao tu.

> *Sheta: Hatuutegemei tena mbuyu. Uwe wa jana au wa leo. Tunachokitegemea ni nguvu na akili zetu tu.*
>
> *Prof.: (Kinamtoka kicheko kikubwa cha kejeli na tashtiti.) Bila ya nguvu zetu, zenu hazifui dafu.* (uk. 24).

Suala hili linasisitizwa na Mzee Jumai alipokuwa akimjibu Sheta. Anamwambia kuwa Wazungu hawaishi kukusanya na kuiba nguvu za Waafrika. Anaongeza huwa hata wakati mwingine wanafikia malengo haya ya kuiba nguvu hizo kwa kutumia sheria fulani walizoziweka wao (uk. 44). Kung'amua huku kunapaswa kufuatwa na Waafrika kujifunga katoka kutumia nguvu kuimarisha uchumi wa mataifa yao badala ya yale ya nje. Kijana 1 vilevile anamkumbusha Sheta kwamba ukuaji wa kiuchumi wanaojivunia na juhudi za Waafrika. Aghalabu Waafrika walifanya hivyo bila hiari yao. Hii ndio maana Kijana 1 anasema hivi: 'Aaa, miaka mingi mmezibana akili zetu ili mweze kufyonza damu yetu' (uk. 48).

Hitimisho

Makala haya yameweza kuonyesha kuwa tamthilia ya Kiswahili imeweza kuimarika sana katika kufumbata hali halisi ya Mwafrika. Imejidhihirisha kama chombo cha Mwafrika cha kujinasua kutokana na athari za muda mrefu alizopata tangu wakati wa utumwa hadi leo wakati wa utandawazi. Makala yameweka bayana kwamba Mwafrika ameweza kuzinduka vilivyo na kuona makosa yake. Haya ni makosa ambayo amekuwa akifanya, na kwa kufanya hivyo akamrahisishia mkoloni amnyanyase kwa kipindi chote hicho. Amejifaragua na kusimama kidete kutetea utu, heshima, rangi na kila kilicho na asili ya Kiafrika. Kwamba kuwa Mwafrika, na mtu mweusi kwa rangi sio ulemavu. Ni ustaarabu na nguvu. Ustaarabu ulioenea kote ulimwenguni, na nguvu ambazo ndizo chemchemi za ustaarabu katika mataifa yanayojiita makubwa kote ulimwenguni.

Marejeleo

Curtin, P. D (1964). *The Image of Africa: British Action 1780-1850*. Wisconsin: University of Wisconsin Press.

Cesaire, A. (1968). *Return to My Native Land*. Paris: Presence Africaine.

Mohamed, S.A (2016). *Mashetani Wamerudi*. Nairobi: Spotlight Publishers.

Molefi, K. A (1999). *The Painful Demise of Eurocentricism*. Trenton: African World Press.

Wafula, R.M na Njogu K. (2007). *Nadharia za Uhakiki wa Fasihi*. Nairobi: JKF.

Zirimu, Pio na wengine, ed. (1971). *Black Aesthetics*. Nairobi: EALB.

SUB-THEME 4: BUILT ENVIRONMENT, INFRASTRUCTURE DEVELOPMENT, INDUSTRIALIZATION: EMERGING TECHNOLOGIES, MANUFACTURING AND AGRO-PROCESSING

Flexibility of Interior Spaces For Low Cost Housing In Kenya- A Case Study Of The Kibera Soweto East Housing Project In Nairobi, Kenya

NJERU GRACE WAWIRA (B51/9253/2017)

Main Supervisor:

DR. S. MAINA

Assistant Supervisor:

MICHEAL MUNENE

March 25, 2019

Abstract

Kibera is the largest slum areas in Nairobi and the largest urban slum in Africa (UN-HABITAT, 2008). It's characterized by poorly constructed mabati (iron sheet) structures, poor-drainage systems, and lack of clean water, electricity, medical care etc. Most of Kibera slum residents live in extreme poverty, earning less than Ksh. 100 per day. The government of Kenya set up the Kenya Slum Upgrading Program (KENSUP) in 2004 whose main aim was to provide low-cost housing to residents living in the slum areas including Kibera, Mathare, Kayole and Dandora. The Kibera Soweto East Project also dubbed 'The Canaan Estate' was one of the first projects under the program and comprised of 21 blocks of five floors each sitting in a five-acre piece of land. However in 2017, more than half of the apartments had been given out for renting or sold by the allocated owners and the residents went back to the slum. The major reason for these phenomenon was due economical enrichment. 40% of the residents preferred to rent their houses as means of earning extra income. However, 50% of the residents stated that the houses did not cater for their needs and lifestyles taking into consideration that they now own the houses. The slum houses allows them to manipulate as well as modify their interior spaces, a concept they are not able to implement in their new houses. This is indeed a great challenge due to their rapid growth in population and change in need and lifestyle over time. This study therefore seeks to determine how flexible are the interior spaces of the low-cost housing units in Kibera and establish how they accommodate different arrangement of furniture pieces as well as allow performance of different tasks/functions within a particular space. The research design is the case study model where the research employs the collection and analysis of qualitative data obtained through examination of documents, interviews, observation and taking of photographs. The study is carried out at The Kibera Soweto East Housing Project, Kenya and its residents plus the professionals are involved in the project are the respondents. The expected output is the development of interior plans and layouts that are ideal for low-cost housing units. Affordability can indeed be achieved in low-cost housing but if the interior plans and layouts are not up to standard then it fails to fulfil its purpose of improving the living standards and quality of life of residents living in these housing units.

Key words; Low-cost housing units, Interior spaces, Flexibility, Multi-functionality, Interior partitioning, Furniture layouts.

CHAPTER 1: INTRODUCTION

1.1 Background of the Research

Until September 2010, Kibera was considered as the second largest slum in Africa after South Africa. It has 170,070 residents according to the Kenya Population and Housing Census of 2009 (Daily Nation, 2010). The neighborhood is divided into 13 villages, including Kianda, Soweto East, Gatwekera, Kisumu Ndogo, Lindi, Laini Saba, Siranga, Makina and Mashimoni. A UN-HABITAT socio-economic record shows that Soweto East has 19,318 inhabitants spread out in four zones: A, B, C and D. Zone A is the largest in size with an area of 6.9 hectares and accounts for 37% of the houses in Soweto East. It has 876 structures and a population of 6,288. Out of this population, about 90% are tenants and only 10% are structure owners, who do not live at all in the area but collect a monthly rent from the tenants and use the money to develop housing in other areas of Nairobi (UN-HABITAT, 2008). This therefore means that on average, each unit is occupied by seven people which is a relatively high figure compared to the average size of a residential unit in Nairobi which has close to four occupants. This area is considered an ideal area to put up structures since its relatively close to the large industrial area, the health sector, for example, Kenyatta National Hospital, Angelic Mission Hospital and Mbagathi Hospital; the Central Business District (CBD), Upper Hill area and the affluent neighborhoods of Kilimani, Lavington, Lang'ata or the middle-class neighborhoods of Nairobi West or South C hence making it a sought-after residential area for workers, artisans and minor functionaries (Rosa & Bernard, 2012).

1.2 Statement of the Problem

The Kibera Soweto East Housing Project was launched in 2012 and the handing over ceremony of the completed houses took place on the 8th of July 2016. As of 2017, more than half of the apartments had been given out for renting or sold by the allocated owners and the residents went back to the slum. The major reason for these phenomenon was due economical enrichment. 40% of the residents preferred to rent their houses as means of earning extra income. However, 50% of the residents stated that the houses did not cater for their needs and lifestyles taking into consideration that they now own the houses. The slum houses allowed them to manipulate as well as modify their interior spaces, a concept they are not able to implement in their new houses. This is an important factor due to their rapid growth in population and change in need and lifestyle. This evidently shows that many low-cost housing especially those provided by the government only focus on reducing cost when coming up with the interior plans and layouts and not on the improvement of quality of life and living standards of residents.

1.3 Research Questions

The following research questions will guide the study;

How flexible are the interior spaces of the low-cost housing units in Kibera, Kenya?

How do interior plans and layouts for low-cost housing in Kenya accommodate different arrangement of furniture pieces within a particular space?

How do interior plans and layouts for low-cost housing in Kenya allow for performance of different tasks/functions within a particular space?

What are the ideal interior plans and layouts for low-cost housing in Kenya?

1.4 Objectives of the study

This study will seek to achieve the following objectives;

To determine how flexible are the interior spaces of the low-cost housing units in Kibera, Kenya.

To establish how interior plans and layouts for low-cost housing in Kenya accommodates different arrangement of furniture pieces within a particular space.

To determine how interior plans and layouts for low-cost housing in Kenya allows for performance of different tasks/functions within a particular space.

To propose ideal interior plans and layout for low cost housing in Kenya.

1. 5 Scope of the study

1.5.1 Geographical Scope

The Kibera Soweto East Housing Project is a five-acre estate comprising of 21 blocks of five floors each. The apartments comprises of 144 three roomed units, 570 two roomed units and 108 single roomed units. It is located in Langata area, southwest of Nairobi and approximately 6.6 kilometers from Nairobi City Centre.

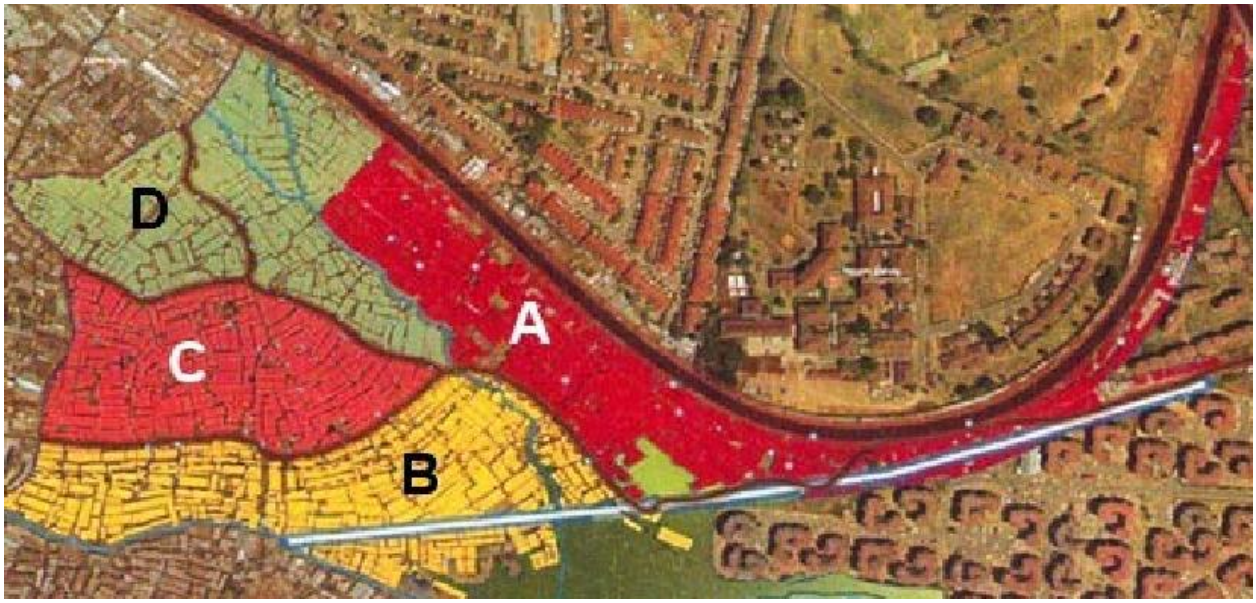


Figure 1: Zone A, B, C & D of Kibera, Nairobi

Source: UN-HABITAT (2008b).

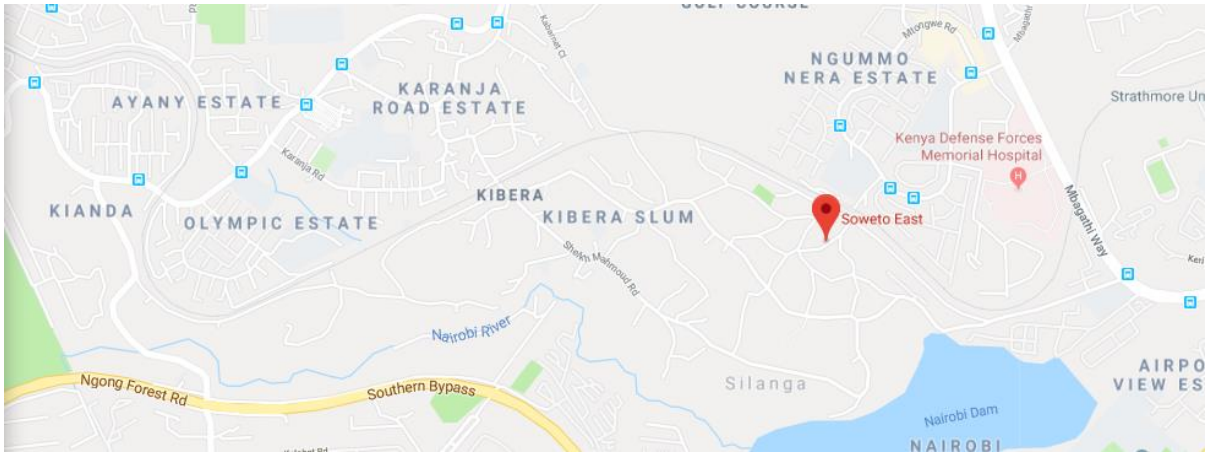


Figure 2: Location of the kibera soweto east project

Source: Authors, 2018

1.5.2 Contextual Scope

This study focuses on low-cost housing developed for the low-income earners who live in the informal settlements; mainly those which are developed by the local government and whose aim is towards slum upgrading.

1.5.3 Conceptual Scope

The conceptual scope of this study will confine itself to flexibility of interior spaces in low-cost housing units, its key aspects such as multi-functionality and different furniture layouts in interior spaces and the relevant key players such as the residents of the Kibera Soweto East Housing Project and the professionals involved in the success of the project such as architects, electrical engineers, quantity Surveyors, mechanical engineers, contractors and plumbers.

1.6 Significance of the study

This study is of great importance since the recommended interior plans and layouts will be applied to the other housing units that the government seeks to construct in Zone B, C and D of Soweto East, Kibera. It may also act as a guideline to be used by the government and the private sector when coming up with future projects for low-cost housing in other parts of the country. In the long run, this will see an improvement of quality of life and living standards of not only the residents of Soweto East, Zone A but of other Kenyan citizens. The findings of this study will also enrich existing knowledge and hence will be of great interest to both researchers and academicians who seek to explore and carry out further investigations.

1.7 Limitations of the study

Limitations include resistance from some of the Kibera residents to participate in the research and most of them denying the researcher access to their houses. In addition, most of the residents speak Kiswahili which requires translation for easier analysis of results. The research also requires presentation of documents from the relevant authorities that the researcher is allowed carry out research in their premises and also initiating a good rapport with the correspondents before carrying out the research. More time will also be allocated for the analysis of the results. Another limitation is difficulty in getting to interview some of the professionals involved in the success of the project and lack of enough time and resources

to explore all aspects of the study. Prior interview arrangements will therefore be done with the professionals. In addition, most interviews will also be scheduled around the period.

1.8 Definition of terms

Low-cost housing - is housing that is meant for the middle-low income group in the society. It is reasonably adequate in standard and location. It may be provided by local government authorities or private housing associations, helping to assist those who cannot access accommodation in the private rental market. In Kenya, it may be sold at or close to Ksh. 1 million (Van Noppen, 2012).

Low income earners – In the Kenyan context, they are individuals who earn Ksh. 50,000 and below per month (Institute of Economic Affairs, 2015).

CHAPTER 2: LITERATURE REVIEW

Housing is a set of durable assets, which accounts for a high proportion of a country's wealth and on which households spend a substantial part of their income (HoekSmit, 2011). In the case of low income earners, they spend more proportion of their income on housing than high income earner (UNCHS, 1996). In most developing countries like Kenya, the low income earners form the larger part of a country's population size hence most governments strive to house these particular set of people. This may be due to the fact that most developers have failed to come up with housing for this group of the society because they are not considered to be credit worth for financing to have decent, affordable housing.

Taking Kenya as an example, the government set up KENSUP in 2004, so to provide low-cost housing to its low income citizens especially those residing in slums. Unfortunately, low-cost housing has been equated with low-cost materials, reduced size of interior spaces and location of the development. No much emphasis has been placed on aesthetics, cultural performance, lighting, arrangement of furniture pieces, partitioning and circulation and movement within these housing units.

2.1 The term 'flexible housing'

Flexible housing is housing that can adjust to changing needs and patterns, both social and technological. It allows for change of space depending on the needs of the dwellers in order to adapt diversity and change of resident's life. It enables people to occupy their homes in a variety of ways, not tied to the specifics of room designations, and allows them to make adaptations to their home. It also allows housing providers to adapt the mix of units, to change internal layouts, and also to upgrade their properties in an economic manner (Schneider & Till, 2007). It gives an individual some choice over how a space is arranged or used to support her or his activities and preferences. Control over the layout of a space can help an occupant manage privacy needs as well as opportunities for social interaction and changes in household characteristics such as growing or aging households. It creates efficient and comfortable homes. It also accommodates changing households and allows new owners a chance to personalize their homes while minimizing waste of materials and cost of make future changes. In general, flexibility is ability and potential of a building to change, adapt and reorganize itself in response to the changes (Estaji, 2017).

2.2 Flexible interior partitioning

Flexibility in Groák's definition, is achieved by altering the physical fabric of the building: by joining together rooms or units, by extending them, or through sliding or folding walls and furniture. Flexibility thus applies to both internal and external changes, and to both temporary changes (through the ability to slide a wall or door) and permanent changes (through moving an internal partition or external wall). Dash (2003) recommends wood

and hardboard siding, since they are available in most parts of the country and their in-place cost is generally lower than that of masonry. They are relatively easy to work with and are often installed by a carpenter. Disadvantages lie primarily in the need for painting or staining every few years, higher fire insurance rates, and susceptibility to termites and weather. Boehland, & Wilson, (2005) believe that low-cost housing is more acceptable if there are no common walls between bedrooms. Closets can help provide this separation. Interior walls should also be insulated and wall studs for acoustic isolation should be provided.

An example of where this concept has been implemented is in the Barcode Room. It is composed of product furniture-walls that freely move from side to side, permitting the resident to create unique spaces to fit a variety of uses. Functional elements, such as storage and furniture, are built into these walls, and these elements are hidden and revealed at different times of day as walls are moved and the elements are unfolded, creating a new interior with each configuration. The tucking away of spaces not in use also allows for a greater floor area available to the inhabitant and their guests. Through the use of the mass-produced furniture-wall or bar, a typical studio space made for a single resident can transform its use, becoming multiple transformable spaces, expanding and contracting when needed, rather than remaining a single room that can be simply arranged. Just as each object in a store has its own unique barcode, each usage of the apartment has its own unique layout.

Dolphin House is also a home composed of individual product rooms with slid able hanging units on a double rail system in the ceiling replacing all walled surfaces. Cruciform columns as the structural elements are located at the corner of each room into which the walls can be locked. Fixed furniture within the rooms is restricted by the wall units' radius of curvature as the walls are moved along rails and rotate around room corners. The furniture for each type of room is organized in three different configurations: circle, square, and line. Since floor and wall material can be customized, when multiple rooms are placed adjacent to each other and furniture styles are varied, room size, function, and materiality can be mixed throughout the house, generating a unique arrangement of rooms that can fit into almost any site condition. The systematic use of components allows users to fully control their spaces by deciding how to combine these parts to create a whole. Rather than piecing spaces together from various individual items at random, residents choose from cohesive units that, in conjunction with each other, create endless possibilities.

While the ideas of using a single space for multiple purposes, as well as folding various functions inside a wall, are not particularly groundbreaking, Barcode Room is unique because it is an easily replicated and customizable product. The rail and wall system that Dolphin House employs can also be mass produced and is created by modifying an existing product line by the Kimado Corporation called "dolphin windows." This line of products is unique because they create large open spaces by effortlessly moving wall-sized hanging windows along rails to a storage space. Both systems, either through generation or modification, result in products that can be reproduced in great numbers.

Through mass production, the modification of Dolphin House allows various materials to replace glass while using the same current rail system. These new materials create differences in transparency and openness that exist between the individual rooms. In the original product, the single rail guiding the product windows from open to closed positions limits the movement of the windows. To overcome this challenge, the rail in Dolphin House has been doubled under each beam, allowing all movable walls to be unlocked and pulled out in either direction and permitting them to travel freely through the space. A wall can be opened temporarily as a door, can trade places with another wall to change a room's materiality, or completely relocated to a storage area to link two or more rooms together for a longer period of time (Knezo, 2016).

2.3 Different furniture layouts in interior spaces

Fay (2005) states that the interior plans and layouts for low-cost housing should be in such a way that they allow flexibility within the spaces as these greatly contributes to increase in livability of residents living in these units. They should also be kept simple, regular/standard and to a bare minimum so as to make the most of the available space and allow maximum repetition of interior elements such as fittings, fixtures and materials. This provides residents with the choice in the way they use space and arrange furniture with the aim of allowing their living patterns to be accommodated as their needs change over time. It also meets social needs by allowing inhabitants a degree of personal expression and it also ensures that housing has a long life. Lack of it thereof, denies them the opportunities for self-expression results in isolation and stigmatization.

One of the earliest inventions to incorporate the concept of flexibility was after the Second World War when the interior of the low-cost housing was opened up in 1950 into what was described as an 'open plan space.' This meant that the conventional division between rooms disappeared, either through elimination or reduction of interior walls, and so the kitchen, living and dining room could occupy one free flow of space, running from the back to the front of the house. This meant that the open living space included a sitting area with sofa-beds and extendable dining tables to accommodate for guests, as well as a large pantry and island within a fully accessible kitchen. This meant that within the same space, one could entertain guests, watch television, work with a computer, use the telephone, relax, prepare meals and dine with friends and family (Ward, 2017). Another example would be the hallways, if their size is increased; it can be used for additional functional purpose such as study, library space, and bed or laundry niche. Storage cabinets and drawers built into the triangular space beneath stairways, library shelves along stairway walls; and display cases built into wall cavities (Brown, 1993).

Storage is critical as well. Low-cost house kitchens may need to include pantry cabinets, cabinetry with interior storage feature that increase efficiency, and overflow storage near/adjacent to the kitchen space. These are feature often omitted from low-cost houses house due to economy, yet may actually increase efficient use of space and are thus desirable. Where possible it is important to consider what the household has to store in the kitchen and how to accommodate any special needs for storage and access to storage space. Adequate counter space is needed in the kitchen and may be comparable to what is needed in a larger home. Counter space may be used as a work area for food preparation, to accommodate small appliances, and for storage or display space. Counter space in small kitchen is often cluttered if there is inadequate storage in the kitchen. Counter space may also be used for other household activities that require a horizontal work surface. Some counter space may need to be transition space between spaces/rooms (Grey, 2004).

However, in the early part of this century there was resistance to the idea and the responses to its introduction seemed more confused. So however much this is true and a completely open plan house did not seem to be universally liked, with time people have been able to identify the rooms to which they prefer for them to be combined and those they prefer to be private. One of the ways was having the boundary between public and private space shifted from the front door to the bedrooms. This meant that the whole of the ground floor of a house become an area for public entertainment and display whilst the bedrooms become private and for the family only (Roberts, 1990).

2.4 Multi-functionality in interior spaces

Multi-functional interior spaces are spaces which can be used in variety of ways, generally without making physical changes. This is primarily through the way the spaces are organized, the circulation patterns and the designation of rooms. Boehland, & Wilson, (2005) suggests combining functions of different rooms for space optimization. For example: combining a guest bedroom with a home office and provision for both television viewing and

music functions in the living room. Hartany & Le (n.d) developed a project with the idea of a single space that is surrounded by the essential minimums of services - kitchens and bathrooms that are pushed to opposite sides of the single large space. A series of angles sections of wall provide the connecting point for concertina panels. These walls allow the creation of different connections between different areas and keep their multi-functionality intact.

This concept of multi-functionality in interior spaces has been widely implemented by MacDonald, 1996; who has designed a number of affordable house prototypes including a studio home for single people ('unmarried workers, retired widows/widowers, single parents, young people and those leading a lonely and unremunerated contemplative life'). This studio home is a single-story building with a ground floor area of 18.2 square meters and a loft of 5.8 square meters (below the pitched ceiling) that can be used for storage, a bed space, or work area, depending on local regulations. The dwelling in the ground floor area has basic furniture including a sofa bed, dining table for two people, and a number of storage units and has a bathroom, walk-in storage space, a large living-sleeping space with kitchen joinery along one wall and a niche at one end in which a prefabricated fireplace can be installed. One of the strategies that have been employed to make the small space appear larger than it is, is having high ceilings of 2.6 meters. This highlights the importance of design, especially if construction costs are to be reduced by keeping floor area to a minimum.

Vander Rohe achieves multi-functionality in interior spaces by only building the perimeter walls and two columns within, which support the ceiling. Everything else is as free as possible. He then proceeds to produce cheap plywood walls. He then designs the kitchen and bathroom as fixed rooms, and the remaining space as variable dwelling space so that he is able to subdivide these spaces according to the needs of the occupant. This would also have advantages insofar as it would provide the possibility to change the layout of a unit according to changes within a family, without large modification costs. Any joiner or any down-to-earth laymen would be in the position to shift walls (Till & Schneider, 2005).

Provide quality detailing and finishes. By limiting the overall square footage of a house, more budget can be allocated to the detailing, materials, and finish quality to make a house special. Minimizing house size may also be a way to include some of the "green" building materials and products that cost more (natural granite countertops, linoleum, certified wood flooring, top-efficiency appliances, etc.) (Boehland & Wilson, 2005).Among the strategies he believes that flexibility in low-cost housing can be achieved entails increased dwelling size, decreased housing specificity, allowance for change (walls to be removed, added or moved), provision of movable elements such as wardrobes, cupboards and walls and provision of developments containing a number of different types of units allowing residents to move as their needs change i.e. children no longer live at home. On of the countries that have successful managed to incorporate well-designed interior plans and layouts in their low-cost housing project is Malaysia. Its commitment towards low-cost housing started during the First Malaysia Plan (1966-1970) while the private sector's involvement was in the Second Malaysia Plan (1971-1975) when the government realized the need and importance of the role of the private sector in ensuring an adequate supply of low cost housing for the country. Its commitment continued through to the Seventh Malaysia Plan (1996-2000), Eight Malaysia Plan (2001-2005) & Ninth Malaysia Plan (2006-2010). More encouragement was placed on the private sector to build more low- and low-medium-cost houses in their mixed-development projects while the public sector concentrated on building low-cost houses as well as houses for public sector employees, the disadvantaged and the poor in urban and rural areas (Ghani & Lee, 1997). One of the ways the government of Malaysia set out to achieve this was to establish a set of standards for the design and interior planning of these low-cost houses. The floor space for the terrace house was 48-60m2 while that of the flats was 45-56m2. The Terrace Houses and flats was to have a minimum number of bedrooms being 3 with the first room having a minimum area of 11.7m2, the second room having 9.9m2 and the third room having 7.2m2. The kitchen's minimum area for both the terrace

and flats was 4.5m2. The living and dining rooms for the terraces and flats had either to be a combined space or separately with adequate area for both rooms. The bathroom and toilets for the terraces and flats were to be provided separately with a minimum area of 1.8m2 each. The storage space and porch for the terraces and flats was to be designed in such a way that there was adequate provision for resident's convenience and comfort (Idrus, Noraliah & Chin 2008)

CHAPTER 3: METHODOLOGY

3.1 Research Design

Case studies are intensive analysis and descriptions of a single unit or system, for example, individuals, events or groups bounded by space and time (Hancock & Algozzine, 2016). In this study, the case study model is applied since the researcher seeks to gain in-depth understanding of how the flexibility of interior spaces, if at all there is, of the Kibera Soweto East Housing Projects affects the living standards and quality of life of its residents. Insights and results from this case study are then be used to propose ideal interior plans and layout for other low cost housing projects in Kenya.

3.2 Population of the Study

The population for this study mainly will consist of the residents living in Soweto East, Zone A whose population is estimated to be around 10,000. The different professionals who were involved in the project such as the electrical engineers, architects, plumbers, contractors, mechanical engineers and quantity surveyors are also be included in the study.

3.3 Sampling Procedure/Method

Purposive sampling is used to identify professionals involved in the project who are seven in number. They include Architect Koech, Quantity Surveyor Busei, Engineer Mutalanga, Engineer Wambugu, Contractor Muthinga, Engineer Koech and Plumber Karago. Stratified random sampling design is also used to come up with a properly representation of the residence of the Kibera Soweto East Housing Project who participated in the study which is 100. The population is grouped into strata, and then simple random systematic sampling is applied to each stratum. In this case, the strata is 2 i.e. residents who live in the one bedroom and two bedroom apartments.

Population	Target Size
Residents	100
Project Professionals	10
Total	110

3.4 Data Collection Methods

The following are the qualitative data collection methods, in order of priority, undertaken in this study;

3.4.1 Examination of documents

It is the analysis of existing resources, like government reports, personal documents, books, articles in newspapers or medical records (Prior, 2003). In this study, policies, guidelines and reports on The Kibera Soweto East Housing project at the ministry are critically analyzed. Information in journals, books and media publications on low-cost housings and especially on their flexibility both in Kenya and worldwide are also looked at in detail and provision.

3.4.2 Interviews

An interview is a product of interaction between the researcher and the interviewee and it may be structured, semi-structured or open/in-depth, dependent on the characteristics of structuring the interview by the researcher. Interviews are useful to explore experiences, views, opinions, or beliefs on specific matters. Accounts can be explored and compared to others, to develop an understanding of the underlying structures of beliefs (Green & Thorogood, 2010). In this study, semi-structured interviews are conducted so as to obtain first-hand information and reactions from the residents in regards to their houses. This is indeed of great importance to the research as it helps one understand what the real issues are and get suggestions directly from the residents on how to improve the interior spaces of these low-cost housing units. The professionals interviewed also help in understand how the low-cost housing project was conceptualized, implemented and the results thereof.

3.4.3 Observation

It is used to understand phenomena by studying people's accounts and actions in an everyday context. It may be non-participating observation, for example, by using video recordings or participant observation or ethnography where the researcher participates, overtly or covertly, in people's daily lives for an extended period of time, watching what happens and listening to what is said (Hammersley & Atkinson, 2007). Participant observation or ethnography is applied in this study. The researcher keenly watches and attentively listen as the residents go about performing their different tasks/functions within the interior spaces. This is of importance as it helps greatly achieve objective three of this study.

3.4.4 Taking of photographs

Photographs are used to critically and objectively analyze the interior spaces of the existing project. This is of great importance as it allows in-depth analysis of the plans and layouts due to the available of more time.

3.5 Data Analysis

Descriptive statistic is applied on the qualitative data through the use of percentages. Content analysis is also conducted so as to make in-depth inferences towards the accomplishment of the four study objectives.

3.6 Data presentation

From the analysis, inferences and information obtained will be presented in form of text as well as graphical charts.

CHAPTER 4: DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Different furniture layouts in interior spaces

The government did try to ensure that the low-cost houses are kept simple, regular/standard and to a bare minimum in very many aspects as illustrated in image 1 and 2. This entails installing standard window and door sizes, eliminating storage facilities apart from the kitchen, installing tiles for the floor, walls for the bathroom and counter top for the kitchen and also installing normal light fixtures, kitchen shelves and sanitary ware. The toilet and bathroom have been separated as well which allows one to use the different rooms at the same time. The kitchen shelves, in particular, have been left open so as to allow one to modify them in the best way that accommodates their lifestyle as illustrated in image 3.

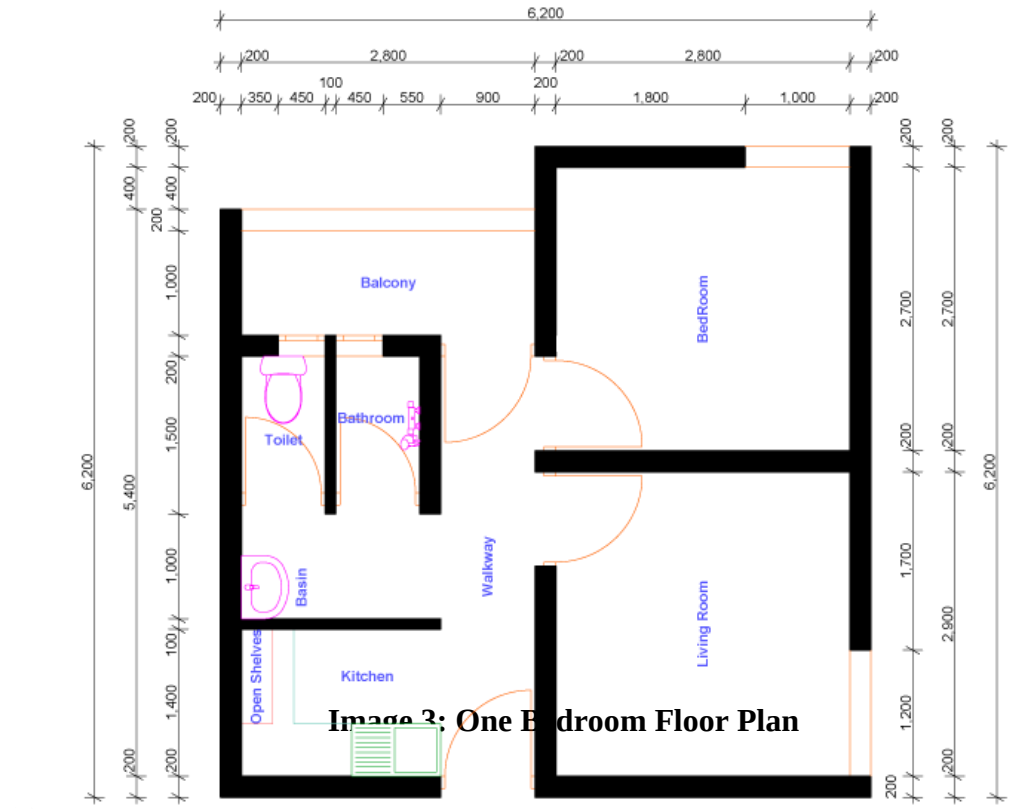


Image 3: One Bedroom Floor Plan



Image 4: Two Bedroom Floor Plan

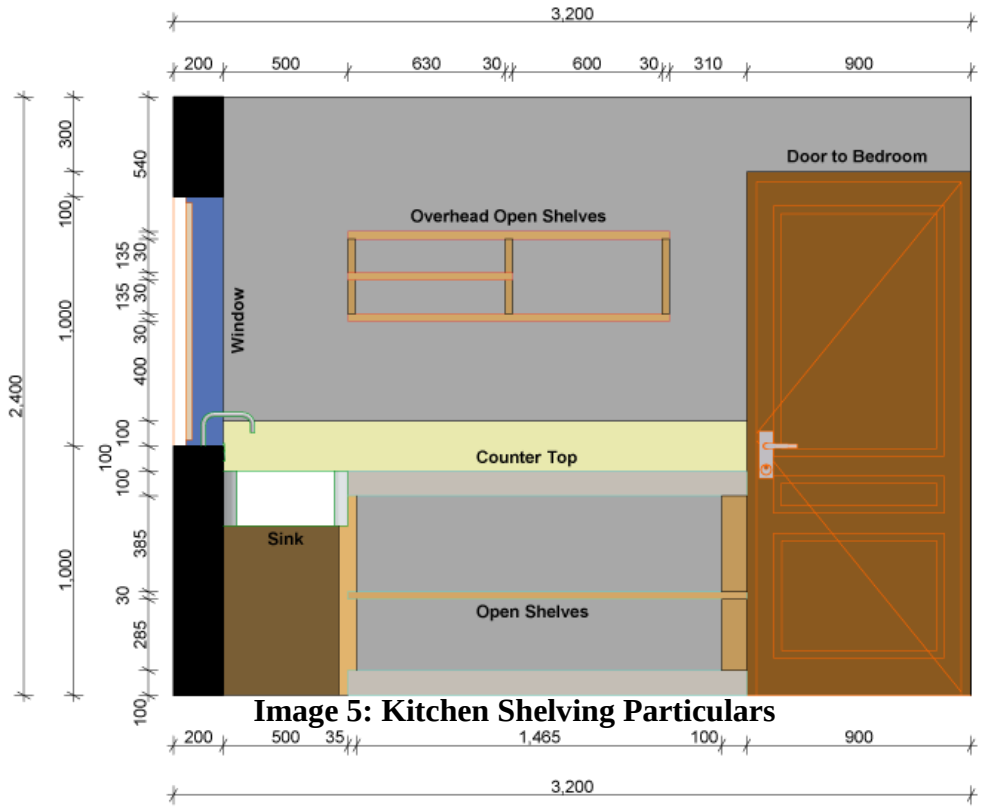


Image 5: Kitchen Shelving Particulars

However, there is an extent to which flexibility has not been attained in the individual spaces and in the entire house as well. The living room of the one bedroom house can only accommodate two furniture layouts while that of the two bedroom house can only accommodate three furniture layouts when maximizing on space. This limitation exists majorly due to the positioning of the window. One furniture layout for the one bedroom living room can only accommodate an L-sofa (five seater), table, TV. Cabinet and four stools while the other layout can only accommodate a three and one seater sofa, stool, table, TV. Cabinet and four stools. This is indicated in image 4 and 5 respectively. The residents believe that more space would be available for the living room if it would be combined with kitchen to make one single room. The partitioning walls would be eliminated thus allowing inclusion of more furniture pieces with its different layouts plus increased circulation.

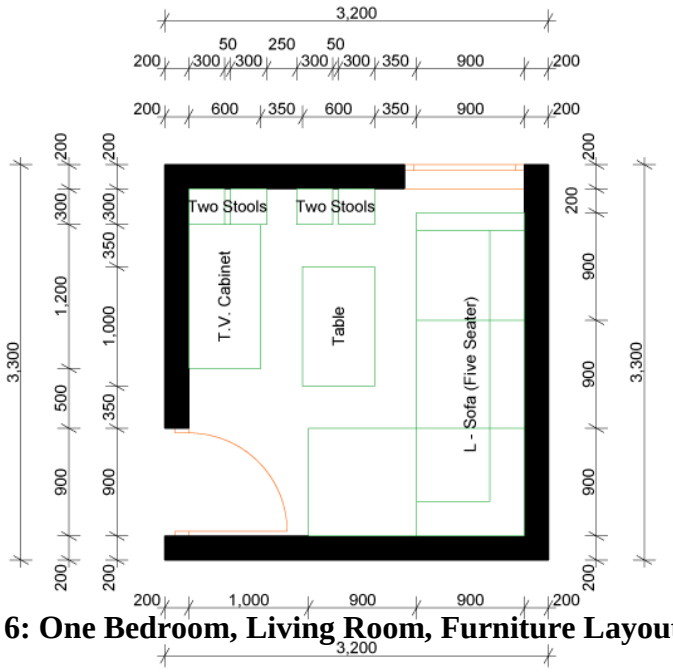


Image 6: One Bedroom, Living Room, Furniture Layout One

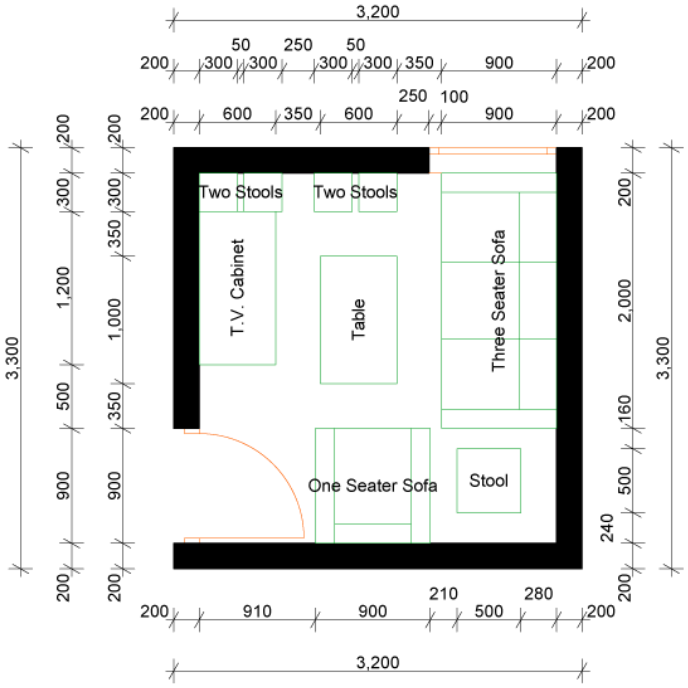


Image 7: One Bedroom, Living Room, Furniture Layout Two

As for the living room of two bedroom house, it can only accommodate three furniture layouts. The first layout accommodating an L-sofa (six seater), table, TV. Cabinet and four stools, the second layout accommodating an L-sofa (five seater), table, TV. Cabinet and four stools while the third accommodating a three and one seater sofa, stool, table, TV. Cabinet and four stools; all illustrated in image 6, 7 and 8 respectively.

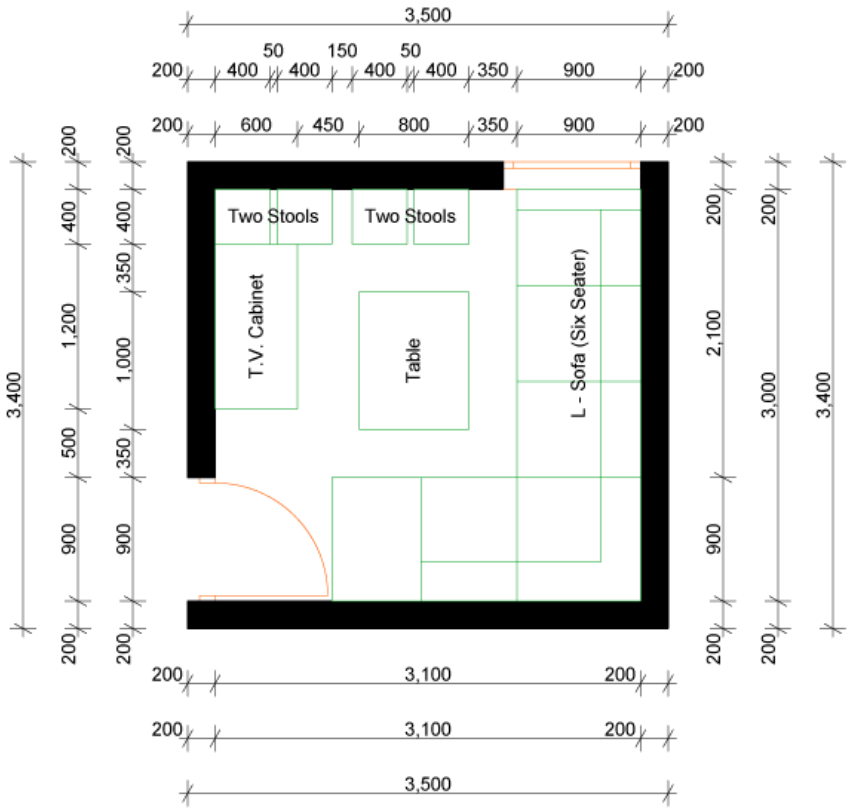


Image 8: Two Bedroom, Living Room, Furniture Layout One

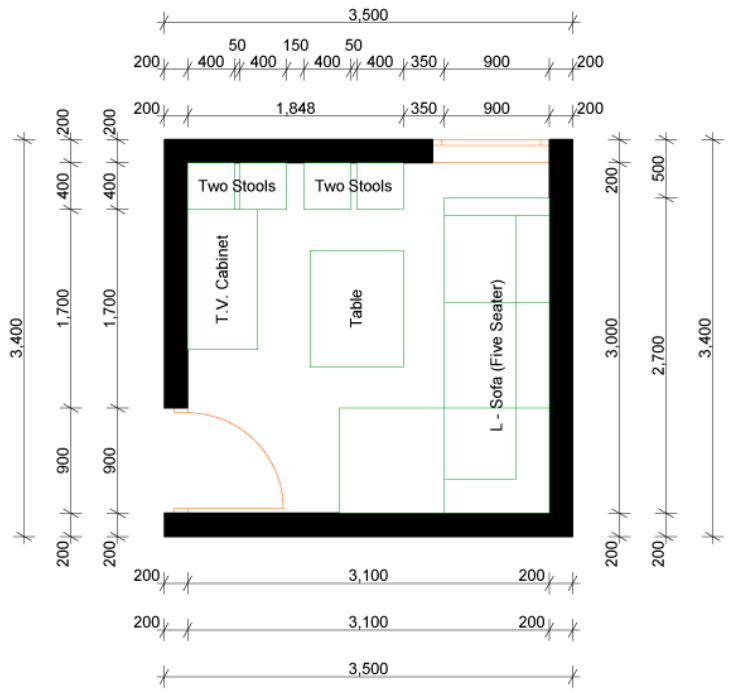


Image 9: Two Bedroom, Living Room, Furniture Layout Two

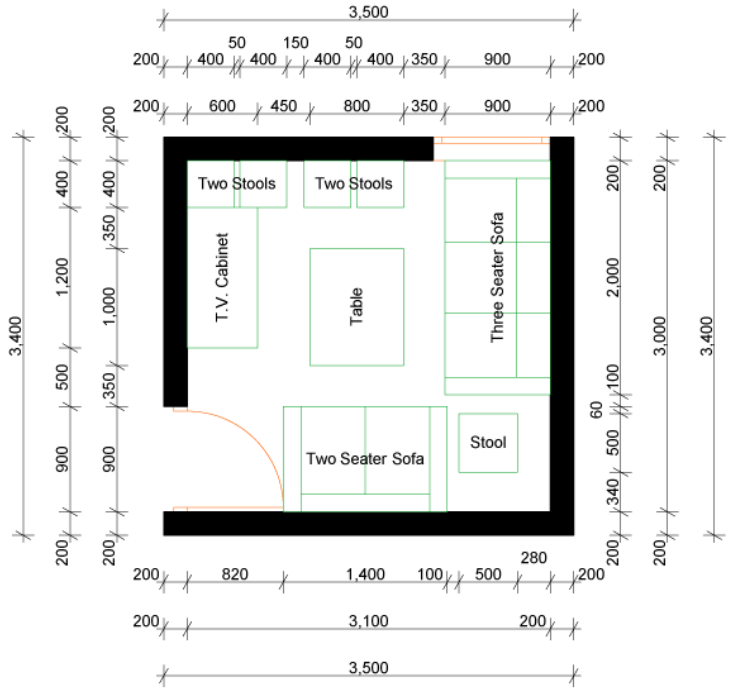


Image 10: Two Bedroom, Living Room, Furniture Layout Three

As for the bedrooms, the one bedroom house has only one furniture layout that accommodates a bed bunk (double bed), single bed, stool and wardrobes as illustrated in image 9 while that of the two bedroom house, has only two furniture layouts. The first one

accommodating a double bed, bed bunk (single bed), stool and wardrobes while the second layout accommodates a bed bunk (double bed), double bed, stool and wardrobes as illustrated in image 10 and 11 respectively.

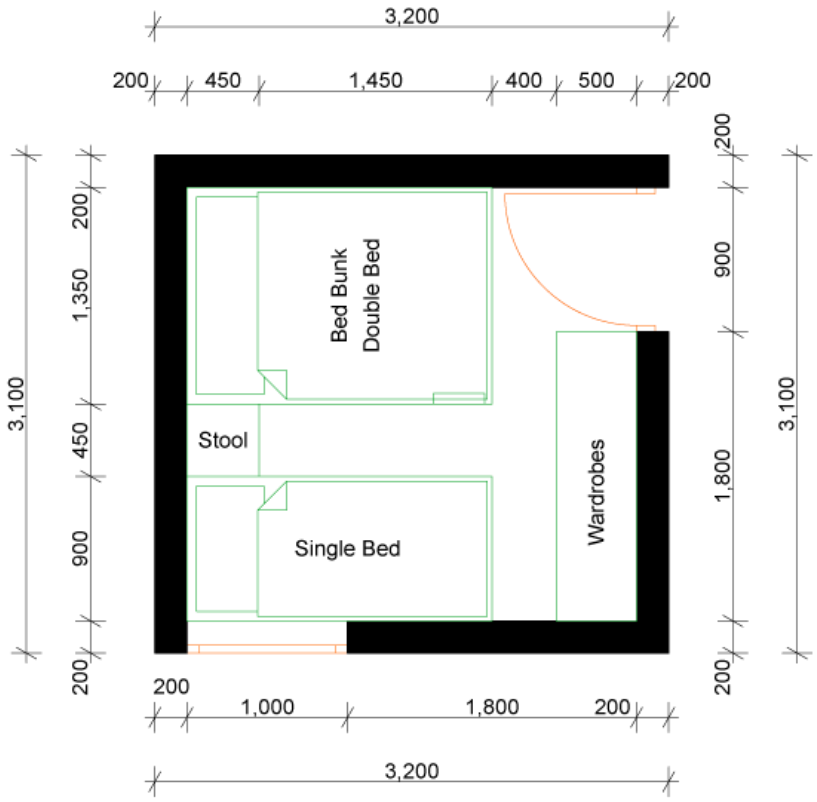


Image 11: One Bedroom, Bedroom, Furniture Layout

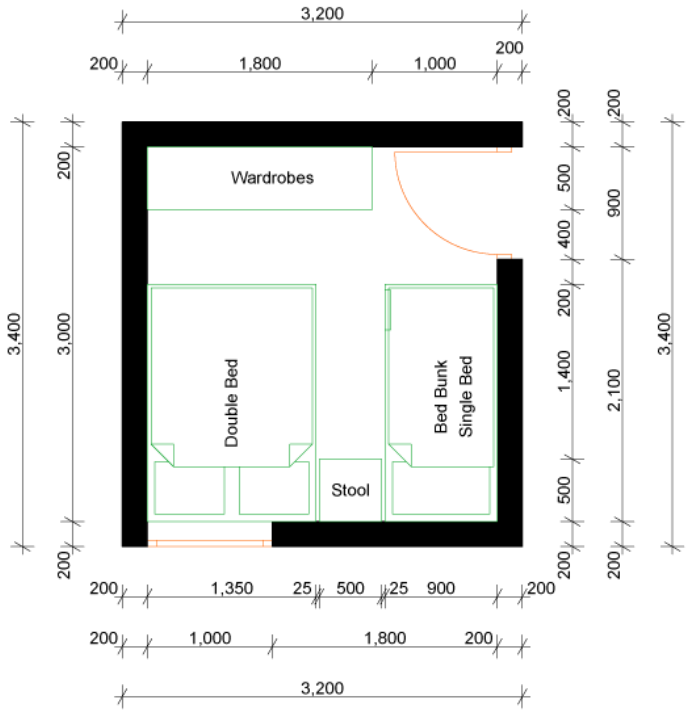


Image 12: Two Bedroom, Bedroom, Furniture Layout One

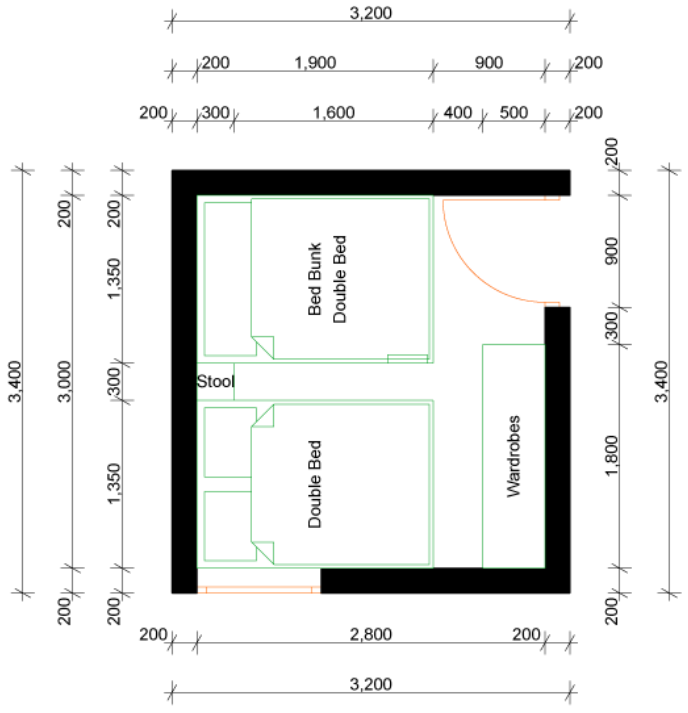


Image 13: Two Bedroom, Bedroom, Furniture Layout Two

The residents also felt it would be better if the rooms where of significant different sizes and make. This would mean that for each room the positioning of the windows, doors, sockets and switches would be different. This to them comes in handy when if they feel that one room

does not accommodated what they specifically want, then they have the option for one or two extra rooms that serves them right for the purpose to which they desire to use the rooms. For example, if they were of the opinion that the living room needed more space, then they would convert the biggest room to be the living room. This would in turn allow residents to add more furniture pieces while at the same time arrange them in whatever layout that is pleasing to them.

In addition, more windows would be provided considering the ceiling is quite low and the rooms are quite small as well. The windows would have more provisions for opening to allow more light and air to come into the spaces. This would enhance the aspect of bringing the outdoor environment into the interior spaces. More natural light as well would penetrate into the room hence bring the illusion of a bigger room. It would also increase the possibility of having a variety of furniture layouts since the arrangements would not be dependent on only one single window. It would also improve the aeration within the rooms hence reducing the aspect of the rooms being dump.

Having sockets on every wall, as suggested by Engineer Koech, would positively contribute to this phenomena as well. The residents also believe that more storage facilities especially those placed or hanged on the wall would have been provided, in particular, those which would work best for both living and bedroom setting. This then provides extra space at the floor area to accommodate more furniture pieces within the room. Also, since the rooms are small in size, the illusion of a bigger space would have been created by the construction of higher ceilings. This would also increase aeration within the rooms.

4.2 Multi-functionality in interior spaces

Multi-functionality has been achieved by ensuring that all rooms are of the same size and provision. This phenomenon allows residents to use whichever room they wish to as either the living room or bedroom/s since there is no specialty to any of them. However, the residents believe that more functionality and space would be achieved if the living room could be combined with the kitchen to make one big room. The kitchen counter top would then be used as a partial divider between the two spaces. Since the house is already small, this gives the illusion of a big room as well create more space for storage and aeration since the windows and door have been put to bare minimum. It would also allow for many activities to happen within the same place such as entertainment, interaction, cooking and many more.

Instead of a concrete wall in between the bedrooms, two or more columns and beams would be used to support the ceiling and the floors above it. The interior partitioning would then be made of closets that runs from the ceiling to the floor. Various functions could also be folded inside as well such as projecting tables and chairs. The most recommended is one that is made of wood e.g. plywood and is insulted as well. This would bring down the cost considering it's a low-cost house. The insulation would limit the noise from one room to another. This indeed provides more storage space not only for the bedroom but also for the entire house. It creates more floor space for bigger furniture pieces to fit in such as beds. The insulated wooden partition would be movable as well if possible on a rail. The other option would be for them to be supported by various steel bars that are screwed both to the ceiling and floor. The movement could be too and from as well as side by side. The partition would also have the element of it being retractable or expandable. With all these features in place, the partition should be in such a way that any joiner or down–to-earth laymen would be in a position to operate it. This phenomenon does allow residents to manipulate their spaces in whatever way that is suitable for them. Sliding doors that run inside the partition from one end to another could be provided to allow residents to have doors in whatever position that works best for their home setting.

The hallway to the different rooms would be eliminated. The space created would then be distributed to the living room and bedroom so as to create more space. The entrance door would be placed in the living room and this would facilitate maximization of space. The doors to the two bedrooms would share the same wall as that of living room and kitchen. According to the residents, this arrangement would help in creating more space for the rooms.

More functionality in the kitchen and bathroom would be achieved by increase in the number of cabinets and shelves available, even if it meant for them to move up. Also, some of them would be closed (provision of doors) for privacy as well as aesthetics. This would be achieved by use of sliding doors. The residents also felt since the houses were constructed to bare minimum, the interior finishes and fittings already installed would be detailed and of better quality. Some of them complained that within the first two years, kitchen sink were breaking down, toilet seats and showers were broken, kitchen cabinets were weak, paint was chipping off and many other malfunctioning due to use of low quality material.

CHAPTER 5: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS.

Elimination of the corridors to create more space for other rooms. This applies to the partitioning walls as well thus allowing inclusion of more furniture pieces with different layouts plus increased circulation. Employ the open plan concept by combining the living room and kitchen into one big space. The kitchen counter top would then be used as a partial divider between the two spaces. This allows for different furniture layouts as well as performs of different tasks and functions within a particular space. Addition of cabinets in the kitchen all the way to the ceiling. This provides more space for storage hence more room for circulation. Creating more storage space by installing floor to ceiling cabinetry. Addition of extra windows since these was one of the limitations of accommodating different furniture layouts within a space.

Introduction of movable closets that are supported by strong steel bars that are screwed both to the ceiling and floor. They are made of wood, preferably MDF boards or plywood. They may be insulated as well to prevent noise. At the end, the partition may be folded or unfolded to facilitate its movement to and from. They may have the element pull-out shelves and partitions that are projected when need be or retracted when not in use. This partition can move to and from to certain extent. Replacement of the hinged door with the sliding doors. This eliminates the space occupied by the door inside the room when open hence creating more space for other functions to take place.

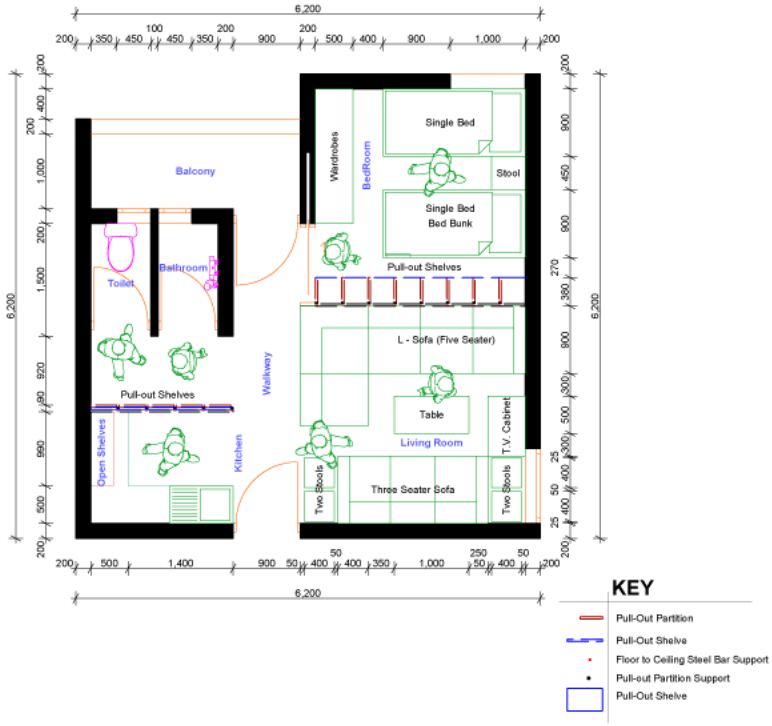


Image 14: One Bedroom, Floor Plan, Option One

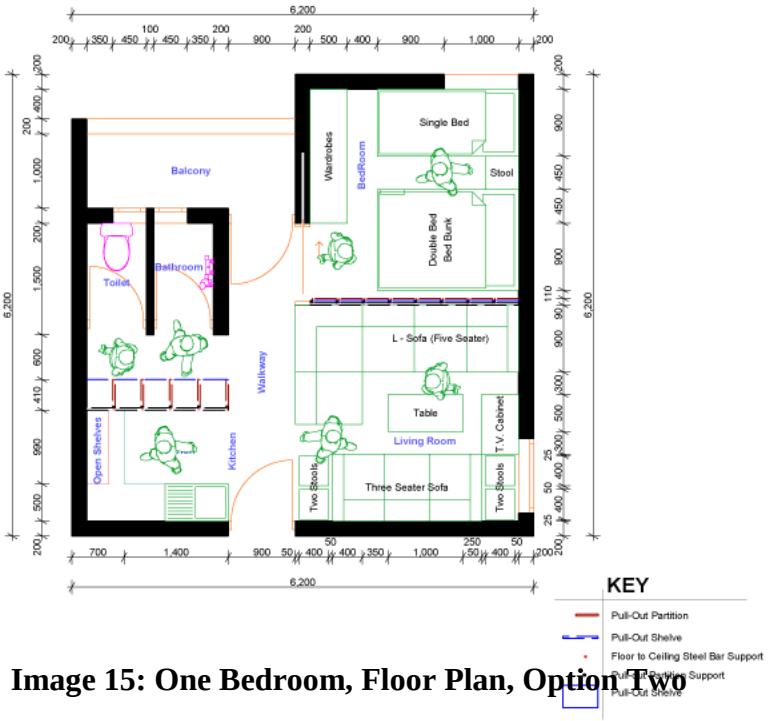


Image 15: One Bedroom, Floor Plan, Option Two

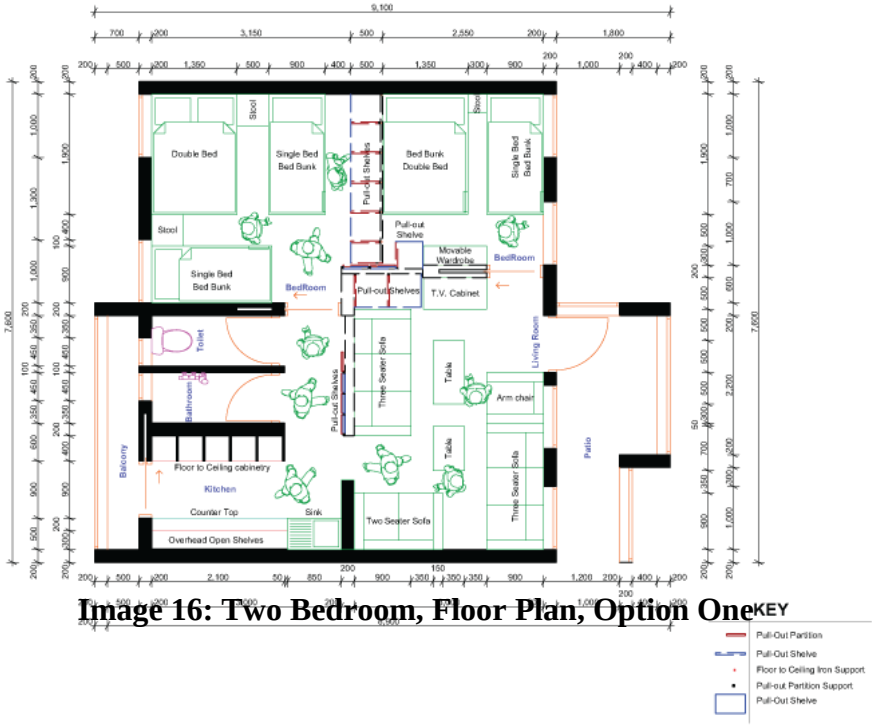


Image 16: Two Bedroom, Floor Plan, Option One

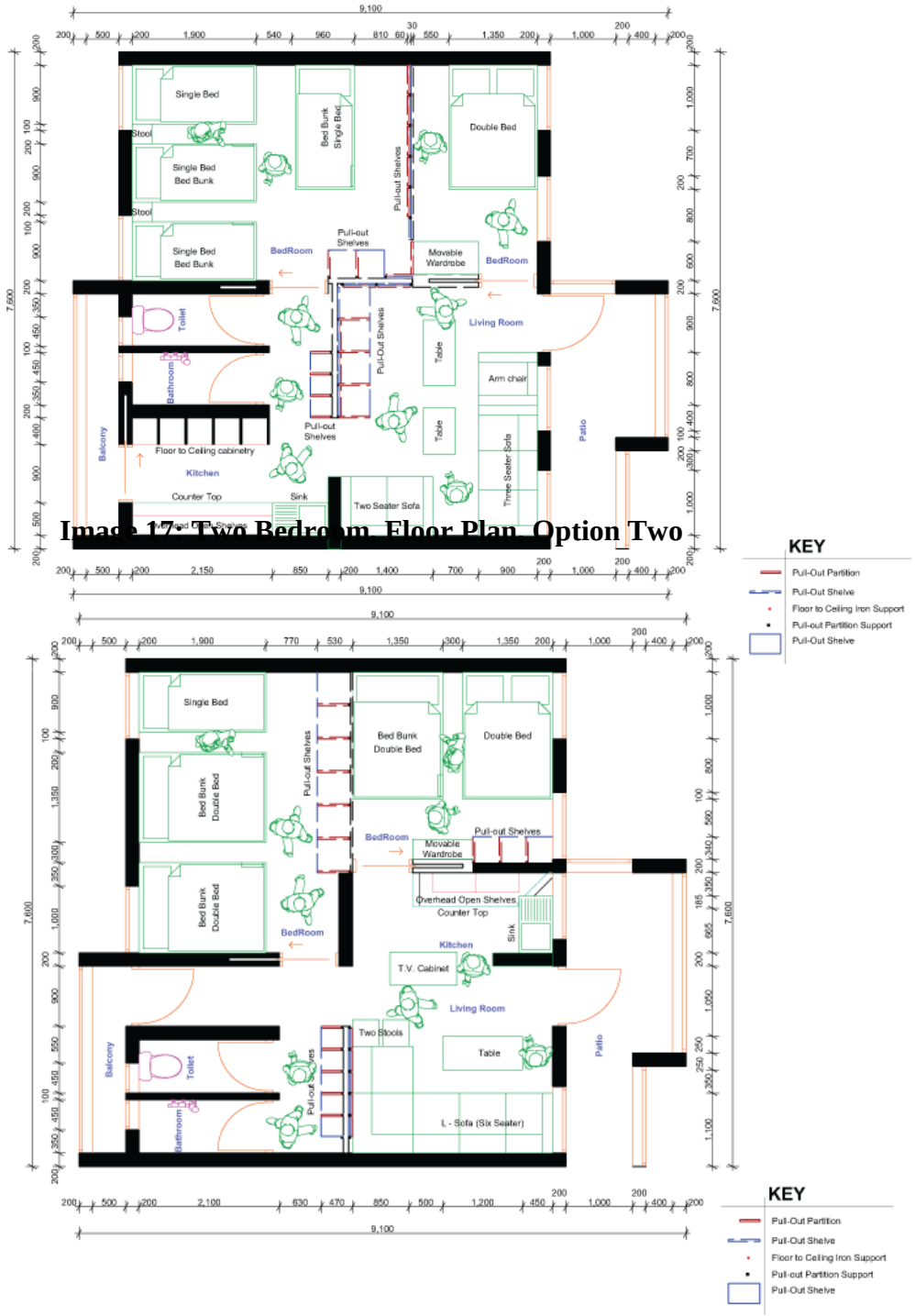


Image 17: Two Bedroom Floor Plan Option Two

Image 18: Two Bedroom, Floor Plan, Option Three

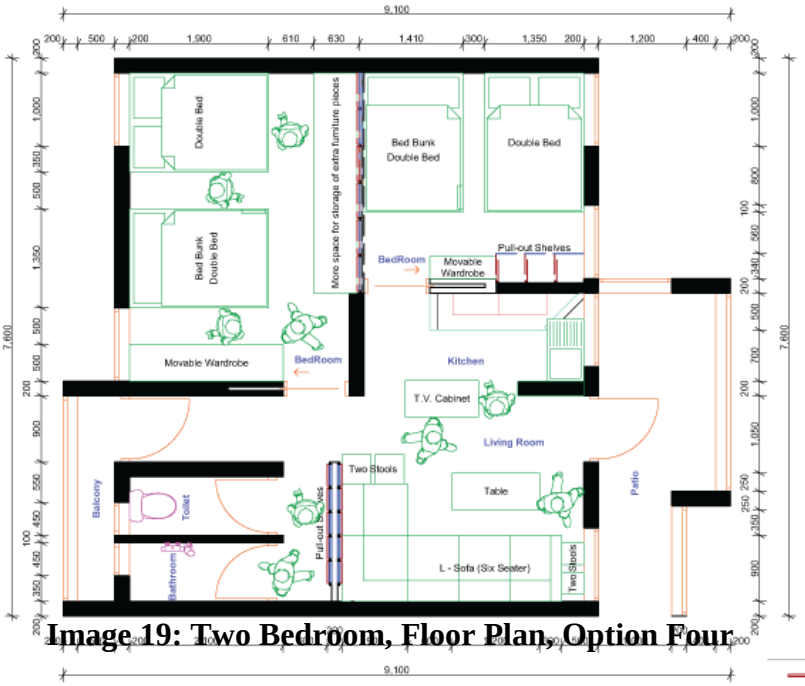


Image 19: Two Bedroom, Floor Plan, Option Four

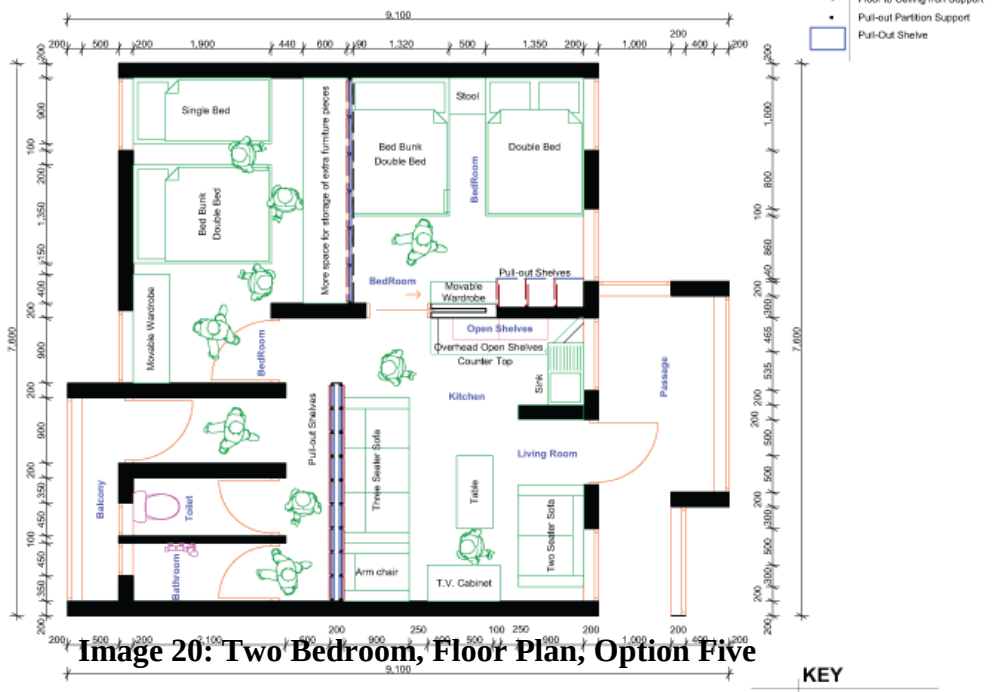


Image 20: Two Bedroom, Floor Plan, Option Five

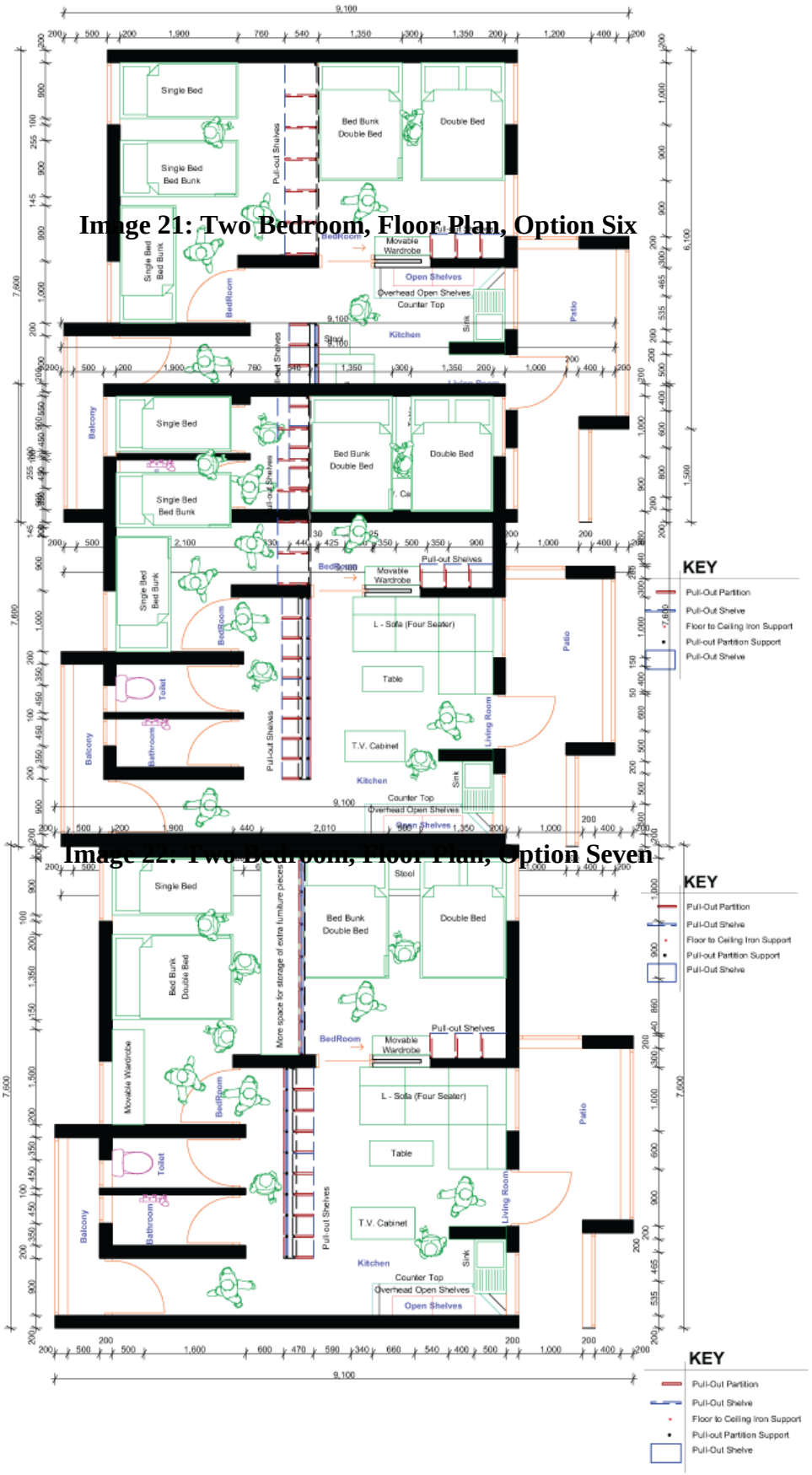


Image 21: Two Bedroom, Floor Plan, Option Six

Image 22: Two Bedroom, Floor Plan, Option Seven

Image 23: Two Bedroom, Floor Plan, Option Eight

REFERENCES

Ahn, M., Beamish, J., Parrott, K., & Emmel, J. (2015). Kitchen Space Planning in Small-Scale Houses. 83-94.

Akyalçın, B. (2015). Investigating and Categorizing the Concept of Flexibility in Mobile Interior Spaces: The Case Study of Yacht Interior Spaces. 8-60.

Boehland, J., & Wilson, A. (2005). Small is Beautiful. *Journal of Industrial Ecology*, 286-287.

Canepa, S. (2017). Living in a Flexible Space. *Materials Science and Engineering*, 1-10.

Cooper, R. D., & Schindler, S. P. (2009). *Business Reasearch Methods* (10th Edition ed.). Tata McGraw Hill, New.

Daily Nation. (2010a). *Myth shattered: Kibera numbers fail to add up.*

Daily Nation. (2010b). *How numbers game turned Kibera into 'the biggest slum in Africa'.*

Dash, K. (2003). Exterior and Interior Wall Materials. 146-147.

Davis, S. (1997). The architecture of affordable housing.

Estaji, H. (2017). A Review of Flexibility and Adaptability in Housing Design. *International Journal of Contemporary Architecture "The New ARCH" Vol. 4, No. 2*, 37-49.

Fay, R. (2005). Design Strategies For Affordable And Sustainable Housing. *Environment Design Guide*, 1-9.

Ghani, S., & Lee , L. M. (1997). *Low Cost Housing In Malaysia.* Kuala Lumpur: Utusan Publications & Distributor Sdn. Bhd. .

Gjakun, M. (2015). Flexibility And Comfort In Limited Dwelling Interior. 15-62.

Gjakun, M. (2015). FLEXIBILITY AND COMFORT IN LIMITED DWELLING INTERIOR. *UPDATED CONSIDERATIONS REGARDING TECHNICAL POSSIBILITIES, FUNCTIONALITY,TRENDS AND IMPACTS ON CONTEMPORARY LIVING SINCE THE PERIOD OF 1970s*, 38-190.

Grey, J. (2004). Trends in Kitchen design. Northwest Renovation: A Home Improvement Magazine.

Hammersley, M., & Atkinson, P. (2007). *Ethnography: Principles in practice.* Routledge.

Hanser, A. (2003). Assembly + Diassembly Of Interior Wall. 1-4.

Hartany, J., & Le, A. (n.d.). On flexible spaces and modularity.

Hoek-Smit, M. C. (2011). *Government Policies and their Implication for Housing Finance.*

Idrus, N., & Ho, C. S. (2008). *Affordable and quality housing through the low cost housing provision in Malaysia.*

Jones, T., Pettus, W., & Pyatok, M. (1997). *Affordable Family Housing.* Mulgrave: The Images Publishing Group Pty Ltd.

Jones, T., Pettus, W., & Pyatok, M. (1997). *Good Neighbours: Affordable Family Housing.* Mulgrave: The Images Publishing Group Pty Ltd.

Kiiskinen, A. T. (2016). A Design Concept Proposal About Compact Living Units : Use Case For Student Housing. 7-122.

Knezo, A. (2016). Empowering Design through Flexible Personal Space. 32-37.

Köhn, D., & Von Pischke, J.D., J. D. (n.d.). *Housing Finance in Emerging Markets.* Springer.

MacDonald. (1996). *Practical Solutions to Today's Housing Crisis. .* New York: Whitney Library of Design.

Raviz, S. R., Eteghad, A. N., Guardiola, E. U., & Aira, A. A. (2015). Flexible Housing: The Role Of Spatial Organization In Achieving Functional Efficiency. *International Journal of Architectural Research*, 65-75.

Roberts, M. (1990). Gender and Housing: The Impact of Design. *Built Environment (1978-), Vol. 16, No. 4, Women and the Designed Environment*, 257-268.

Robson, C., & McCartan, K. (2016). *Real world research.* John Wiley & Sons.

Rosa, A., Flores, F., & Bernard, C. (2012). *The Kibera Soweto East Project.* Nairobi, Kenya.

Schneider, T., & Till, J. (2005). Flexible housing: the means to the end. *Theory*, 287-295.

Schneider, T., & Till, J. (2007). Flexible Housing. 3-17.

Standard Media. (2010b). *How numbers game turned Kibera into 'the biggest slum in Africa'.*

Susanka, S., & Obolensky, K. (1998). *A Blueprint for the Way We Really Live.* Newtown: The Taunton Press Inc.

Till, J., & Schneider, T. (2005). Flexible housing: opportunities and limits. *Theory*, 157-164.

UN-HABITAT. (2008a). *Minutes of the Design and Redevelopment Committee Meeting.*

UN-HABITAT. (2008b). *Soweto East Redevelopment Proposal.*

UN-HABITAT. (2008c). *UN-HABITAT and the Kenya Slum Upgrading Programme Strategy Document.* Nairobi.

Van Noppen, A. (2012). *The ABC's of Affordable Housing in Kenya.*

Ward, K. (2017). *An Evidence-Based Approach to Designing Low-Income Housing Communities.*

Comparative Analysis of Compressive Strength of Bamboo Leaf Ash and Baggash Ash Concretes

Oluwaseye Onikeku [a], Stanley Muse Shitote [b], John Mwero [c], Adeola. A. Adedeji [d]

[a] Civil Engineering Department, Pan African University Institute for Basic Sciences, Technology and Innovation (PAUISTI), 62000-00200 Nairobi, Kenya

[b] Civil Engineering Department, Rongo University, 103-40403 Rongo, Kenya

[c] Civil Engineering Department, University of Nairobi, Nairobi, Kenya

[d] Civil Engineering Department, University of Ilorin, Ilorin, Nigeria

*Correspondence: oluwaseyeonikeku@yahoo.com; +254796217159

Abstract:

Billions tons of conventional concrete are produced yearly as well as cement which emit large tons of carbon dioxide due to huge millions of metric tons produced annually. Sequel to this, there is need to produce a sustainable product due to pollutions from cement production, using agricultural waste materials which have recently been found to be of great interest to construction industries at large due to their ability to substituting cement will solve environmental and pollution related issues. Bamboo leaf ash and baggash ash are produced as a result of combustion which serves as supplementary cementitious materials and can be used for construction purposes. This study determines the compressive strength of concrete without ashes, bamboo leaf ash, and baggash ash concrete at varying percentage replacement of 5%, 10%, 15%, 20% respectively. Physical test, workability test, compressive strength test, and durability test was performed on concretes. A total of 138 cubes were produced using 100*100*100 size cube cured at 7, 28, 56 and 90 days, of which 108 cubes were to ascertain compressive strength for all the concretes, while 30 cubes were used for durability test. Based on experimental results obtained, BLA surpassed BA concrete, and concrete without ash in term of compressive strength at early and later age of curing using 10% as optimum level of replacement, thus, one way ANOVA indicated, that BLA concrete is statistically better than BA concrete and statistically the same at 56 and 90 days of curing for conventional, BLA, and BA concrete. Furthermore, BLA and BA concretes reduced durability. BA concrete increased the water absorption, permeable voids, and sorptivity. As a result, BLA and BA can be considered as a good pozzolanic material which can save cost of construction, improved concrete properties.

Keywords: Concrete, Physical Test, Compressive Strength, Durability Test, Bamboo Leaf Ash, Baggash Ash, One – Way ANOVA.

Introduction

There is heavy dependence on cement most especially the construction industry for the purpose of concrete production (Alabadan, Olutoye, Abolarin & Zakariya, 2005). Concrete of 10 billion tons are largely produced around the world (Mehta & Montero, 2006). Ensued, cement is one of the most vital binding materials in terms of quantity produced. It is produced at very high temperatures which consumes a lot of energy of about 4GJ (Suhendro, 2014). It

emits harmful gases which pollute the atmosphere (Dhinakaran & Gangava, 2016). According to (Statista, 2017)"Cement production around the world was estimated to be 4100 million metric ton, thus, 1 ton of cement emits 0.94 ton of carbon dioxide into the atmosphere (Pan & Padavoni, 2003). As a result of this menace has led to thorough research into various materials which can be utilised as cement supplementary so as to save on construction cost, eliminate environmental hazards, and need to improve performance of concrete. Most new biogenic waste materials to date are attained by partial replacement of cement with any of the many wastes (industrial, agricultural, construction, etc.) and non-waste materials.

Bamboo leaf ash is a pozzolanic agricultural wastes due to it high silica content and it is said to be amorphous in nature (Asha, Salmad & Kumar, 2014). Bamboo leaf ash is obtained as a result of combustion of bamboo leaves. The ash content of bamboo is made up of inorganic minerals, primarily silica, calcium, and potassium. Manganese and magnesium are two other common minerals. Silica content is the highest in the epidermis (Li, 2004). Application of these waste as cement replacement not only reduces the economic and environmental problems associated with the waste disposal (Patil & Kumbhar, 2012; Wong, Hashim & Ali, 2013) but also reduces the CO2 emissions during cement manufacture which requires extreme heat (Anupam, Kumar & Ransinchung, 2013).

According to the studies conducted by (Modani et al., 2013; Subramaniyan et al., 2016; Abdulkadir et al., 2014) indicated that sugar cane baggash ash is an excellent pozzolana. Baggash is the dry pulpy left after the extraction of juice from sugar cane (Babu, 2017). Sugar cane baggash ash is a pozzolanic material which improves the strength of concrete over some period of time. It contains high amount of silica and carbon materials, some minerals like calcium, potassium, and magnesium oxide are present as minor compounds.

One way analysis or single factor analysis of variance is used for establishment of fact whether there are statistically significant differences between the means of two or more independent unrelated groups (Kim, 2017). This study has therefore established the difference which existed between conventional, bamboo leaf ash, and baggash ash concrete by using one way ANOVA test.

Materials and Methods

Materials

The materials employed for this research work were ordinary portland cement (OPC) type 1, bamboo leaf ash (BLA), baggash ash (BA), water, coarse aggregate (CA), fine aggregate (FA), and superplasticizer. Bamboo leaves were fetched from Mau forest located in the rift valley of Kenya. The sugar cane ash was gotten from sugar manufacturing industry located in Kakamega county of Kenya. CA, FA, superplasticizer and cement were purchased in Kenya. Lastly, portable water was used.

2.2 Methods

The methods utilised in these research are listed in Table 1. Sampling was in accordance with techniques stated in BS EN 12350-1 (2009). Cubes of sizes 100 × 100 ×100 mm was used for all the test. A total number of 132 cubes were prepared and cured in according to the methods stipulated in BS EN 12390-2 (2009) for all the test. Cubes for compressive strength test were cured for 7, 28, 56, and 90 days while the remaining cubes for water absorption, permeable void, density, and sorptivity were cured for 28 days. Three samples were produced for each test.

Table 1. Test methods

Test on Component Materials	Test on Hardened Concrete

Test Conducted	Standard Adopted	Test Conducted	Standard Adopted
Aggregate specific gravity	BS EN 1097-6	Compressive strength	BS EN 12390-3
Sieve analysis (BLA, BA)	ASTM D7928-7	Water Absorption	ASTM C642
Sieve analysis (aggregates)	ASTM C33	Permeable voids	ASTM C642
Aggregate water absorption	BS EN 1097-6	Hardened density	ASTM C642
Voids in aggregate	ASTM C29	Sorptivity	ASTM C1585
Aggregate density	ASTM C29		

Test Methods for Material Characterization

Grading process for aggregates was performed in line with ASTM C 33 (2003) techniques using sieves in accordance with BS ISO 3310-2 (2013) , aggregate sampling was conducted in accordance with BS EN 932-1 (1997) requirements for purpose of batching. Bamboo leaves were allowed to sun dry to expel water content, later undergo burning to remove inorganic materials that might be present in it, it was further calcined at 650^{0}C using muffle furnace at 2 hours retention time, after cooling, it was sieved using 0.15mm sieve. Baggash ash was collected from the sugar industry and was sieved using sieve size 0.15mm.

Mix Design and Mix Procedure

The portland concrete mix design for grade 25 was carried out in line with BS EN 206 (2014) and BS 8500 -2 (2012). A total of 9 mixes were prepared. Table 2 shows the details of all the mix proportions. Water binder ratio (w/b) of 0.5 was kept constant for all the mixtures using 195kg/m^3 of water. The cement was partially replaced by 5%, 10%, 15%, and 20% BLA and BA by weight of cement. Superplasticizer at 0.8% (by weight of cementitious material) for all mixes. Mixing was done manually as stipulated by BS EN 1881-125 (2013) [32] and was controlled with a mechanism to guard against loss of water and cementitious materials during mixing apportioning. The specific gravity for both BLA, BA, and cement were performed in line with ASTM C188 (2016), chemical analysis for both BLA, BA, and cement was executed using x-ray diffraction equipment in line with BS EN 196-2 (2013).

Table 2. Mix proportions for 25MPa concrete comprising BLA/BA

Mix Description [BLA/BA] (%)	Cement (kg/m^3)	BLA/BA (kg/m^3)	Superplasticizer (kg/m^3)	C.A (kg/m^3)	F.A (kg/m^3)	Water (kg/m^3)
Control	390	0	1.5	993	662	195
5% BLA	370.5	19.5	1.482	993	662	195
10% BLA	351	39	1.404	993	662	195
15% BLA	331.5	58.5	1.326	993	662	195
20% BLA	312	78	1.248	993	662	195

3.0. Results and Discussions

3.1 Material Characterization

Coarse aggregate (CA), fine aggregate (FA), bamboo leaf ash (BLA), and baggash ash (BA) materials were characterised in term of grading. Aggregates, BLA, BA, and cement are characterised in term of specific gravity. Aggregates are further characterised in term of fineness modulus, bulk density, water absorption, and void content.

Physical and Mechanical Properties of Materials

The specific gravity for aggregates and cementitious materials, bulk density, water absorption, silt content, fineness modulus, among others, are illustrated in Table 3.

Table 3. Physical and mechanical properties of materials

Property	BLA	BA	OPC	FA	CA
Bulk specific gravity	2.79	2.10	3.12	2.43	2.48
Bulk specific gravity based on SSD				2.52	2.56
Apparent specific gravity				2.68	2.80
Fineness modulus				2.55	
Silt content (%)				4.67	
Water absorption (%)				3.95	3.27
Loose bulk density (kg/m^3)	365	359	1398	1456	1417.5
Rodded bulk density (kg/m^3)	479	471	1435	1577	1495
Voids in loose aggregate (%)				39.33	45.75
Voids in rodded aggregate (%)				34.31	39.52
Maximum particle size (mm)	0.15	0.15	0.09	5	20

The gradation results for coarse aggregate, fine aggregate, bamboo leaf ash, and baggash ash are depicted in Figures 1 -4 respectively.

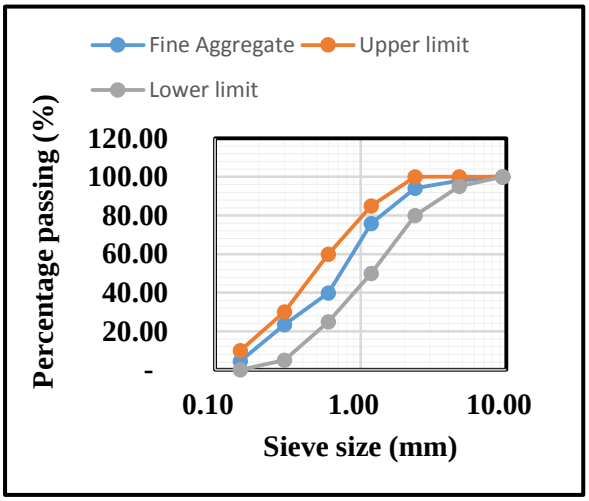


Figure.1. Particle size distribution of fine aggregate as per ASTM-33 standards

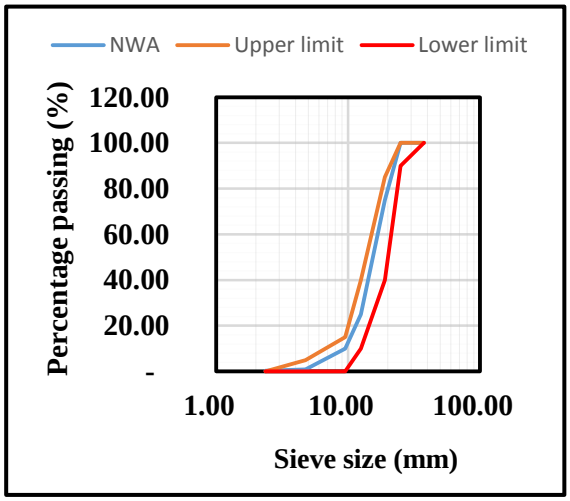


Figure.2. Particle size distribution of coarse aggregate as per ASTM-33 standard

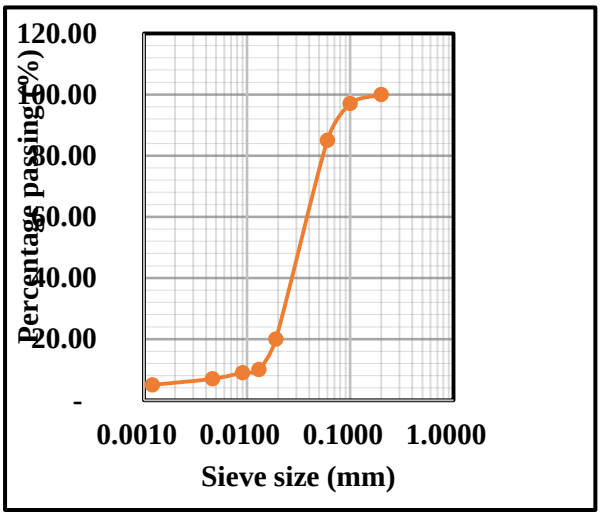


Figure 3. Particle size distribution BLA as per ASTM – D7928 standards

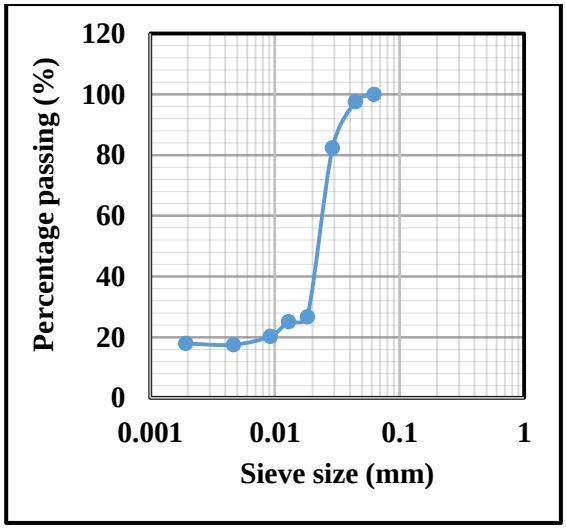


Figure 4. Particle size distribution of BA as per ASTM - D7928 standards

Figure 1 indicated that , the particle size of fine aggregate lies between 0.155 to 4.75mm within zone 2 which satisfies the requirement that the fine aggregate should be less than 45% retained on any sieve by ASTM – 33 (2003). The gradation for coarse aggregate as seen in figure 2 illustrated that ,90% of coarse aggregate were between 9.5mm and 25mm, the envelope curve was also between the upper and lower limit curve as stated by ASTM – 33 (2003). Figure 3 shows the particle size distribution of BLA, the figure indicated that, about 20% of its particles falls within 0.001mm (1 μm) to 0.02mm (2 μm) and 80% falls within 0.02mm (2 μm) to 0.15mm (150 μm) which was conforms with specifications of ASTM – D7928 (2017), based on this fineness particle behaviour, the water demand and surface area of the bamboo leaf ash was increased. The maximum particle size for bamboo leaf ash used in this work was 0.150mm (150 μm). Figure 4 shows the particle size distribution of BA, the figure depicted that, about 29% of its particles falls within 0.002mm (2 μm) to 0.02mm (20 μm) and 71% falls within 0.02mm (20 μm) to 0.070mm (70 μm) which was conforms with specifications of ASTM – D7928 (2017), due to this fineness, the water demand and surface area of the bamboo leaf ash was enhanced. The maximum particle size for baggash ash used in this work was 0.150mm (150 μm) .The fineness modulus of fine aggregate was 2.55, the fineness modulus conforms to ASTM -C33- (2003) which specified that fineness modulus should not exceed 2.3-3.1. Silt content 0f 4.67% for fine aggregate conforms to requirement of ASTM – C33 (2003) of not exceeding 5%. The specific gravity of 2.43 and 2.48 for fine and coarse aggregate was in line with the limit stated by ASTM – 33 (2003) of not exceeding 2.4 – 2.9, thus, rodded bulk density of 1577 kg/m^3 and 1495kg/m^3 for both aggregates falls within the range of 1200 - 1750 kg/m^3 according to ASTM – C33 (2003) standards. The water absorption for both aggregates was 3.95 and 3.27 conforms to ASTM – C33 (2003) of not exceeding 4. The specific gravity for BLA and BA was 2.79 and 2.10 which were 11% and 33% lesser than OPC, the bulk density of BLA and BA were about 33% and 32% of that of OPC. The lower values obtained in specific gravity and bulk density of BLA and BA could lead to reduction in concrete density. The maximum particle size of BLA, BA, and OPC were 150mm, 150mm, and 90mm. Table 4 shows the chemical compositions of BLA, BA, and cement respectively.

Table 4. Chemical composition of BLA and OPC

Chemical composition (%)	Cement	BLA	BA
Silica (SiO_2)	20.600	69.112	70.40
Calcium Oxide (CaO)	62.927	10.814	2.90
Aluminium (Al_2O_3)	5.985	2.523	3.54
Iron (Fe_2O_3)	3.341	1.741	3.93
Phosphorus (P_2O_5)	0.639	1.525	2.17
Chloride (Cl)	0.151	0.670	0.25
Sulphur (S)	2.622	0.406	0.27
Manganese (Mn)	0.129	0.245	0.20
Potassium (K_2O)	0.266	4.814	4.67
Loss of Ignition (LOL)	3.34	8.15	11.67

Table 4 illustrated the chemical analysis of OPC and BLA, and BA. The test was carried out by using X-ray diffraction (XRD). Based on table 4. The percentage composition of CaO in BLA is more than that of BA, though CaO for cement was higher than BLA and BA. CaO is responsible for the formation of tri calcium silicate and di calcium silicate which both react with water to form calcium silicate hydrate (C-S-H) which is the main agent for strength development of concrete. The percentage of $SiO_2 + Al_2O_3 + Fe_2O_3$ for BLA and BA were found to be 73.38% and 77.87% which was more than minimum of 70% stipulated by ASTM C618 (2008) for pozzolana. Also, loss of ignition (LOL) for BLA and BA was higher than OPC but still within the range of 12% stipulated by ASTM C618 (2008).

3.2. Hardened Properties of Concrete

Hardened Properties of Property

Table 7 shows the compressive strength (CS), water absorption (w), permeable void spaces (v), bulk dry density (bdd), and sorptivity (k) of concretes.

Table 7. Hardened properties of concrete

	CS (MPa)							
S/No	7d	28d	56d	90d	W (%)	V (%)	Bdd (kg/m³)	K (mm/h$^{1}/_{2}$)
0%	19.7	26.9	29	33.9	7.38	15.6	2.3	0.08
5% BLA	21	27.6	30.4	35.8	6.83	11.3	2.3	0.11
10% BLA	21.1	28.5	32.3	38.5	4.21	8.3	2.3	0.14
15% BLA	17.6	25.5	28.6	32.1	5.60	7.5	2.2	0.15
20% BLA	15.8	24.1	26.8	30.4	6.90	6.6	2.1	0.17
5% BA	16.1	21.8	25.5	29.1	7.99	15.9	2.3	0.07
10% BA	17.2	23.4	27.1	32.7	8.43	17.7	2.2	0.09
15% BA	14.9	21.1	26.2	28.3	8.72	17.9	2.2	0.12
20% BA	14.1	20.3	25.1	27.4	9.06	18.9	2.1	0.14

Average value for three replicate samples

Compressive Strength (CS)

The compressive strength of normal, BLA, and BA concrete at curing age of 7, 28, 56, and 90 days is shown in figure 5 and 6. It was noticed that, there was an early strength generation at 7 days for percentage replacement from 5% to 10% BLA replacement and a drop in strength at 15% and 20% replacements was noticed, these trend was also applicable to 28, 56, and 90 days compressive strength. The increase in strength could be as a result of the presence of high amount of amorphous silica present in the ash and high amount of CaO which lead to the formation of tri calcium silicate and di calcium silicate which both react

with water to form C-S-H which was the determining factor for strength gain, tri calcium silicate is mostly reactive at early ages which gave the ash more strength at 7 days for 5% and 10% replacement while di calcium silicate is most reactive at later ages but contributes very little to strength development unlike tri calcium silicate. As shown in figure 6, it was seen that, there was a slow generation of strength at all level of replacements of BA at 7 and 28 days, thus, compressive strength increased from 56 days and 90 days, the slow reaction could be attributed to low amount of CaO present in BA and di calcium silicate was most reactive at later ages. The maximum strength was recorded at 10% for both BLA and BA replacement at 7, 28, 56, and 90 days curing age. The BLA compressive strength obtained from this study produced better results when compared with those of (Kolawole et al., 2015; Dwivedi et al., 2006; Olutoge et al., 2017). Similar results in term of compressive strength of BA concrete was reported by (Djima et al., 2018; Modani et al., 2013; Abdukadir et al., 2014).

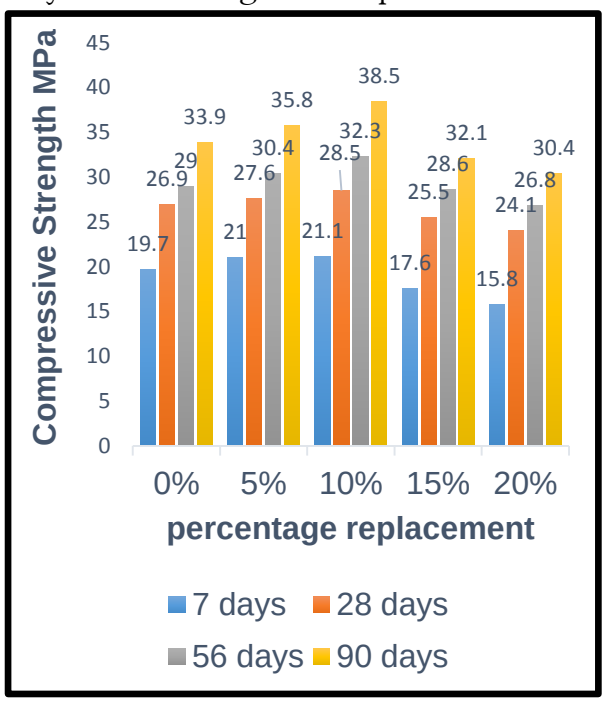


Figure.5. Compressive strength of normal BLA concretes

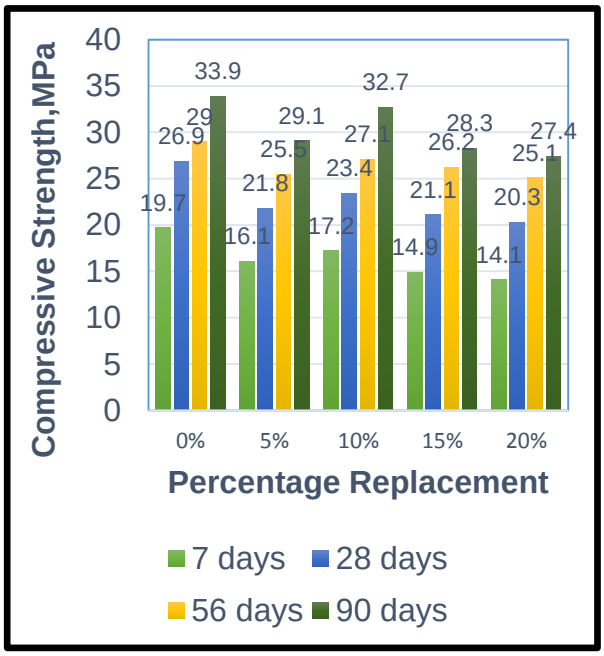


Figure.6. Compressive strength of normal and BA concretes

Water Absorption

The water absorption of normal concrete as well as BLA and BA concretes is shown in figure 7 and 8. It was found out that, there was a general reduction in water absorption after immersion (Wi) and after immersion and boiling (Wib) as the percentage replacement of BLA content increased. Generally, the water absorption of BLA concrete samples had low water absorption as compared with reference concrete. This reduction in water absorption could be attributed to the initial filling of the voids by BLA concretes thereby acting as water resistant. The results of this studies conforms to previous work by (Umoh & Ujene, 2014). Consequently, from figure 8, it was seen that, there was an increment in water absorption after immersion (Wi) and after immersion and boiling (Wib) as the percentage replacement

of BA content increased. Thus, water absorption increased as percentage replacement of BA increased, this could be as a result of very fine particle of BA which lead to high absorptivity features. The results of this studies was in line with previous research performed by (Djima, Mang'uriu & Mwero, 2018).

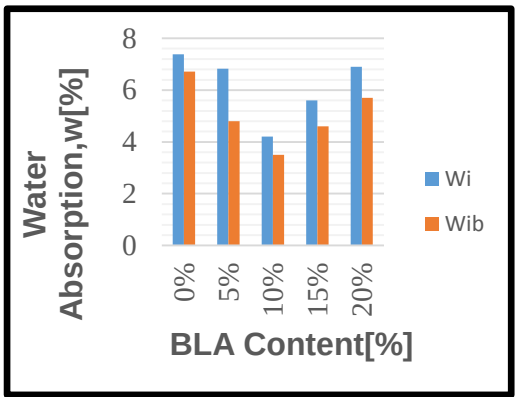


Figure.7. Water absorption of normal and BLA concretes

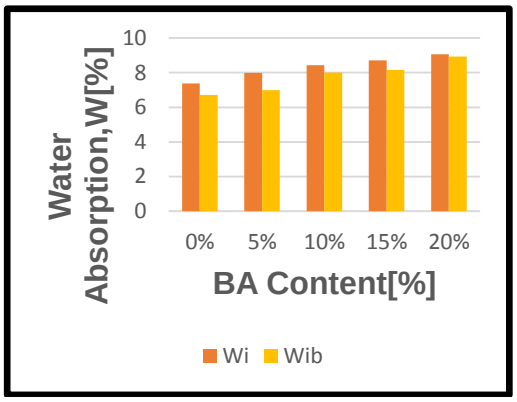


Figure.8. Water absorption of normal and BA concretes

Volume of Permeable Void Spaces in Hardened Concrete

The permeable void spaces of BLA concrete reduced a bit as the percentage BLA content increased as seen in figure 9. This reduction in void could be as a result of increased reactions which caused a denser porosity, thus reducing the permeable void spaces. The output of this work conforms to previous research carried out by (Dhinakaran & Gangava, 2016). Furthermore, BA increased the void as the percentage replacement of BA increased as shown in figure 10. The increment could be as a result of finess nature of BA which makes the concrete less impermeable.

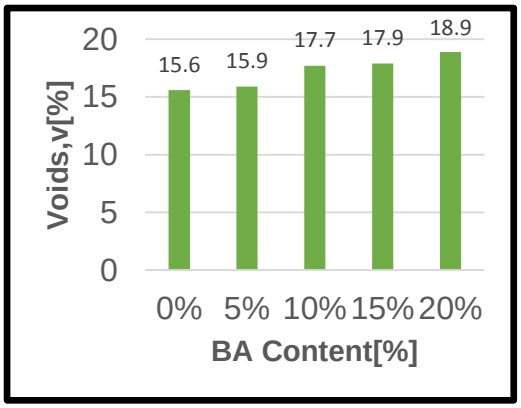


Figure 9.void of normal and BLA concretes

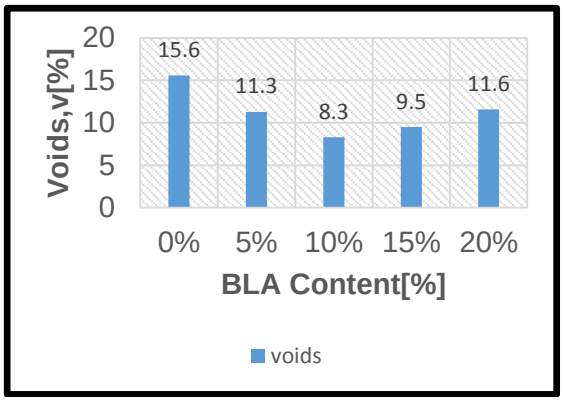


Figure 10. Void of normal and BA concrete

Bulk Dry Density of Hardened Concrete

The apparent density (AD), bulk density after immersion (BDI), bulk density after immersion and boiling (BDIB), and bulk dry density (BDD) of BLA and BA concrete at 28 days of curing reduced with an increment in BLA and BA content as illustrated in figure 11 and 12. The reduction in density could be as a result of the lower specific gravity of BLA and BA which is 11%, 32.69% lower than that of cement thereby directly reducing the density of the matrix as the percentage BLA and BA content increased. The bulk dry density for both BLA and BA concretes were within the range of 2000 – 2600kg/m^3 for normal concrete as stated by BS EN 206 (2014). Thus, BLA and BA concrete can be classified as normal concrete. The result of this studies conformed to previous work executed by (Olutoge & Oladunmoye, 2017; Hussein, Nuruddin & Memon, 2014)

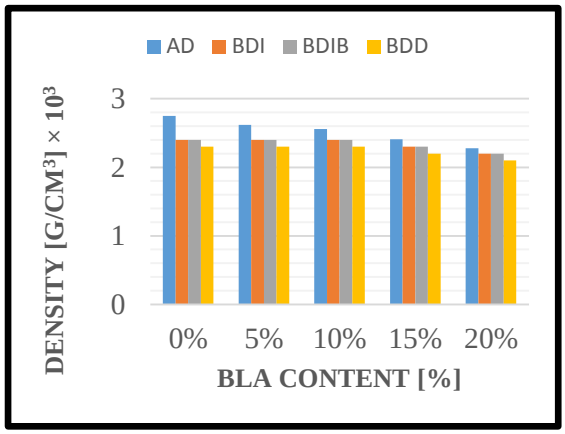


Figure.11. Hardened density of normal and BLA concretes

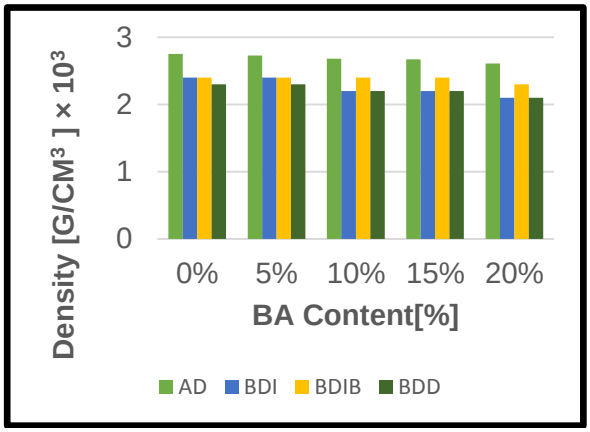


Figure.12. Hardened density of normal and BA concretes

Sorptivity

The results of the rate of absorption of BLA and BA concretes is given in table 9 and 10. The rate of water absorption (mm/min$^{1/2}$) was obtained from the slope of best fit line to the cumulative water absorption (I) plotted against the square root of time (mm$^{1/2}$). Thus, slope was gotten using least squares, linear regression analysis of the plot of I against square root of time (t$^{1/2}$).From table, it was noticed that, soprtivity reduces as BLA content increased. The sorptivity reduction could be due to the finer particle of BLA which filled up the air voids in the concrete, thus, hindering the intrusion of water into the concrete. Meanwhile sorptivity is increased as BA content increases. BA sorptivity increment could be as a result of fineness particle of BA which is not closely packed together thereby allowing water to pass through it. The sorptivity results of this research unveiled that , all the concretes samples conforms to limit of sorptivity value less than 6mm/h$^{1/2}$ based on the research conducted by (Hinczack, Conroy & Lewis, 1986).

Table 8. Sorptivity of conventional and BLA concretes

Sample	0%	5%	10%	15%	20%
Sorptivity, K (mm/h$^{1/2}$)	0.1666	0.1451	0.1417	0.1153	0.0828
Coefficient of Determination (R^2)	0.9604	0.971	0.9737	0.9661	0.9298
Coefficient of Correlation (R)	0.9800	0.9854	0.9868	0.98290	0.9643

Table 9. Sorptivity of conventional and BA concretes

Sample	0%	5%	10%	15%	20%
Sorptivity, K (mm/h$^{1/2}$)	0.1666	0.0672	0.0919	0.119	0.1405
Coefficient of Determination (R^2)	0.9604	0.7936	0.8309	0.8322	0.7790
Coefficient of Correlation (R)	0.9800	0.8908	0.9115	0.9122	0.8820

3.3. One way ANOVA

The mean compressive strength values at 7, 28, 56, and 90 days curing age ranging from 0% -20% percentage replacement in each case for conventional, BLA and BA concretes is shown in table 10, where (A1, A2) represents BLA and BA at 7 days curing age, (B1, B2) stands for BLA and BA at 28 days, (C1, C2) connotes curing age at 56 days for BLA and BA, (D1, D2) stands for 90 days curing age for BLA and BA, Z1-Z4 represents conventional concrete at curing age of 7-90 days respectively.

Table 10. Compressive strength mean values of Conventional, BLA, and BA concretes

Group	Means
A1	18.89367
A2	15.56958
B1	26.48942
B2	21.65775
C1	29.52833
C2	25.95675
D1	34.21433
D2	29.35383
Z1	19.73633
Z2	26.93500
Z3	29.06967
Z4	33.96667

Replicates of average mean values of 12 samples (A1-D2), 3 mean values for (Z1-Z4)

Table.11. One-Way ANOVA Table

	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Ashes	11	3542	322	64.65	<2e-16 ***
Residuals	96	478	5		

Signif. Codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

The null hypothesis of equal compressive strengths of control, BLA and BA concretes at different curing ages (7, 28, 56, and 90 days) was rejected given that the P-value (2e-16) was less than the alpha (0.05). This connotes that, the compressive strengths are not significantly equal at all level of percentage replacement. Hence, post-hoc test (Tukey multiple comparisons test) was performed on the each pair order to deduce which pairs are equal or different at 95% fa-mily - wise confidence level (Kim, 2017) as shown in table 11.

Table. 12. Tukey multiple comparisons of means

Pairs	Difference	lower	upper	P adj
A2-A1	-3.3240833	-6.37619102	-0.2719756	0.0207034
Z1-A1	0.8426667	-3.98313931	5.6684726	0.9999849
Z1-A2	4.1667500	-0.65905598	8.9925560	0.1603627
B2-B1	-4.8316667	-7.88377436	-1.7795590	0.0000454
Z2-B1	0.4455833	-4.38022265	5.2713893	1.0000000
Z2-B2	5.2772500	0.45144402	10.1030560	0.0197701
C2-C1	-3.5715833	-6.62369102	-0.5194756	0.0086416
Z3-C1	-0.4586667	-5.28447265	4.3671393	1.0000000
Z3-C2	3.1129167	-1.71288931	7.9387226	0.5812337
D2-D1	-4.8605000	-7.91260769	-1.8083923	0.0000397
Z4-D1	-0.2476667	-5.07347265	4.5781393	1.0000000
Z4-D2	4.6128333	-0.21297265	9.4386393	0.0748046

Based on Tukey post hoc test shown in table 11, it was found out that;

For the pair of comparison (A2-A1), (B2-B1), (C2-C1), and (D2-D1). 0 was not contained in the confidence interval, this means that, there is significant difference between the compressive strength of BLA and BA at 7, 28, 56, and 90 days curing age. The P-values was less than the alpha (0.05) indicating that, the compressive strength of BLA and BA at all

curing ages are not equal. The difference was also negative which means the compressive strength of BLA is better than that of BA at 7, 28, 56, and 90 days curing age respectively. Comparing (Z1-A1), (Z1-A2), and, 0 was contained in the confidence interval, this means that, there is no significant difference between the compressive strength of Control, BLA, and BA at 7 days curing age. The P-values were greater than the alpha (0.05) which connotes that, the compressive strength of Control and BLA at 7 days curing age are statistically equal. Furthermore, in the Pair of (Z2-B1), 0 was contained in the confidence interval, this indicated that, there is no significant difference between the compressive strength of Control and BLA at 28 days curing age. The P-value (1.000) was greater than the alpha (0.05) which shows that, the compressive strength of Control and BLA at 28 days curing age are statistically equal. Meanwhile, the pair of (Z2-B2), at 28 days shows that, the compressive strength of control sample and BA samples are not the same. Furthermore, the pair of (Z3-C1), (Z3-C2), (Z4-D1), and (Z4-D2) at 56 and 90 days curing age, indicated that, 0 values was in the confidence interval, this shows that, there is no significant difference between the compressive strength of Control, BLA, and BA at 56 and 90 days of curing . The P-values were greater than the alpha (0.05) which means, the compressive strength of Control, BLA, and BA at 56 and 90 days of curing age are statistically equal.

Conclusions

The comparative analysis of compressive strength of conventional, bamboo leaf ash, and baggash ash was performed. Thus, properties of conventional, bamboo leaf ash, and baggash ash concretes in term of fresh, and hardened properties were also examined. Based on the comparative analysis, experimental results, and discussions carried out, the following conclusions was made:

There was an increase in compressive strength of BLA concrete, while compressive strength of BA concrete increased at later age of curing beyond 28 days. The optimum level of replacement was achieved at 10% for both BLA and BA concretes.

BLA concretes had lower water absorption, density, permeable voids, and sorptivity values as compared to that of control samples. BA concretes had higher water absorption, permeable voids, sorptivity, but lower density values as compared to that of control samples.

BLA concrete is better than BA concrete at 7, 28, 56, and 90 days. Control sample and BLA concretes are the same at 7, 28 days , thus, control sample is higher than BA concretes at 7, 28. Control sample, BLA and BA concretes are statistically the same at 56 and 90 days respectively.

Funding: The authors wish to express their profound gratitude to African Union Commission (AUC) and Japan International Cooperation Agency (JICA) for funding this research work.

Conflicts of Interest: The authors affirm that there was no known conflicts of interest

References

Abdulkadir, T. S., Oyejobi, D. O., & Lawal, A. A. (2014). Evaluation of sugarcane bagasse ash as a replacement for cement in concrete works. Acta Technica Corviniensis-Bulletin of Engineering, 7(3), 71.

Anupam, A. K., Kumar, P. & Ransinchung RN, G. D. (2013). Use of Various Agricultural and Industrial Waste Materials in Road Construction. 2nd Conference of Transportation Research Group of India - Social and Behavioural Sciences, 104, 264 – 273. EN 197-1. Cement – part 1: Composition, Specifications and Conformity Criteria for Common cements.

Alabadan, B. A., Olutoye, M. A., Abolarin, M. S., & Zakariya, M. (2005). Partial replacement of ordinary Portland cement (OPC) with bambara groundnut shell ash (BGSA) in concrete. Leonardo Electronic Journal of Practices and Technologies, 6, 43-48.

Asha, P., Salman, A., & R. Arun Kumar. (2014) Experimental Study on Concrete with Bamboo Leaf Ash. International Journal of Engineering and Advanced Technology (IJEAT), 3 (6), 46-51.

ASTM C188. (2016) Standard Test Methods for Density of Hydraulic Cement; ASTM International: West Conshohocken, PA, USA, 1, 1-3.

ASTM C642. (2013) Standard Test Methods for Density, Absorption, and Voids in Hardened Concrete; ASTM International: West Conshohocken, PA, USA.

ASTM C 1585. (2013) Standard Test Methods for Measurements of Rate of Absorption of Water by Hydraulic Cement Concretes; ASTM International: West Conshohocken, PA, USA.

ASTM C 618. (2008). Standard Specification for Coal Fly Ash and Raw Calcined Natural Pozzolan for Use in Concrete; ASTM International .West Conshohocken, PA, USA.

ASTM C29/C29M-16. (2003).Standard test method for bulk density ("unit weight") and voids in aggregate; ASTM International: West Conshohocken, PA, USA.

ASTM, C. 33. (2003). Standard Specification for Coarse Aggregates; ASTM International: West Conshohocken, PA, USA.

ASTM D7928. (2016). Standard test method for particle-size distribution (gradation) of fine-grained soils using the sedimentation (hydrometer) analysis; ASTM International: West Conshohocken, PA, USA.

Babu, A. (2017). Investigation of Effect on Various Fibres on the Mechanical Properties of Bagasse Ash Blended With High Performance Concrete. International Research Journal of Engineering and Technology (IRJET), 4(6), 1756-59.

BS EN 206. (2014). Concrete Specification, Performance, Production, and Conformity; British Standards Institution: London, UK.

BS EN 196 – 2. (2013). Method of Testing Cement, Part 2: Chemical Analysis of Cement; British Standards Institution: London, UK.

BS EN 1097 – 6. (2013) .Tests for Mechanical and Physical Properties of Aggregates Part 6: Determination of Particle Density and Water Absorption; BSI Standards Ltd: Brussels, Belgium.

BS EN 1881- 125. (2013). Testing Concrete. Methods for Mixing and Sampling Fresh Concrete in the Laboratory; British Standards Institution: London, UK.

BS ISO 3310-2. (2013).Test Sieves—Technical Requirements and Testing Part 2: Test Sieves of Perforated Metal Plate. ISO: Geneva, Switzerland.

BS EN 932-1. (2012).Tests for Geometrical Properties of Aggregates Part 1: Determination of Particle Size Distribution – Sieving Method; Concrete Society: Farmington Hills, MI, USA.

BS EN 8500 – 2. (2012). Concrete Complementary British Standard to BS EN 206: Constituents Materials and Concrete; BSI Standards Institution: London, UK.

BS EN 12350 -1. (2009).Testing Fresh Concrete, Part 1: Sampling Fresh Concrete; British Standards Institution: London, UK.

BS EN 12390 – 2. (2009) .Testing Hardened Concrete Part 2: Making and Curing Specimens for Strength Tests; British Standards Institution: London, UK.

BS EN 12390 – 3. (2009) .Testing Hardened Concrete Part 3: Compressive Strength of Test Specimens; British Standards Institution: London, UK.

Dhinakaran, G., & Gangava Hari Chandana. (2016) .Compressive Strength and Durability of Bamboo Leaf Ash Concrete. Jordan Journal of Civil Engineering, 10(3), 1-11.

Djima, M. O., Mang'uriu, G. N., & Mwero, J. N. (2018). Experimental Investigation of Lime Treated Palm Kernel Shell and Sugarcane Bagasse Ash as Partial Replacement of Coarse Aggregate and Cement Respectively in Concrete. Open Journal of Civil Engineering, 8(04), 358.

Dwivedi, V.N., Singh, N.P., Das, S.S., & Singh, N.B. (2006) A New Pozzolanic Material for Cement Industry: Bamboo Leaf Ash. Int. J. Phy. Sci., 1(3), 106-111.

Ho, D. W. S., Hinczak, I., Conroy, J. J., & Lewis, R. K. (1986). Influence of Slag Cement on the Water Sorptivity of Concrete. Special Publication. 91, 1463-1474.

Hussein, A. A. E., Shafiq, N., Nuruddin, M. F., & Memon, F. A. (2014). Compressive strength and microstructure of sugar cane bagasse ash concrete. Research Journal of Applied Sciences, Engineering and Technology, 7(12), 2569-2577.

Kim, T. K. (2017). Understanding one-way ANOVA using conceptual figures. Korean journal of anaesthesiology, 70(1), 22.

Kolawole, J. T., & Olusola, K. O. (2015). Compressive strength characteristics of bamboo leaf ash blended cement concrete. Knowledge Exchange for Young Scientists (KEYS), 83.

Li, X. (2004). Physical, Chemical and Mechanical Properties of Bamboo and its Utilization Potential for Fibreboard Manufacturing. MSc Thesis, Louisiana State University.

Mehta. PK, & Monterio PJM. (2006). Concrete: Microstructure, Properties and Materials. 3rd Edition .New York: McGraw-Hill.

Modani, P. O., & Vyawahare, M. R. (2013). Utilization of bagasse ash as a partial replacement of fine aggregate in concrete. Procedia Engineering, 51, 25-29.

Olutoge F.A. & Oladunmoye O.M. (2017). Bamboo Leaf Ash as Supplementary Cementitious Material. American Journal of Engineering Research (AJER), 6(6), 1-8.

Patil, B. B., & Kumbhar, P. D. (2012) .Strength and Durability Properties of High Performance Concrete Incorporating High Reactivity Metakaolin. International Journal of Modern Engineering Research (IJMER), 2(3), 1099-1104.

Statista. World Cement Production, Retrieved February 5, 2017, https://www.statista.com/statistics/219343/cement- production-worldwide/.

Subramaniyan, K. S., & Sivaraja, M. (2016). Assessment of sugarcane bagasse ash concrete on mechanical and durability properties. Advances in Natural and Applied Sciences, 10(9 SE), 253-261.

Suhendro, B. (2014). Toward green concrete for better sustainable environment. Procedia Engineering, 95, 305-320.

Umoh, A. A., & Ujene, A. O. (2014). Empirical Study on Effect of Bamboo Leaf Ash in Concrete. Journal of Engineering and Technology (JET), 5(2), 71-82.

Van OSS, H.G., & Padavoni, A.C. (2003). Cement manufacture and the environment part 2: environmental challenges and opportunities. Journal of Industrial Ecology, 7 (1), 93-126.

Wong, L. S., Hashim, R., & Ali, F. (2013). "Improved Strength and Reduced Permeability of Stabilized Peat: Focus on Application of Kaolin as a Pozzolanic Additive" Construction and Building Materials, 40, 783–79

A Stage Model for Cloud Computing Adoption in E-Government Implementation

Kanuku watson.

Machakos University

watskanuku@gmail.com

Abstract

As Governments look for ways to improve service provision, the need for restructuring processes and effectively using technology to improve efficiency and effectiveness of their functions becomes critical. Cloud computing is one of the recent technological trends that support these efforts. It is a type of sourcing model in which computing services are provided as a utility over the Internet. The promise of cloud computing has captivated organizations globally. Considering e-Government is one of the sectors that is trying to provide services via the internet, cloud computing is a suitable model for implementing e-Government architecture to improve e-Government efficiency and user satisfaction. Adoption process is the challenge. Organizations have challenges of how to best adopt cloud computing. Existing frameworks of cloud adoption look at different aspects of cloud but fail to view the complete spectrum of cloud adoption issues. This study takes a concept centric approach by creating a stage model for adoption of cloud computing in e-Government. The model is a guide on cloud adoption, especially with the dynamics of technology. The organizations at different stages of cloud adoption exhibit different characteristics and possess distinct competencies, and organizations should not bite more than they can chew, lest their programs fail. In this study, the adoption of cloud computing in implementing e-Government was done through mixed research, where primary and secondary data was utilized to inform the stages of adoption. A stage model was therefore developed. The model is to provide a guideline for Governments in creating cloud-computing strategy by identifying the levels of implementation and stages thereof. Deployment model is mostly utilized by governments to adopt cloud computing. This model is not clear on application and progression nor does it clearly address security issues. This puts at risk the integrity and confidentiality of data owned by the Government or its agencies. The stage model for adoption of cloud computing in e-Government developed in this study is therefore a useful tool for it provides cloud adoption path. It addresses issues of cloud ownership, cloud policy, systems complexity and economic benefits of cloud computing adoption in e-Government implementation. The model evaluation confirms the applicability and the central role it plays on laying a roadmap to cloud computing adoption for governments.

Key words: Cloud computing, E-Government, Stage model, transparency, deployment model, e-Government architecture, concept centric approach

INTRODUCTION AND RATIONALE

E-Government (Electronic Government) means the operation of providing governmental services to the citizens, businesses or to other governments electronically using Information Communication Technologies (ICTs) especially the Internet (Alvarez, 2012). That means the governmental services are turned into electronic services (E-services). E-government started emerging in the nineties of the last century as a project to provide e-services to the citizens in order to save cost, time and effort. With this progress of technology, the development models of E-government began to appear to put the scientific steps to adopting and development of e-Government from zero point. These development models were developed according to different standards that change from one country to another (Alvarez et al., 2012). They developed to become maturity models to assess the progress of any e-Government projects. With this change, Cloud Computing began to appear in the horizon as a revolution in the world of information technology. Cloud computing sparked widespread controversy about the future of information technology fields including e-Government (Gens & Frank, 2013).

Cloud computing means providing the computer resources as services via the internet by providers to customers. These computer resources include the power of CPU processor, storage space, bandwidth and the required applications to manage any operations (Brodkin, 2013). Cloud computing services include operation, maintenance and update and manage the applications. That means the computer resources are turned to services and the payment of the services done per use.

Cloud computing is very useful for E-government projects. The cost of infrastructure of E-Government and the inefficiency of human resources and staff have contributed to failure of e-Government projects. Cloud computing presents Cost Saving, professional management and utilization of high-end resources and application (Alvarez et al., 2012).

Even though cloud computing presents many opportunities to e-Government, governments have not fully adopted cloud computing. This has been due to lack of guidance into cloud computing adoption to e-Government implementation. This research seeks to provide that guidance through a stage model for adoption of cloud computing in e-Government implementation (Li, 2016 b).

Despite of the benefits that come with cloud computing, Governments still have not fully adopted cloud computing in service delivery. This could be attributed to lack of adoption criteria. E-Governments cannot clearly identify and define what level of implementation they are in and what it entails.

Questions of control and ownership of data arise with the migration of Government data to the Cloud. In many countries storing Government data outside of country's boundaries is prohibited, thus compliance with legislation is an important challenge related to cloud computing adoption (Gens & Frank 201,3).

From industrial perspective, there are an increasing number of organizations offering Cloud products and services. Amazon is a market leader in Public Cloud and offers Elastic Compute Cloud (EC2) for computing capacity and Simple Storage Service (S3) for storage capacity. Microsoft provides Windows Azure services to allow developers to store their codes and develop new applications for their clients or companies (Li, 2016b).

Salesforce.com is a pioneer in Cloud and presents their Customer Relation Management (CRM) applications for a large number of their users. Oracle consolidates resources with Sun Microsystems, and offers several products and services ranging from hardware to application focus. IBM has Cloud products and applications suites to help their customers. In addition, there are more Small and Medium Enterprises (SME) developing and selling their Cloud services and products, and they offer different types of business models and perspective (Marston, et al., 2010).

Despite of the many players in the cloud business, cloud computing in e-Government has not been addressed adequately. Much of the focus has been on profit making business organizations that adopt short-term cloud service for convenience. This has led to slow adoption of cloud computing by Governments (Li, 2016b).

Different cloud models including service and deployment are in existence, but none addresses the issue of adoption process and the complexities involved. They only address cloud ownership and the services that accompany each deployment. The path to cloud computing adoption in e-Government implementation has not been fully addressed. This leaves e-Governments with no option other than adhoc utilization of cloud services, hence not fully realizing the full benefits.

Cloud frameworks and adoption models available currently have not addressed the issue of e-government adoption of cloud computing instead they focus on general cloud service deployment. Even the cloud service providers have not given a solution on the approach which governments need to take to fully enjoy the benefits of cloud computing, instead Governments use trial and error methods to embrace cloud computing in providing essential services.

Position of the current cloud business market players

Cisco is a founded player in the cloud business. He has identified two broad categories of cloud deployment, virtualization and cloud computing. Out of which several stages of deployment have been identified including data center networking, unified fabric, unified computing, private clouds and inter-cloud as shown in Figure 2.16. A closer look at the model reveals a infrastructural approach of the model, with complete exclusion of service model perspective, which forms the basis of cloud adoption. It is therefore difficult for any e-government to adopt cloud computing using this model because it is oriented towards creating a data center but not the broader perspective of government cloud adoption

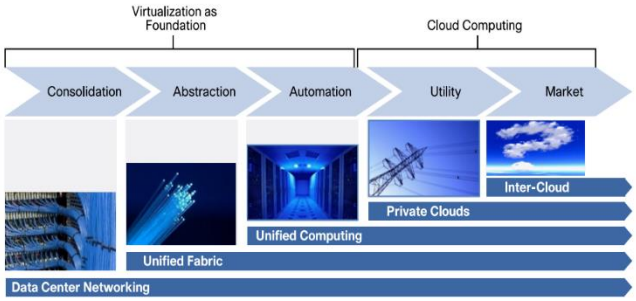


Figure 1: Cisco Cloud data center Evolution Roadmap

Oracle developed a maturity stage model, as shown in figure 2, which has five adoption levels ranging from application level to enterprise level. It identifies hierarchies of adoption ranging from ad-hoc to optimised. It identifies three stages, exploration, expanding and exploitation. This model comes closer to establishing an adoption path but misses to relate the levels with the already existing models for the users who are already in progression. It largely takes a data storage concept and therefore can only be used in cases of deployment of Iaas or Storage as a service adoption, but not e-Government cloud implementation.

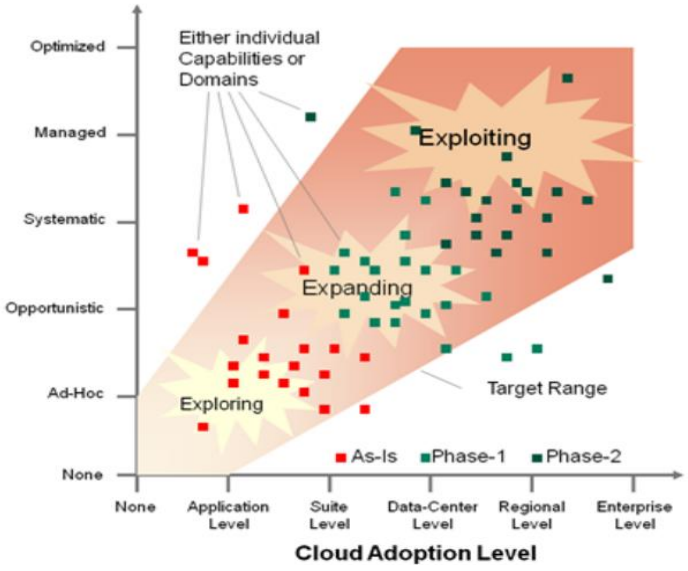


Figure 2.oracle's cloud maturity stage model

Upon review of published literature, it was observed that previous work by Tsaravas and Themistocleus (2011) was limited to analyzing case studies in which cloud computing was used by public organizations. Aamirand and Shahzad (2011) created the cloud service model which related the different services supporting cloud computing namely; Infrastructure as a service (Iaas), Platform as a service (Paas) and software as a service (Saas).

This model only defined the services which support cloud computing but did not define their hierarchy and deployment approach. Aamir and Shahzad (2011) listed Saas as the highest service level citing email service as an example. In reality, it is the lowest because all mail services like Gmail and yahoo are hosted in clouds available to any user at the basic level of deployment, bearing the high level of abstraction and usability in SaaS.

Erwan Granger (2013) came up with the deployment service model which related the service levels to the four types of cloud adoption levels namely private, public, community and hybrid. His study only defined the levels of cloud ownership but did not give a roadmap to adoption of cloud computing. The model presented in this study is for adoption of cloud computing in e-Government implementation. It is intended to map the path for adoption of cloud computing in

e-Government by identifying the different levels involved and relating them in hierarchical order.

While most authors examine the potential of cloud computing in e-Government generally, others focus on the e-Government system of a specific country. Tahamtan et al. (2011) studied the potential of cloud computing in Austrian public sector, interviewing eight ministries and the office of chancellor. The research showed that the most important requirements of the Austrian public sector, related to cloud computing adoption, are legal compliance, reliability, availability, compatibility, connectivity and scalability. In addition, Data security and privacy, network security, lack of knowledge of available systems, previous investments and business continuity, were identified as the obstacles for integration of cloud computing in the Austrian public sector

Khan et al. (2011) focused on the future integration of cloud computing in e-Government of developing countries, using as an example the e-Governments system of Pakistan. After reviewing the e-Government challenges and readiness of the country, the authors proposed that cloud computing can be used as a solution to problems such as digital divide and inadequate funding that developing countries usually face in the context of e-Government.

Stefanou and Skouras (2012) conducted a survey to find whether companies in Greece would be positive towards using a Government's payroll information system based on cloud computing. The information payroll system based on cloud computing that authors propose, promises to simplify the bureaucratic procedures related to labor inspection, giving to the state the role of administrator of the businesses database and therefore enabling distant control of labor issues.

Through a questionnaire, companies were asked to choose between the Integrated Information System planned by Ministry of labor and aforementioned Payroll Information System provided by public sector via cloud computing. According to the results of the survey, half of the responses were in favor of the first solution and the other half in favor of the cloud based payroll Information system. It therefore seems that companies have some reservations about using the cloud based solution, mainly as regards data security, connection and software issues.

European Commission adopted a more focused approach, indicating key actions for cloud migration in Europe. Although it cannot be considered as a full migration strategy, it clearly helps towards that direction, bringing to the fore the following important actions to be taken. "Cutting through the jungle of standards", "safe and fair contract terms and conditions" and "Establishing a European cloud partnership to drive innovation and growth from the public sector".

Out of related literature, it is clear that there is no existing model on adoption of cloud computing in e-Government implementation.

Objectives of the study

The main objective of the study was to formulate a stage model for the adoption of cloud computing in E-Government implementation. However, there were other specific objectives;

To review the suitability and benefits of cloud computing in e-Government

To review available literature on cloud adoption models

To establish the status of cloud adoption in Kenya, Machakos County Government.

To formulate and discuss the four stages of a stage model for adoption of cloud computing in e-Government services.

To evaluate the stage model.

METHODOLOGY

Research Design

This study has used a mixed approach deriving its insights from combination of primary data and system modelling. To identify the level of e-Government implementation initiatives and their influence on public service delivery in Kenya, a survey design was adopted where the relevant public office holders in the county government on adoption of cloud computing in e-Government and public services dissemination was carried out to ensure an informed discussion, evaluation and conclusion.

The steps used in the survey are:-

Establish the level of awareness on cloud computing in e-Government service delivery.

Identify the challenges facing e-Government and their impact on electronic public service delivery.

Establish the Government policy on utilization of e-Government services.

Establish whether the Government has any strategy on cloud computing adoption.

Establish the cloud adoption criteria in e-Government services.

Findings distilled from the survey and case studies in literature review and accompanying analysis yielded an adoption model. The adoption model was created after identifying distinct characteristics for each of the accompanying stages, mapping characteristics to Adoption. They examined through the lens of the adoption model by ranking them on each of the Adoption and Readiness dimensions.

As final part of the study, the adoption model and other insights were evaluated through focus group. Key parameters influencing the move to cloud, were mapped in stock flow diagrams (Infrastructure as a Service (SaaS), Platform as a Service (PaaS) and Software as Service (SaaS)),

which contained balancing and reinforcing loops. From the stock flow diagrams, basis of the stage model was developed.

Target Population

Target population refers to the entire group of individuals or objects to which a researcher is interested in generalizing the conclusions (Best and Kahn, 1989). In this study, the target population was the nine (9) departments in the Machakos county government. Each county government has nine ministries, from which two top ICT officers were sampled.

Sample Size and Sampling Procedure

A sample is a finite part of a statistical population whose properties are studied to gain information about the whole (Webster, 1985). The sample size was drawn from the ICT departments from the nine (9) ministries in Machakos county government, established as per Constitution of Kenya (2010). The sampling units were obtained through selective sampling where the two (2) top managers of the ICT departments in each ministry were sampled. The Government of Kenya has two tier Government system, the Central and County Governments. The central government has devolved its functions to the County government in a structured way. All 47 counties just replicate each other but at different geographical regions. Therefore sampling Machakos county is representative of all other counties. Since there are a total of nine ministries in the county government as per the constitution of Kenya (COK, 2010), the study engaged 2 ICT professionals from each department where 18 respondents were picked to fill the questionnaires.

Methods of Data Collection

The survey utilized questionnaires as the main data collection tool. The questions were fully structured with most of the questions being closed (multiple choice and ranking) with only few open-ended question. The questionnaire was pre-tested by administering to five ICT officers in the county government of Machakos before conducting the main survey. This ensured that in the actual survey the response given was specific to the respondent's ministry.

Reliability of Data Collection Instruments

Reliability is the consistency of measurement, or it is the repeatability of your measurement. A measure is considered reliable if a person's score on the same test given twice is similar. It is important to remember that reliability is not measured; it is estimated (Mustonen & Vehkalahti, 1997). Alternative Form Method was used where the questionnaires were purposely administered to a group of seven respondents who were on their internship program in the county government one week after the main data collection exercise. The results were compared with the actual survey and it was found to give almost similar results with the actual results.

Validity of Data Collection Instruments

According to Mugenda and Mugenda (1999), validity is the degree to which a test measures what it purports to measure. Validity was achieved through pilot study where the irrelevant items were removed. Secondly, the results were given to a peer for review and comments and lastly the supervisor for further review and technical input.

Data processing and analysis

Since the survey generates quantitative data, Microsoft excel was used for analysis. Writing was done using Microsoft word and findings presented in graphs.

RESULTS AND DISCUSSION.

Analysis of primary data from Machakos County.

It was observed that 78% of the respondents had access to the internet. 44% of all staff had corporate email addresses. Of those who had corporate email addresses, 80% of their mail servers were hosted in google cloud. Only 22% of the staff interviewed were aware of restriction to use organization based email domain for official communication. The fact that staff are not restricted on domains to open and use for official use means there is no guidelines on cloud service adoption. The few cloud-based services are just used for personal convenience but not general objective of e-Government service delivery.

From the research, 100% of all respondents had at least one online service they utilize from the central Government. 100% of all application programs from central government were web based. 50% of those who enjoy web based application programs have the servers based on the cloud, 28% are hosted locally while 22% were not sure. 0% of respondents have no official programs which they pay for per usage, 11% have but for personal use only, while 6% were not sure as shown in figure 3. This confirms that Machakos County has not yet embraced cloud computing because the only few persons who use cloud computing is a personal initiative and intended to fulfil a personal obligation but not the e-Government system.

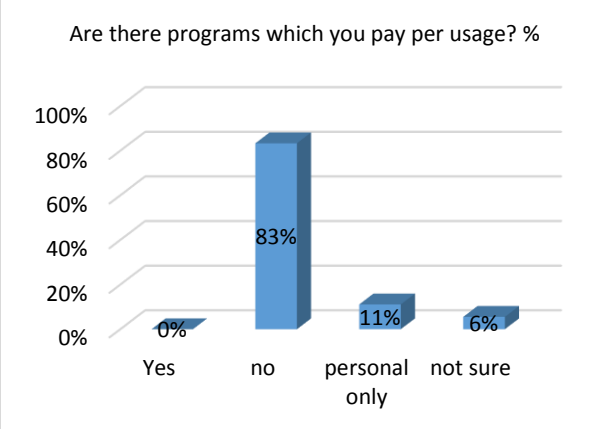


Figure 3: programs paid per usage.

On level of confidence that users have about the government on cloud computing, 61% feel that they are just beginning to familiarise, 28% are relatively familiar, while 11% are very familiar as shown in figure 4. To embrace cloud computing, the Government has to make a deliberate attempt to create awareness and make staff appreciate and embrace cloud computing especially in service delivery.

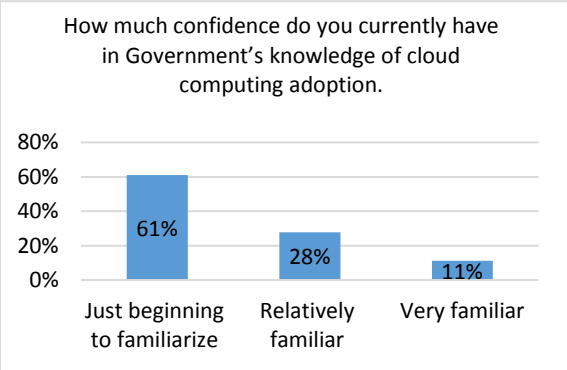


Figure 4: level of confidence in Government's knowledge on cloud computing adoption

On the future of Cloud computing in e-Government computing, 28% of respondents strongly agree, 56% agreed and 17% disagreed while 6% strongly disagreed (figure 5). Considering the global trends, it is clear that cloud computing holds the future of e-Government implementation. The stage model provides this implementation path.

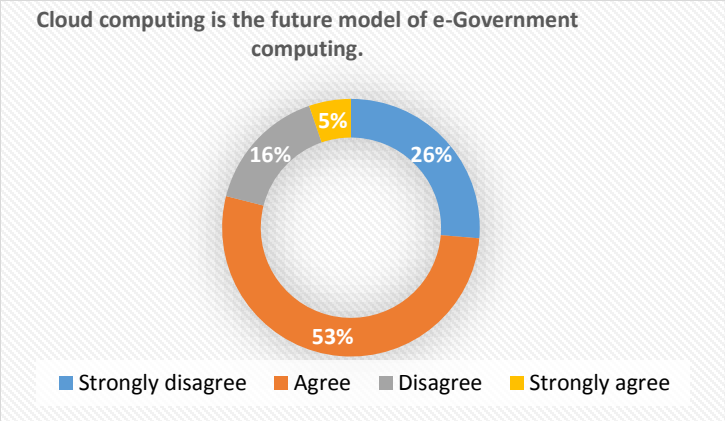


Figure 5: future of cloud computing model of e-Government

About the stage that the government is with regard to cloud computing adoption in offering its services, 17% felt that the government is not involved, 11% thought it was using, 28% thought they were still at the trial stage and 17% were at implementation stage. (figure 6). If the path to the cloud is not known, then it is difficult to fully adopt cloud computing in e-Government

service delivery. Therefore, cloud adoption awareness is paramount in the e-Government cloud business.

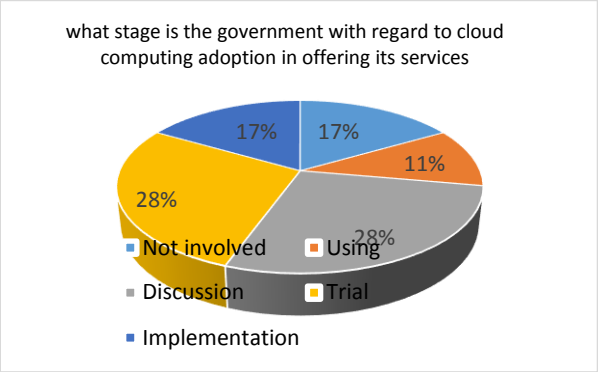


Figure 6: The stage in cloud computing that the Government is in offering its services.

On beneficial characteristics of cloud services in e-Government, the greatest identifiable benefit was buyers' pay per use while the least was rapid acquisition and deployment. Variable pricing based on consumption, lower on going operating costs and little or no capital investment were also identified as benefits (Figure 7). This clearly shows how financial implication is central to cloud business. The pricing policy is of focus here. E-Government users seem to be more interested in only paying for what they use. At the initial levels, Software as a Service (SaaS) provides the best opportunity for such, because of the level of abstraction and user friendliness. This points out that cloud computing is highly considered for cloud e-Government implementation for the financial gains that it presents, but cutting down on operational cost.

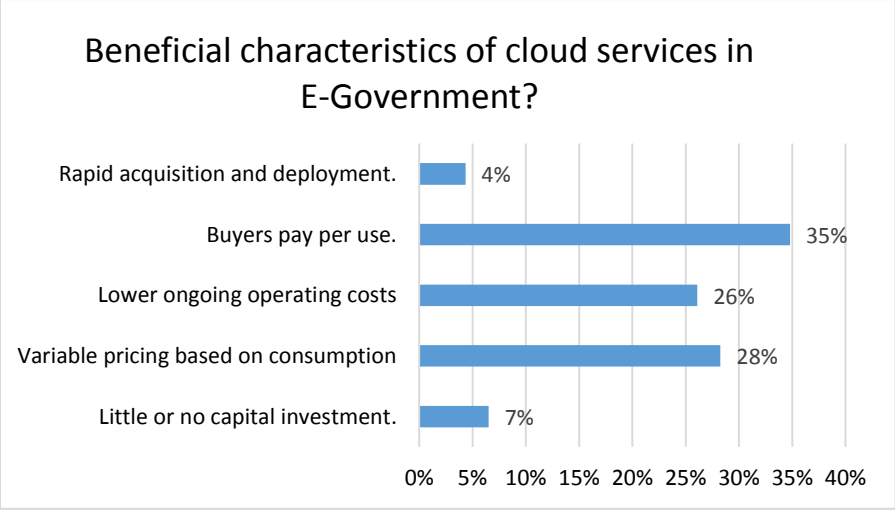


Figure 7: Beneficial characteristics of cloud services in e-Government

The respondents expressed that greatest service provided by e-Government to its citizens is tax returns (31%) while the least is complaint/compliment management (5%). (Figure 8). In the county Government of Machakos, cloud computing is still at the very young stage. There is

therefore need to come up with guideline on cloud computing implementation path. There is therefore need for a deliberate effort to achieve this. Some decisions may not be made at the county level but at the national level. This can either be through a roadmap to the cloud, methodology or cloud adoption criteria. Through the stages in cloud adoption presented in this study, this can be achieved.

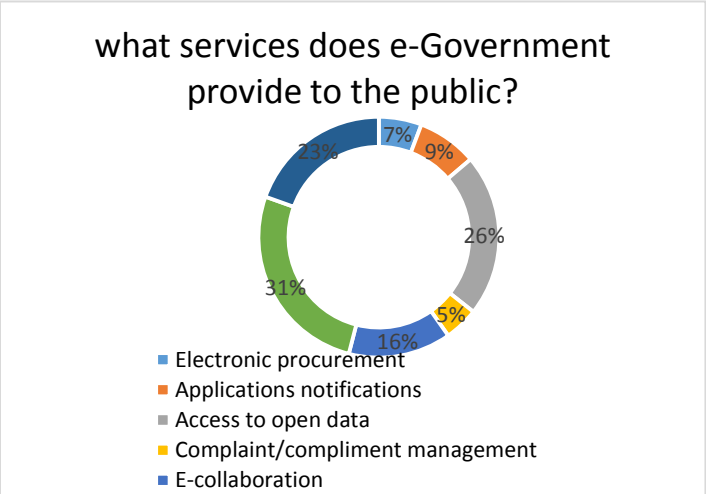


Figure 8: Services provided by Government to its citizens

According to this research, 32% of the respondents expressed that cloud computing for public service means a type of outsourcing of IT and 13% felt it is an interesting business offering (Figure 9), meaning that they have a basic understanding of cloud computing. On this foundation, the concept can be developed further into fully-fledged adoption strategy. Some staff still feel that the cloud hype will subside but this provides a precaution to carefully consider adoption strategy and path to the cloud taking into consideration the unique circumstances for each Government entity.

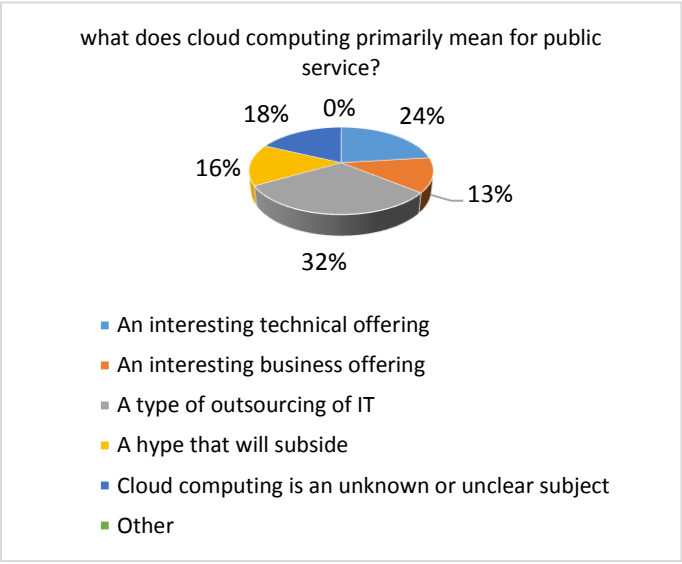


Figure 9: Primary meaning of cloud computing for public service

As clearly presented in this study, 83% of respodents felt that there is no sufficient knowledge in the public to enable them make decisions on cloud computing adoption while 17% felt the contrary (figure 10). This adoption model will therefore provide the knowledge required by the Governmnet to make right cloud adoption decisions.

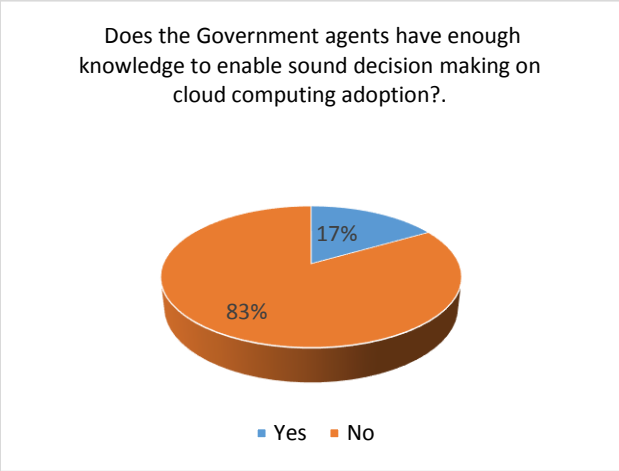


Figure 10: Availability of sufficient knowledge to make decisions on cloud computing adoption

In view of the respondents, hardware cost saving and pricing flexibility are the very important benefits of cloud computing while increased collaboration is the least important. (Figure 11). The financial and economic benefits of the cloud business therefore confirms that cloud adoption into e-Government will save money. This is confirmed by literature review, as cost saving was identified as a key benefit of cloud computing. The technology requires minimal capital investment making it a better alternative to traditional computing, which requires many infrastructural establishments.

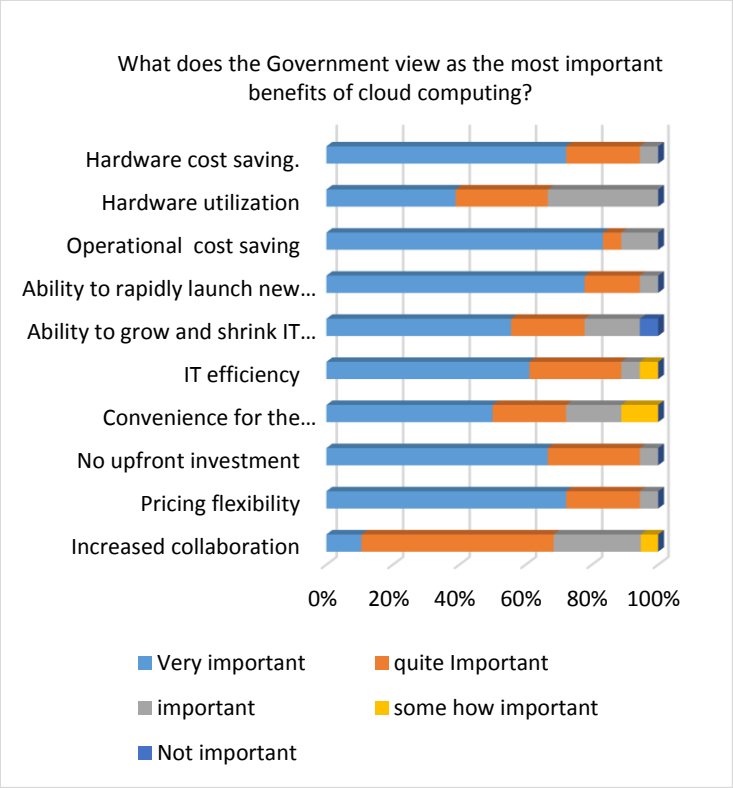


Figure 11: The most important benefits of cloud computing to the Government

Security, Privacy and vendor lock-in were viewed as the main concerns regarding the use of cloud computing in e-Government. Integration, lack of functionality and insufficient financial benefits were the least concerns of the options provided. (Figure 12). The different levels of cloud adoption stages pose different challenges. When the adoption path is clearly defined, it leaves nothing to doubt. All service model options are made open as well as the underlying deployment designs. Security, privacy and vendor lock-in are factors which slow down cloud adoption. These questions are clearly addressed by the stage model.

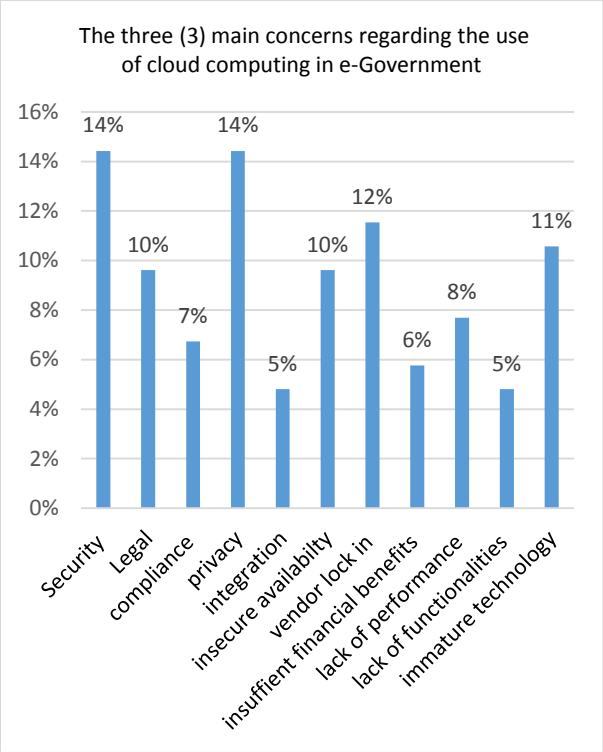


Figure 12: The three main concerns regarding use of cloud computing in e-Government.

Data storage (41%) and email/messaging (21%) were identified as the main online services in the Government currently. Application development (0%), Application hosting (0%) and enterprise service bus (0%) were online services, which the Government is not using at all. (Figure 13). This demonstrates that the time to embrace cloud computing is now. The first thing would be to create awareness on cloud computing models. It is on service and deployment models upon which stage model rides. Further to that, software as a service (SaaS) is already in use while platform as a service (PaaS) and Infrastructure as a Service (IaaS) are not in the picture yet. This confirms what is presented in the stage model that the lowest level of cloud adoption is Software as a Service (SaaS) while PaaS and IaaS traverse second third and fourth stages respectively.

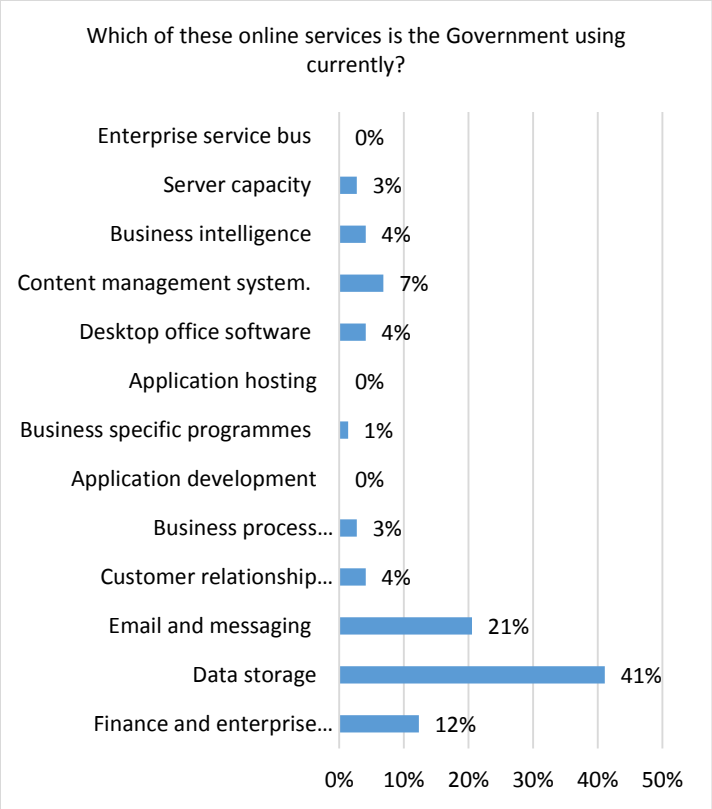


Figure 13: The online services that the Government is using now.

As observed from the study, 100% of all respodents said that cloud computing has not been discussed formally as part of IT strategy in e-Government in their ministries. (Figure 14). For Cloud computing to be fully integrated into e-Government, a policy has to be in put in place to guide the process. This is at the highest level of adoption stages, before which an adoption path has to be discussed and agreed by all process owners and stake holders in the adoption process. The adoption process can only be guided by the available models at any one time. The stage model therefore provides this guideline to the cloud.

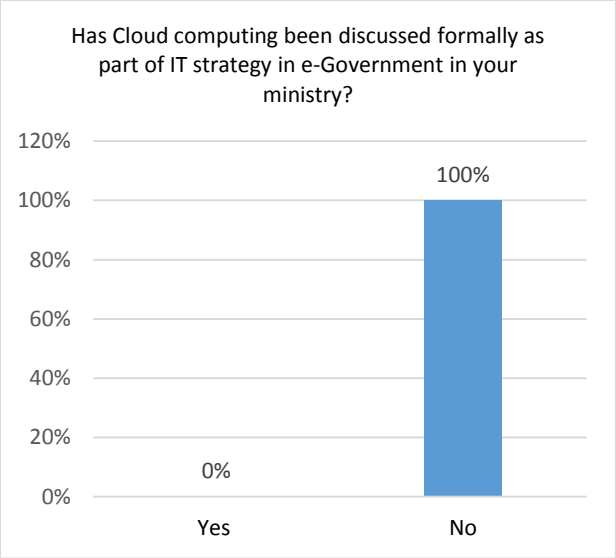


Figure 14: If cloud computing has been formally discussed.

From the research, 100% of all respodents said that the Government has not enlisted the stages in implementation of cloud computing. (Figure 15). This confirms that there does not exist an adoption path to the cloud for e-Government implementation. This research was therefore timely to provide such solution.

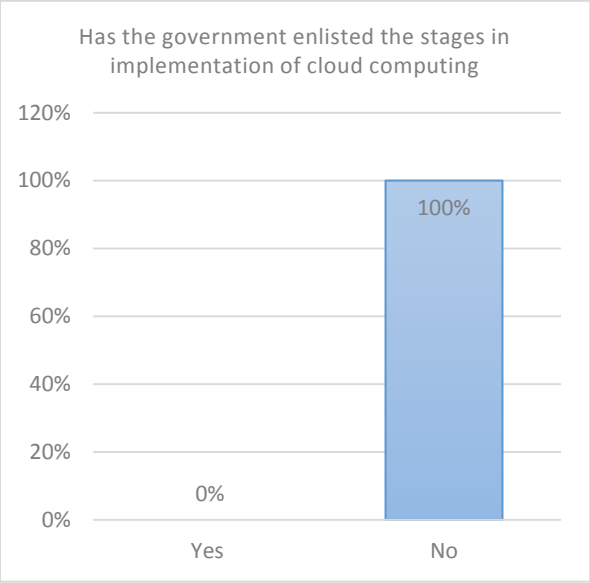


Figure 15: Enlisting of the stages in implementation of cloud computing

It is clear that 83% of the cloud services provided to the Government are owned by private vendors while none is owned by communities or other governments. Only 17% is owned by

Government agencies. (Figure 16). This clearly demonstrates how uncordinated cloud computing is in e-Government. The cloud deployment model therefore needs to be maped in the adoption stage model. At the initialization stage, the Governmnet is not expected to own any cloud and if it does, only at agency level. This confirms the explanation of the stage model that stage1 cloud deploymnet is largely private. As we climb up the satages, clouds become more personalised. This is basicallly due to economies of scale and security and confidentiality of the large volumes of government data involved.

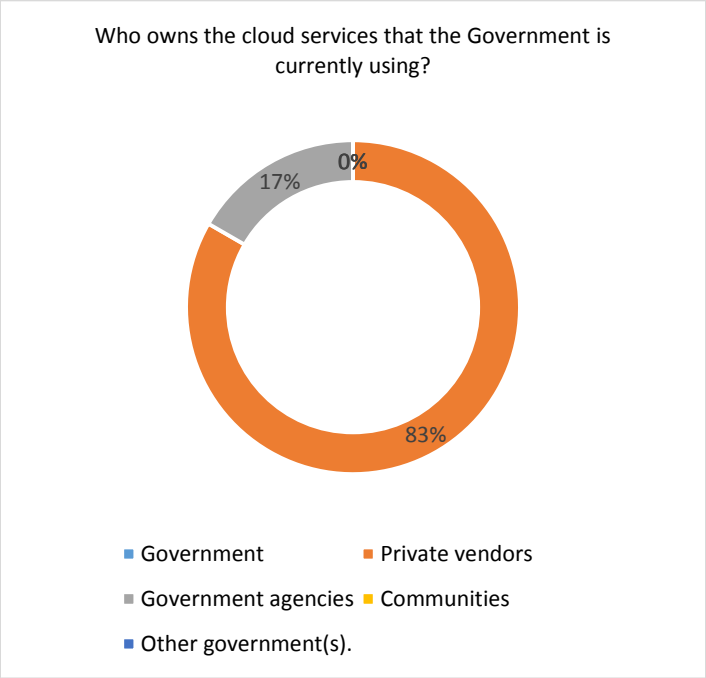


Figure 16: Ownership of the cloud services that the Government is currently using.

Security, cloud computing market and legal expertise were the top most knowledge/expertise which should be sufficient within e-Government regarding cloud computing.(Figure 17). For cloud computing to be fully adopted in e-Governmnet, there are competencies which need to be developed from within the governmnet systems. These findings therefore demonstrate how unprepared the government is for cloud adoption. Stage model provides the areas of competency which need to be developed at each stage of the adoption process.

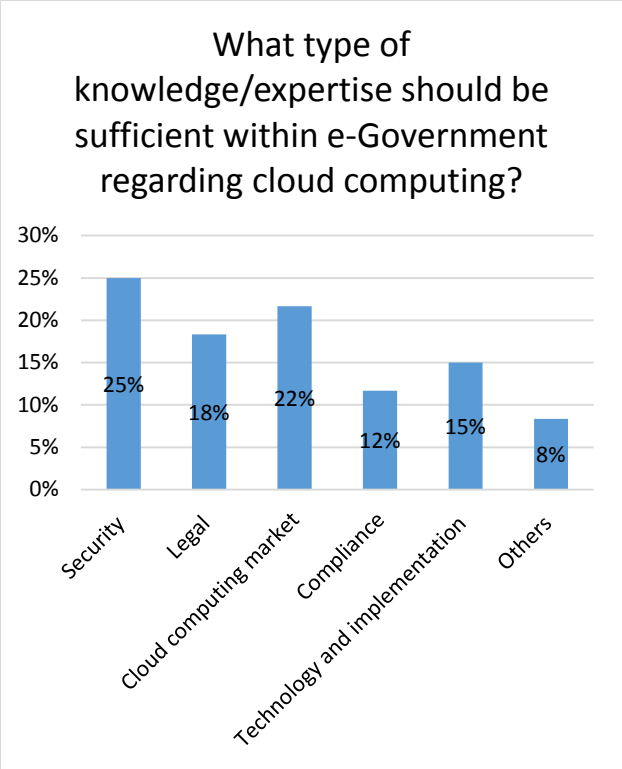


Figure 17: Types of Knowledge/expertise needed within e-Government for cloud computing

Findings from case study

Despite of the fact that the county Government of Machakos has some online services, it is evident from the data collected that the Government does not have a structured way of adopting cloud computing in its e-Government initiatives. Much of the cloud computing is used for personal purpose, meaning it is a personal initiative of the IT staff to deploy the services for their own convenience but not to deliver service to the citizens. This confirms the adhoc nature of cloud deployment as proposed in the stage model.

There is evidently no adequate awareness even among the IT staff on cloud computing and intentions of the Government to deploy and utilize it in service delivery. Despite of the service not being deployed, staff have confidence that cloud computing is the way forward in e-Government deployment. The IT staff, who are to support the e-Government services, are not able to tell the extent of cloud computing adoption in e-Government services. From the proposed model knowledge base is key to deploying cloud computing. Accordingly, inadequate knowledge is characteristic of the proposed stage1 of the proposed model.

The cost benefits and value for money are factors, which respondents seem to be certain about, as the gains for deploying cloud computing. Currently, e-Government services are utilised by staff through tax compliance and other statutory services, which are mandatory obligations of the citizens to the Government.

It is therefore clear that citizens are ready to consume cloud services once the Government deploys them, going by the rate of consumption of the currently available few Government cloud services. The initiative must be from the Government side. Guiding the Government on how to go about adoption of cloud computing in e-Government implementation will therefore provide a big solution to the current e-Government status.

It is evident that there is no sufficient knowledge in the public to enable them make decisions on cloud computing adoption. Cloud computing is "just a type of outsourcing in IT which offers interesting technical environment". Despite of the inadequate knowledge, the respondents are confident that cloud computing would increase efficiency in e-Government service delivery.

However, respondents are concerned about security, privacy and vendor lock in once the cloud computing is adopted for e-Government implementation. This scenario provides a fertile ground for systematic deployment of cloud computing. The staff have a positive attitude towards the cloud, despite of the few concerns, which are adequately addressed by the cloud computing adoption stage model provided in this study.

Currently, data storage and email/messaging are the major cloud based services enjoyed among the e-Government services. There has never been a formal discussion at the Government level on how and when to adopt cloud computing in offering e-Government services. It is very clear that the Government has never enlisted the stages and cycles involved in implementation of cloud computing in e-Government.

From the stage model presented, SaaS is identified as the service model component at the initial stage of the model. The findings confirm the same because the current cloud based services in use are SaaS based. It is expected that the cloud adoption will take place in progression despite of the current status.

The little cloud services utilised in e-Government are majorly owned by private vendors, only some Government agencies own a small proportion of the cloud services utilised by the Government. For this to happen, respondents were very clear that security, legal and cloud computing market knowledge and expertise were critical. Out of the findings it is evident that there is no structured way of adopting cloud computing in e-Government implementation.

Conclusion

Different audiences know cloud from different perspectives. As organizations across public and private sectors understand cloud computing, they are looking to act and deploy cloud solutions. Some have made significant progress in their journey to cloud and others are just about to start, though mostly under personal initiatives. They offer tenable insights into what makes a successful cloud program and the required competencies.

From the data gathered, there is a clear revelation that cloud computing is the way to go on implementation of e-Government Services. This is due to the positivity expressed by majority of the respondents. Financial and economic benefits of cloud computing are very clear and

immense. The only challenge is the best way to adopt the cloud service. The responses clearly show that the Government sampled has never communicated to its ICT technical staff on cloud policies let alone the adoption methodology. Staff only apply cloud solutions under own initiatives or to close gaps in the short run.

From the respondents it is also clear that cloud solutions in place are not intended to benefit the citizens, businesses or other government agencies but just for in house operation convenience, despite of electronic government being strategic in Government operations.

The respondents have demonstrated positive attitude but are limited in understanding of the cloud deployment. This reveals that the cloud business in Government service is still at infant stage. The status provides a perfect opportunity for the government to guide the implementation process, by avoiding pitfalls or chewing more than enough hence slipping back to the ground. Establishing the status would be the first thing to do, and by the research results presented in this study, much more may be built on it. This study confirms the observations made in literature review that in practical application, e-Governments has a long way to go in fully adopting cloud computing in its service provision initiatives. This confirms the importance of the stage model developed in this study. The model shall provide guidance in implementation of cloud computing in e-Government services.

5.0 A STAGE MODEL FOR CLOUD COMPUTING ADOPTION IN E-GOVERNMENT

This chapter presents the four stages of the stage model for cloud computing adoption in e-Government. The key differences between the stages are also discussed. The model is then evaluated using focus group.

Similarly, for e-Government to adopt cloud computing in its implementation, there has to be a defined approach. This will be achieved by first identifying the stages so involved in relation to existing models. Service model shall be used in this case. At the initial stages of adoption of cloud computing some organizations implement solutions which only address specific needs. As the system grows, a structured way of addressing cloud solutions has to be developed. In the later stages, the cloud adoption process has to be driven by policy, especially when so many players are in place trying to claim space as users as well as clients.

As presented in Figure 18, the proposed model consists of four stages, Ad-hoc e-Government solutions (Stage 1), Cloud based public services (stage 2), e-Government clouds (stage 3) and e-Government cloud policy (stage 4). The horizontal axis represents the degree of cloud computing adoption in e-Government, and the vertical axis represents the organizational and technological complexity of the solutions included in each stage.

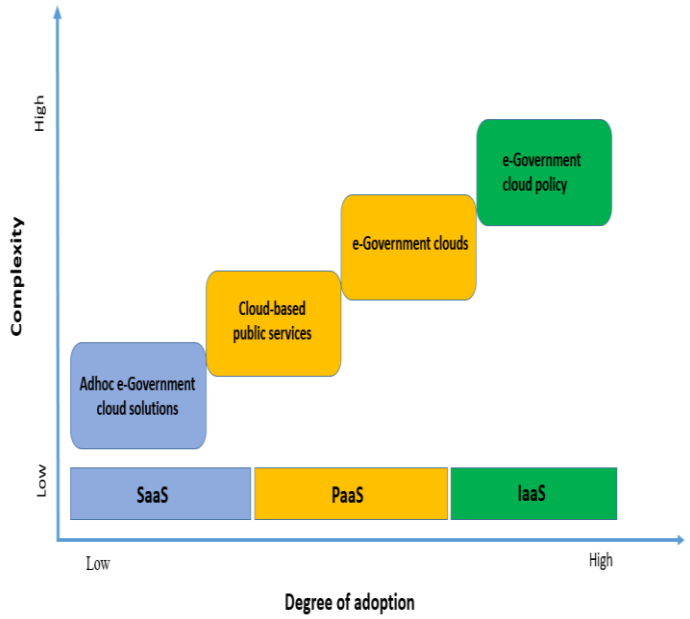


Figure 18: A Stage Model for Cloud Computing Adoption in e-Government

Different agencies or public organizations in a country may use cloud computing in various ways. The stage model provides a guide into how e-Government can systematically adopt cloud computing against the already existing models. From the known service model, a Government entity can evaluate the level of adoption depending on the services they are already utilising (Zhang, 2010). As such, in relation to the cloud adoption model, they are able to establish their level of adoption. Out of which they can systematically adopt cloud computing in e-Government processes as guided by the stage model.

Table 1 highlights the main differences between the stages of the model, which forms the basis of the model as shall be discussed in the subsequent headlines.

Table 1: Main differences among model stages

	STAGES			
VARIABLES	**Stage 1 Adhoc e-Government cloud solutions**	**Stage 2 Cloud-based public services**	**Stage 3 e-Government cloud(s)**	**Stage 4 e-Government cloud policy**
Type of services	Internal agencies	External (citizens and businesses)	Internal and external	Internal and external
Provider	Individual vendors	Individual vendors	Government	Government and individual vendors
Main change in	Procurement of IT services for Government	Provision of public services	Architecture of e-Government systems	Government IT strategy/Policy
Service Model adoption	SaaS	SaaS/PaaS	PaaS/IaaS	IaaS

Stage 1: Ad-hoc E-Government Cloud Solutions

At this stage, agencies or public organizations use cloud computing only for covering their needs in IT resources and enhancing collaboration with other agencies, and not for providing digital services to citizens or businesses. Due to absence of Government Cloud(s), the cloud services (SaaS) are entirely provided by individual vendors. In the absence of an official Government policy, each agency decides how and to what extent it will use cloud services on its own. For this reason, adoption of cloud computing in this stage is very erratic. With no central guidance or clear familiarity with cloud computing adoption concept, there are few agencies that use cloud computing. Much of it is on trial and error basis. Thus, the degree of adoption in this stage is very low. The organizational complexity of this stage is low, considering that the change that happens is internal and limited. As for the technological complexity, the organization continues to operate with little technological change. The provision of cloud services is considered as a form of outsourcing. For this reason, the degree of engagement is very low and the agencies can revert to the previous modes quite easily. The low degree of adoption combined with the low technological and organizational complexity places this stage at the bottom of the hierarchy.

An example of this stage would be the implementation of the "Government to Cloud" or "Government to Cloud to Government" business model proposed by Deussen et al. (2011). A more tangible example that belongs in that stage is the case of "Apps.Gov" portal of US Government. Although in that case there was an involvement of the central Government, the agencies were the ones that decided whether they would use cloud services for their internal operations and which services they would procure. The fact that the portal was closed in December 2012 is consistent with the low engagement, which characterizes this stage. It further shows that this kind of initiatives alone are not enough for the consolidation of cloud computing in e-Government.

Stage 2: Cloud- based Public Services

At this stage, cloud computing is used by agencies and municipalities in order to provide digital public services to citizens and businesses. The public services are based on Software as a service (SaaS) and partly Platform as a Service (PaaS) models provided by individual vendors. The decisions related to cloud computing are made at agency or municipal level. The degree of engagement is still low since the Government holds also in this stage only the role of the customer of cloud services, but the fact that there are more stakeholders (citizens and businesses) in this case makes the return to the previous state more difficult. This is the stage where cloud computing can promote Open Innovation and Open Data Initiatives (Charalabidis et al., 2011). Since cloud solutions that appear at this stage are more sophisticated and are not limited to use of SaaS or storage services, there is an increase in technological complexity. Organizational complexity is also increased due to the use of cloud computing for interaction with citizens.

Furthermore, the decision to deploy PaaS solutions for providing e-Government services implies a higher degree of awareness of cloud computing on the part of Government officials. The cloud-based platforms for e-Government services that have been proposed in literature (Charalabidis

et al., 2011) require the active participation of organizations' administrators in the designing process of the services. This involvement of agencies' personnel should result in further familiarization with cloud computing and make agencies more active in using it largely. It should also not be forgotten that the presence of agencies in a Government that deliver public services through PaaS, does not prevent the existence of agencies whose cloud use falls into the first stage. Therefore, the degree of adoption for Governments that have reached the second stage is higher than the first stage.

The increase in both organizational and technological complexity, and degree of adoption that occurs in this stage places it above and to the right of the first stage. The business models "Government to Cloud to Enterprise" and "Government to Cloud to Citizen" suggested by Deussen et al. (2011) describe possible examples that fall into this stage. Moreover, as was discussed in the Case Studies section, the City of Edmonton in Canada has already used cloud computing platform in order to offer census data and other public information online. This confirms that Platform as a Service (PaaS) model is suitable for the second stage of cloud service adoption in e-Government service delivery. It therefore provides a perfect synergy for integrating the second stage of the model under discussion.

Stage 3: E-Government Cloud(s)

The main change in this stage is the development of one or more Government clouds. The private clouds can belong either to the central Government or more often, to agencies or Government organizations. They are used in order to replace the former e-Government information systems that the organization probably had and can support the provision of both internal and public services. The fact that a private cloud offers more security and control than the other deployment models may encourage the organization to use cloud computing more broadly. There are also some cases where the agency handles sensitive Government data and the development of its own private cloud is the only way to adopt cloud computing. The turn of the Government from customer of cloud services to owner of a Cloud, increases the organizational complexity along with the degree of engagement. Although it is not impossible in theory to quit the use of cloud computing in the future, it is highly unlikely that the organization will leave its own cloud to turn again to traditional computing.

While a third party can operate a private cloud, in practice the public organizations choose to build an on-premises cloud. This can be attributed either to their distinctive security requirements, or to the fact that Government organizations usually have their own data center and want to utilize its resources. A lot of technological changes take place in this stage, with the virtualization of the data center being the most significant. The organization is also responsible for the security of the virtualized data center, so technological changes will probably occur in this field too. These changes, which are not found in the previous stages, increase the technological complexity of this stage.

A typical example of a Government cloud is the Open-Gov Private Cloud of Greece Government that accommodates various applications of e-Government. At the agency level, the cases of US,

DoD and NASA illustrate how cloud computing can be incorporated in public organizations with special needs in terms of security and control (Zhang, 2010).

As the above examples indicate, private clouds are usually developed either by large public organizations that their considerable needs in IT resources justify such a decision or by Governments that intend to use cloud computing for hosting their central information systems but they want to have the control of the IT resources they use. (Frost & Sullivan, 2011) In either case, the Government or organization will have to follow an organized approach or strategy in order to move its information systems to a cloud environment. The US DoD's Cloud Computing Strategy presented in literature review is such an example (US DoD, 2012). The degree of adoption in this stage is higher than the previous due to the organized effort and the number of agencies that Government may have.

Stage 4: eGov Cloud Policy

At this final stage cloud computing adoption is fully supported by the central Government of a country. While in the other stages the use of cloud computing is usually a result of individual initiatives of agencies and municipalities, here the central Government promotes cloud adoption in e-Government through policies and roadmaps.

The coordinated effort for integrating cloud computing in e-Government at this stage results to high degree of engagement. A strategy is developed to facilitate cloud deployment by all departments/Agencies. In addition, the Government encourages smaller agencies and public organizations that have not developed private clouds to procure cloud services from individual vendors, by establishing a cloud marketplace for public sector. In that way, the quality of cloud services is ensured and the procedure of IT procurement is easier for agencies. Successful initiatives in this stage lead to the highest degree of adoption for a Government.

The diffusion of cloud computing in the whole e-Government system of a country raises also complexity since the organizational changes that happen are significant. At this point, the change of mindset from assets to services occurs (Kundra, 2011). In contrast to the previous stages, the change here refers to the IT culture of the Government. The Government should also take steps in order to resolve the legal issues that according to several scholars (Clemons & Chen, 2011; Hada et al., 2012; Macias &Thomas, 2011b; Zissis & Lekkas, 2011) hinder the adoption of cloud computing in e-Government.

Another important issue that should be resolved in this stage is the absence of standards. According to the recommendations of NIST (2011b), cloud computing standards should be developed and used widely from Government agencies to support Government's requirements for interoperability, portability and security. In the previous stages, cloud computing is adopted for covering the needs of individual public organizations or central Governments and the related decisions do not affect other organizations or agencies outside of organization's/Government's direct authority.

In this stage, for the diffusion of cloud computing in the whole Government, standards are necessary to ensure the interoperability of the different information systems. The development of technological standards characterizes the technological complexity of this stage.

6.0 CONCLUSIONS

As the research related to the use of cloud computing in e-Government started quite recently, the number of studies published in this topic is relatively limited. This research presented an extended literature review in order to promote further research in the topic, by mapping the areas in which scholars have already published studies and identifying the areas that are still unexplored. The conceptual model that is presented in indicates the main areas of current research, which are: the examination of suitability of cloud computing for supporting e-Government, strategies for adopting cloud computing successfully and implementation of cloud solutions in e-Government. While some sub-areas have drawn the attention of many researchers, such as the identification of benefits and risks of cloud adoption in e-Government and the development of cloud architectures for e-Government, other sub-areas clearly need further research. The frameworks and models that have been proposed so far obviously do not cover all needs of Governments. The discussion about open data has been intensified lately, so further examination of how cloud computing can promote open data initiatives would be welcomed. The development of secured cloud architectures for e-Government is also important, since security is one of the main challenges in cloud adoption by Governments. About the question of whether cloud computing should be used in e-Government, the unique characteristics of each case should be taken into consideration. The research drew attention to the following issues:

Governments should take steps towards standardizing and ensuring quality of services.

Although the general migration strategies that have been presented can be applied almost in any situation, it is advisable that each agency develops a strategy that covers its own requirements.

Cloud computing will bring about changes in the way some services are delivered. The stakeholders should be properly informed in order to accept these changes.

The case studies examined in answered the question about the ways that Governments around the world deploy cloud computing for supporting e-Government. The analysis of the cases showed that the complexity of the cloud solutions and the extent to which these are applied in e-Government system, differ from country to country. This finding, in conjunction with the different aspects from which the topic has been viewed in literature, led to the proposal of a stage model that classifies the different levels of adoption.

The stage model, which was the main objective of this study, was developed from the basis of literature review, relying on what players in the market are offering and improving on the same. Again, the model concept is drawn from other frameworks and models already in application. After analysing them the gaps identified which what informed this model.

From the primary data from Machakos county government, the ideas from literature were confirmed out of the responses from the ICT county officers. From the same, it was established that the levels of adoption are related to perceived benefits, risks and knowledge available to guide decision making. The stage model on adoption of cloud computing in e-Government implementation therefore comes in handy to inform governments on several aspects about cloud adoption and stages involved

References

Annastellah, O. & sigwejo, J. (2015). Evaluating e-Government services: a citizen-centric model. Cape Peninsula: Cape Peninsula University of Technology.

Alshawi, S. & Alalwany, H. (2009). E-Government evaluation: citizen's perspective in developing countries. Information Technology for Development, 15(3),193-208. Retrieved from: <http://searchvirtualdesktop. techtarget.com/definition/virtual -desktop.

Alvarez, V., James S. & Jessica M. (2012). Assess Your Cloud Maturity. Cambridge: Forrester Research, 2012 At the dawn of E-Government: The citizen as customer. [White Paper]. Retrieved from: http://www.egov.vic.gov.au/pdfs/e- Government.pdf .

Deussen, P., Eckert, K.P., Strick, L. & Witaszek, D. (2011). Armbrust, Michael. "A View of Cloud Computing." Practice. 2010 Babcock, Charles. State Street Private Cloud: $600 Million Savings Goal . Retrieved from <http://www.informationweek.com/cloud-computing/platform/state-street-private-cloud-600-million-s/240002596>.

Baker, J. (2010). The Technology–Organization–Environment Framework." Dwivedi, Y K. Information Systems Theory: Explaining and Predicting Our Digital Society. Springer Science+Business Media, 2012. 231-245. Benchmark Measurement, November 2009.Retrieved from: http://ec.europa.eu/information_society/eeurope/i2010/ docs/benchmarking/egov _benchmark_2009.pdf

Bertot, C., Jaeger, P. & McClure, C. (2008). Citizen-centered e-Government services: benefits, costs, and research needs. In Chun, S.A., Janssen, M. & Gil-Garcia, J.R. (eds). Dg.o 2008: Proceedings of the International Digital

Breil, A., Hitzelberger, P., Da Silva Carvalho, P. & Feltz, F. (2012). Exploring Data Integration Strategies for Public Sector Cloud Solutions. In A. Ko et al. (Eds), Proceedings from EGOVIS/EDEM 2012, Lecture Notes in Computer Science, 74(52), 271-278. doi: 10.1007/978-3-642-32701-8_24

Brodkin, J. (2011). State Street Modernizing with Cloud, Linux Technologies . Retrieved from: http://www.networkworld.com/news/2011/041411-state-street-cloud.html>.

Building the Virtual State: Information Technology and Institutional Change. Washington, DC: Brookings Institution Press.

Fraunhofer- FOKUS (2012). goBerlin – Marketplace for trustworthy Governmental and business services". Retrieved from: : http://www.fokus.fraunhofer.de/en/elan/projekte/national/go_berlin/index.html

Chang, V., Ramachandran, M., Yao, Y., Kuo, Y. H., & Li, C. S. (2016 b). A resiliency framework for an enterprise cloud. International Journal of Information Management, 36(1), 155-166.

Charalabidis, Y., Koussouris, S. & Ramfos, A. (2011). A Cloud Infrastructure for Collaborative Digital Public Services. Proceedings from CloudCom 2011: IEEE Third International Conference on Cloud Computing Technology and Science, (pp. 340-347). doi: 10.1109/CloudCom.2011.53

Chen, X., Wills, G., Gilbert, L., & Bacigalupo, D. (2010), Using Cloud for Research: A Technical Review, TesciRes Report for JISC, June.

Chuob, S., Pokharel, M. & Park, J. (2010). The Future Data Center for E-Governance. Proceedings from ICACT 2010: The 12th International Conference on Advanced Communication Technology (pp. 203-207). Retrieved from: http://ieeexplore.ieee.org/xpl/login.jsp? tp=&arnumber= 5440476&url=http%3A %2F%2Fieeexplore.ieee.org% 2Fxpls%2Fabs_ all.jsp%3Farnumber%3D5440476.

Chuob, S., Pokharel, M. & Park, J. (2011). Modeling and Analysis of Cloud Computing Availability based on Eucalyptus Platform for E-Government Data Center. Proceedings from IMIS 2011: Fifth International Conference on Innovative Mobile and Internet Services in Ubiquitous Computing (pp. 289-296). doi: 10.1109/IMIS.2011.135

Clemons, E. & Chen, Y. (2011). Making the Decision to Contract for Cloud Services: Managing the Risk of an Extreme Form of IT Outsourcing. Proceedings of the 44thHawaii International Conference on System Sciences (pp. 1-10) doi:10.1109/HICSS.2011.292

Craig, R., Frazier, J., Jacknis, N., Murphy, S., Purcell, C., Spencer, P. & Stanley, JD (2009). Cloud Computing in the Public Sector: Public Manager's Guide to Evaluating and Adopting Cloud Computing. [White Paper]. Retrieved from :http://www.cisco.com/web/about/ac79/ docs/sp/Cloud_Computing.pdf.

Deussen, P., Eckert, K., Strick, L. & Witaszek, D. (2011). Cloud Concepts for the doi: 10.1111/1467-8616.00135

Earl, M. (2000). Evolving the E-Business. Business Strategy Review, 11(2), 33-38.

Cloud. Proceedings from SRII 2011: 2011 Annual SRII Global Conference, (pp. 285-292). doi: 10.1109/SRII.2011.39 Communications of the ACM, 16(7), 399-405.

European Commission (2009). Smarter, Faster, Better e-Government. 8th e-Government cloud computing architecture. Government Information Quarterly, 28, 239-251. doi: 10.1016/j.giq.2010.05.010 Cloud Computing Beyond 2010. K. Jeffery and B. Neidecker-Lutz (Eds). Retrieved from: http://cordis.europa.eu/fp7/ict/ssai/docs/cloud-report-final.pdf.

European Commission (2012a). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – Unleashing the Potential of Cloud Computing in Europe (Report No. COM

(2012), 529 final). Retrieved from: http://ec.europa.eu/information_society/activities/cloudcomputing/docs/com/co m_cloud.pdf

European Commission. (2012b). Accompanying the document: Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – Unleashing the Potential of Cloud Computing in Europe (Report No. SWD(2012) 271 final). Retrieved from: http://ec.europa.eu/information_society/activities/cloudcomputing/ docs/com/swd_com_cloud.pdf

European Conference on Information Systems, Verona, Italy, and 8–10 May: Proceedings. 13 pp. Retrieved from: http://unpan1.un.org/intradoc/groups/public/documents/unpadm/ unpan035996.pdf 2015.

European Network and Information Security Agency (ENISA) (2011). Security & Resilience in Governmental Clouds: Making an Informed Decision. [White Paper].Retrieved from: http://www.enisa.europa.eu/activities/risk-management/emerging-and-future- risk/deliverables/security-and-resilience-in-governmental-clouds/ .

Erwan, G. (2013). IT Glossary Cloud Computing. (2nd ed.) Retrieved fromhttp://www.gartner.com/it -glosary/cloud-computing/>

Federal Cloud Computing Strategy. [White Paper]. Retrieved from CIO.GOV website: https: //cio.gov/wp-content/ uploads/downloads/ 2012/09/Federal-Cloud-Computing-Strategy.pdf

Kurdi, R., Taleb-Bendiab, A., Randles, M. & Taylor, M. (2011). from IMIS 2011: Retrieved in June 2016 G-Cloud: New Paradigm Shift for Online Public Services. International Journal of Computer Applications, 22 (8), 24-29. Retrieved from http://www.ijcaonline.org/volume22 /number8/ pxc3873629.pdf

Breil, A., Hitzelberger, P., Da Silva Carvalho, P. & Feltz, F. (2012). Gens, Frank. Defining Cloud Services and Cloud Computing. Retrieved from: http://blogs.idc.com/ie/?p=190>.

Gottschalk, P. & Solli-Sæther, H. (2006). Maturity model for IT outsourcing relationships. Industrial Management & Data Systems, 106(2), 200-212. doi: 10.1108/02635570610649853

Gottschalk, P. & Solli-Sæther, H. (2009). E-Government Interoperability and Information Resource Integration: Frameworks for Aligned Development. Hershey, PA: Information Science Reference Governance. International Journal of Computer Applications, 7(7), 31-34. doi: 10.5120/1262-1613 Government Information Quarterly,27(3), 220-230. doi: 10.1016/j.giq.2009.12.009

Leikums, T. & Cevere, R. (2012). Government IT Services Consolidation– Taiwan's Experience. Proceedings

Guan, Y. (2009). A Statistical CPID Algorithm on Cloud Computing. Proceedings from FCC 2009: International Conference on Future Computer and Communication, (pp. 101-104). doi: 10.1109/FCC.2009.27

Herndon: UNICOM Government, (2009). Explaining and Predicting Our Digital Society . Springer Science+Business Media, 2012. 231-245.

Hobson, S., Anand, R., Yang, J., Liu, X. & Lee, J. (2011). Municipal Shared Services cloud computing architecture. Government Information Quarterly, 28, 239-251. doi: 10.1016/j.giq.2010.05.010 Cloud Computing Beyond 2010. K. Jeffery and B. Neidecker-Lutz (Eds). Retrieved from: http://cordis.europa.eu/fp7/ict/ssai/docs/cloud-report-final.pdf.

Hung, C., Tuan, C. and Chu, Y. (2011). Growth. Information Systems Management, 18(3), 42-50. doi:10.1201/1078/43196.18.3.200 10601/ 31289.6

Huff, S., Munro, M. & Martin, B. (1988). Growth Stages of End User Computing. Communications of the ACM, 31(5), 542-550.

Hung, C.F., Tuan, C.C. & Chu, Y.C. (2011). Constructing a Private Cloud for Information Sharing Cloud. Advances in Information Sciences and Service Sciences, 4(17), 577-586. doi: 10.4156/AISS.vol4.issue17.66

King, W.R. & Teo, T.S.H. (1997). Integration between Business Planning and Information Systems Planning: Validating a Stage Hypothesis. Decision Sciences, 28(2), 279-308.

Khan, J. & Kwang, K. (2011). Shared Service Infrastructure for Pakistan Public Sector. Case Study. Pakistan

Kundra, V. (2011). Federal Cloud Computing Strategy. [White Paper]. Management, 41(2004), 457-468. doi: 10.1016/S0378-7206(03)00084-3

Li J. (2016). A maturity model for cloud computing. Retrieved from: <http://news.cnet.com/8301-19413_3-10122295-240.html>.

Marasso, L., De Maggio, M., Chetta, V., Grieco, M., Elia, C. & Totaro, S. (2010). Allowing Citizens to Self-compose Personalized Services:A Cloud Computing Model. In R. Meersman et al. (Eds), Proceedings from OTM 2010 Workshops: On the Move to Meaningful Internet Systems, Lecture Notes in Computer Science, 6428, 41-42. doi: 10.1007/978-3-642-16961-8_12

Marston l. (2010). Hype Cycle for Cloud Computing (2012). Hype Cycle. Stamford: Gartner.

Mattoon, S., Bob, H. & James, B. (2013). Cloud Computing Maturity Model - Guiding Success with Cloud Capabilities. White Paper. Redwood Shores: Oracle, 2011.

Massonet, A., & James, T. (2011). Cloud Computing Maturity Model - Guiding Success with Cloud Capabilities. White Paper. Redwood Shores: Oracle, 2011.

Mukherjee, K. & Sahoo, G. (2010). Cloud Computing: Future Framework for e-Governance. International Journal of Computer Applications, 7(7), 31-34. doi: 10.5120/1262-1613

Mutavdžić, R. (2012). Decision Framework for Building Platform as a Service (PaaS) based Government Services. Proceedings from MIPRO 2012: 35th International Convention (pp 1655-1660). Retrieved from: http://ieeexplore.ieee.org/xpl/articleDetails.jsp?reload=true&arnumber=6240916.

Repschlaeger, J., Wind, S., Zarnekow, R. & Turowski, K. (2012). A Reference Guide to Cloud Computing Dimensions: Infrastructure as a Service Classification Framework. Proceedings from HICSS 2012: 45thHawaii International Conference on System Science (pp. 2178-2188). doi: 10.1109/HICSS.2012.76

Schubert, L. (2010). The Future of Cloud Computing: Opportunities For European Cloud Computing Beyond 2010. K. Jeffery and B. Neidecker-Lutz (Eds). Retrieved from: http://cordis.europa.eu/fp7/ict/ssai/docs/cloud-report-final.pdf.

Sharma, R. & Kanungo, P. (2011). An Intelligent Cloud Computing Architecture Supporting e-Governance. Proceedings from 17th International Conference on Automation & Computing (pp.1-5). Retrieved from: http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=6084891&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxpls%2Fabs_all.jsp%3Farnumber%3D6084891.

Smith, D. (2012). Hype Cycle for Cloud Computing 2012. Hype Cycle. Stamford: Gartner.

Smith, R. (2013). Cloud Maturity Models Don't Make Sense Retrieved from: <http://www.informationweek.com/software/business-intelligence/cloud-maturity-modelsdont-make-sense/229208663>.

Solli-Sæther, H. & Gottschalk, P. (2010). The Modeling Process for Stage Models. Journal of Organizational Computing and Electronic Commerce, 20(3), 279-293. doi: 10.1080/10919392.2010.494535

Sorofman, J. (2013) The Cloud Computing Adoption Model. Retrieved from: http://www.drdobbs.com/web-development/the-cloud-computing-adoption-model/211201818>.

Staten, J. (2008). Is Cloud Computing Ready For The Enterprise? Cambridge: Forrester esearch, 2008. Sterman, John D. Business Dynamics – Systems Thinking and Modeling for a omplex World. New York: McGraw Hill.

Stefanou, C.J. & Skouras, A. (2012). E-Government: Cloud Solutions in Labor Regulatory Area in Greece. Proceedings from 9th ICESAL 2012: 9th International Conference on Enterprise Systems, Accounting and Logistics (pp. 390-406). Retrieved from: http://ergatika.gr/wp-content/uploads/2012/07/e-gov-cloud-solutions-9o-ICESAL.pdf.

Taher, Y., Haque, R., Nguyen, D. K. & Van den Heuvel, W. (2011). Allowing Citizens to Self-compose Personalized Services:A Cloud Computing Model. In R. Meersman et al. (Eds), Proceedings from OTM 2010 Workshops: On the Move to Meaningful Internet Systems, Lecture Notes in Computer Science, 6428, 41-42. doi: 10.1007/978-3-642-16961-8_12

Tahamtan, C. & Frank, G. (2011). A Case Study in the Austrian Government. Poster presented at 1st International Conference on Cloud and Green Computing (CGC 2011), Sydney, Australia. Retrieved from: http://www.ifs.tuwien.ac.at/~tahamtan/ Publications/ Tahamtan_CGC-Poster.pdf.

Teo, H. & Pian, Y. (2004). A model for Web adoption. Information & US Department of Defense (DoD) (2012). Cloud Computing Strategy. [White Paper]. Retrieved from: http://www.disa.mil/Services/~/media /Files/DISA /Services/Cloud-Broker/dod- cloud-strategy.pdf.

Tsaravas D. & Themistocleus L. (2011). Cloud Maturity Models Don't Make Sense. Retrieved from: <http://www.informationweek.com/ software/ business-intelligence/cloud-maturity-models-dont-make-sense/2292 08663>.

Vidhya l. (2013). The Cloud Computing Adoption Model. Retrieved from: http://www.drdobbs.com/web-development/the-cloud-computing-adoption -model/211201818.

Wyld V., & Reza M. (2012). A maturity model for cloud computing. Retrieved from: http://news.cnet.com/8301-19413_3-10122295-240.html..

Yeh, C., Zhou, Y., Yu, H. & Wang, H. (2010). Analysis of E-Government Service Platform Based on Cloud Computing. Proceedings from ICISE 2010: International Conference on Information Science and Engineering, (pp. 997-1000). doi: 10.1109/ICISE.2010.5690772.

You, J., Sun, Y., Xu, T., Liu, J. and Liu, H. (2012). Research on G2G E-Government Information Sharing Cloud. Advances in Information Sciences and Service Sciences, 4(17), 577-586. doi: 10.4156/AISS.vol4.issue17.66

Zhang, W. & Chen, Q. (2010). From E-Government to C-Government via Cloud Computing. Proceedings from ICEE 2010: International Conference on E-Business and E-Government (pp. 679-682). doi: 10.1109/ICEE.2010.177

Zissis, D. & Lekkas, D. (2011). Securing e-Government and e-Voting with an open cloud computing architecture. Government Information Quarterly, 28, 239-251. doi: 10.1016/j.giq.2010.05.010

Solar PV Potential and Energy Demand Assessment in Machakos County

K. Muchiri[a*], J. N. Kamau[b], D. W. Wekesa[c], C. O. Saoke[d], J. N. Mutuku[e], J. K. Gathua[f]

[a*, b, d, e] Department of Physics, Jomo Kenyatta University of Agriculture and Technology, P.O Box 62000-00200, Nairobi, Kenya

[c]Department of Physics, Machakos University, P.O Box 136– 90100, Machakos, Kenya

[f] Department of Physics, Kenyatta University, P.O Box 43844-00100, Nairobi, Kenya.

Abstract

Machakos County has the need for renewable energy access due to its rapid industrial development, growing population, higher living standards and rural electrification. Wind-solar hybrid off-grid system has therefore been proposed for small scale energy production suitable for Machakos County rural areas. This paper presents the solar photovoltaic (PV) potential assessment results and a survey done to investigate the levels of energy use, and economic potential of the energy consumers in three rural zones adjacent to Machakos town. Assessment of solar PV potential was done using the Photovoltaic Geographical Information System (PVGIS), a tool that gives access to PV performance and solar radiation patterns for a period of over 10 years. Monthly variations in energy output and solar irradiation were investigated at a fixed angle of Inclination of 10°, Azimuth angle of -180° , latitude and longitude of $1.531\,^{o}$S $37.262\,^{o}$E, and an altitude of 1623 m above sea level. Measured values of Global Horizontal Irradiance from the site using MS-602 pyranometer were used for comparison. Yearly average PV energy production and yearly in-plane irradiation were determined as 1740 kWh and 2130 kWh/m^2 at an installed capacity of 1kWp. This yearly average energy value was used in sizing of the solar panels and battery capacities required for the wind- solar hybrid system installation. The End-use method was used to determine the energy utilization levels in the rural homes where a questionnaire with a sample of 100 households per zone was used for data collection. The questionnaire items included household income, average month electricity bill, power rating of appliance used, house hold size and daily use time of each electrical appliance collected via end-use method. The energy load demand was 782.7 kWh, 841.2 kWh and 620.02 kWh per day for zones A, B and C respectively. Demand per household differed depending on household size and the appliances present. The household's peak energy consumption was 9.09 kWh and a minimum of 0.052 kWh per day. The average energy demand per household was 2.429 kWh, 2.26 kWh and 2.347 kWh in the three zones respectively. Monthly income and daily load demand profiles were plotted to investigate the energy use patterns and the economic status of the energy consumers in the three zones.

Key words: Solar PV Potential, PVGIS, Energy Load Demand, Wind-Solar Hybrid, Renewable Energy, Rural Electricity Consumption, Machakos county rural energy load

1. Introduction

1.1 Solar PV

The world level of energy consumption is rapidly increasing creating a high demand for energy. This exponential rise in energy demand attributed to the growing population, urbanization and industrial developments, rural electrification and the rise in people's living standards [1]. With the country's vision of industrialization by the year 2030, new approaches to energy generation are paramount. In Kenya, energy is mainly from electricity (9%), petroleum fuels (22%) and biomass (68%) [2]. In the rural areas, most of the conventional sources of energy used highly impact negatively to the environment and life due to the hazardous emissions that lead to pollution and global warming [3], [4], [5], [6], [7], [8]. This trend can be reversed by diversifying ways of energy sourcing, attracting the use of inexhaustible and friendlier renewable energy sources [9]. Modern sustainable technologies of energy harvesting from renewable sources like wind and solar need to be embraced to support and enhance energy self-sufficiency in both urban and rural areas [2]. To help in renewable energy development in rural areas, a wind-solar hybrid micro-off grid system has been proposed and developed. Solar and wind are two intermitted sources which are highly site specific [10]. Successful deployment of the hybrid system required solar PV resource assessment, wind resource assessment and the energy demand assessment. This paper reports on the solar PV assessment and the energy demand assessment for the three selected zones in the county. Solar PV energy is enormous than other sources of renewable energy and its systems have huge capacity to meet the ever increasing demand for energy [11], [12], [13]. Irradiance is the solar power density incident on an area from the sun [14]. The percentage of solar radiation reaching the earth's surface is greatly depended on meteorological, spatial, temporal, global and local factor which need to be accounted for when assessing its potential [15]. Kenya extends four degrees either side of the equator and as a result its locations receive a large amount of solar radiation. Assessments show that Kenya has abundant solar energy resources with a daily average solar insolation estimation of about 4-6 kWh/m^2, one of the best for solar energy production in Africa [16], [17]. In Machakos County, the three sites in this study lie adjacent to Machakos University which lies approximately 1.531^{0}S 37.262^{0}E and therefore their location suits them for a vast potential of solar energy generation. Areas within the equator have the sun directly above them therefore not significantly affected by the sun's declination angle. An ideal tool thus has to be sought that will accommodate all these factors. PVGIS used in estimating solar PV potential in this work is a solar-based online tool that has been used in the world to estimate PV production potentials [18]. The database in the tool was developed by use of solar radiation model *r.sun* [19], [20], [21]. This models approximates diffuse and reflected components of clear-sky and global irradiance for horizontal or slanting surfaces for a selected site within the whole of Africa, parts of Europe, America and Asia. Solar PV potential assessment was done in Nigeria using databases with monthly means of daily isolations from NASA meteorology and solar energy [22]. The analysis showed that the sites have a PV potential of over 1000 kWp/kWp. A study done in Lisbon suburb using LiDAR data and ArcGIS reported a PV potential of 11.5GWh per year at 7 MW installed capacity [23]. Other studies have been conducted elsewhere to determined PV energy production potentials by use of PVGIS and Global Horizontal Irradiance as well as *r.sun* solar radiation model [24], [25], [26], [27].

The sun and the earth are two hot bodies at different temperature levels producing radiations at different wavelengths and energy affecting the amount of solar PV energy harnessed in day time and at night. Both solar and terrestrial radiations from the two bodies are governed by radiation laws. According to the inverse square law given by equation 1.1 [28], the intensity of radiation

becomes weaker as it spreads out from the source. Solar intensity reaching the earth is weakest when the sun is furthest and highest when near,

$$I = \frac{S}{4\pi r^2} \qquad [1.1]$$

where S is the source strength and r is the distance from the source.

Wavelength and energy of emitted radiations are functions of absolute temperature. This is explained by the Wien's and Stefan-Boltzmann laws of radiation given by equation 1.2 and 1.3 [29], [30]. From Wien's law more energetic short wavelengths are emitted at high temperature whiles according to Stefan-Boltzmann law, energy radiated per unit area is directly proportional to the fourth power of absolute temperate. This explains why energy is at its optimum at midday when temperatures are highest during the day and the equinox for areas near the equator,

$$\lambda_{max} = \frac{b}{T} \qquad [1.2]$$

where b is the Wien's constant and T is the absolute temperature,

$$E = A\sigma eT^4 \qquad [1.3]$$

where A is the surface area, is the Stefan-Boltzmann constant, e is the emissivity and T is the absolute temperature

Solar radiation reaching the earth's surface is depended on environmental conditions, period of the day, local features, ecological and biological processes, peoples' activities and inclination of the surface. In solar PV technology the variation in amount of insolation falling on a panel also differs depending on sun's position which is a factor of declination angle, latitude angle, zenith angle and azimuth angle, and sun's angle of elevation. Latitude (∅) is the angle that on the equatorial plane south or north of the equator. It varies from -90° and 90°. [31]. Declination angle(δ) is the angle of tilt with respect to the earth's orbit around the sun ranging from -23.5° to 23.5° depending on the month and season of the year. Declination angle can be determined using equation 1.4 [31], [32]

$$\delta = 23.5\ sin\left[\frac{(360(284+n))}{365}\right]^o \qquad [1.4]$$

where n is the day of the year starting from January 1st.

Zenith angle (θ_z) is the angle between the vertical axis and the suns position 90° on horizontal plane and 0° at noon. This can be calculated by equation 1.5 [33],

$$cos\theta_z = Cos\delta cos\emptyset cos\omega + sin\delta sin\emptyset \qquad [1.5]$$

where ω the hour angle is determined using equation 1.6 [31], [32],

$$\omega = 15(t_s - 12) \qquad [1.6]$$

where t_s is time of the solar in hours.

Solar azimuth angle (γ_s) is the angle between the direction of due South and that of the perpendicular projection of the sun down onto horizontal line ranging from 0° to -180°. Azimuth angle in the northern hemisphere is south oriented whiles in the southern hemisphere is north oriented. This angle can be calculated using equation 1.7[33],

$$Cos\gamma_s = \frac{1}{COSA_Z}[\cos\delta\sin\emptyset\cos\omega - \sin\delta\cos\emptyset] \quad [1.7]$$

Sun's angle of elevation (α), the angle between the horizontal plane and the sun is the complement of zenith angle 90° and can be determined using equation 1.8 or 1.9[33],

$$\alpha = 90 - \theta_z \quad [1.8]$$

$$\sin\alpha = \cos\delta\cos\emptyset\cos\omega + \sin\delta\sin\emptyset \quad [1.9]$$

1.2 Energy Demand Evaluation

Energy is vital for sustainance of any rural and urban development in the country. It is therefore necessary to ensure a balance between the energy demand and the energy supply [34], [35]. A solution thus lies in optimizing energy by use of alternative sources of energy from renewable sources [36]. Energy load demand in a region is variable with time and the standards of living of consumers. Methods of energy generation and energy systems ought to be reliable to meet the rising load demand. Energy load demand assessment is thus a necessary activity in deployment, planning and installation of energy generation and distribution systems [37], [38], [39]. Energy demand evaluation done in Kikwe Village in Tanzania reported a village daily load of 757.024 kWh with a peak load of 56 Kw and a minimum of 5 kW [37]. Rural and urban household energy demand analysis studies were done in Pakistan simulated using 2010 data as the base year by use of LEAP model. This reported a demand of 25GWh extrapolated to 170000GWh by 2036 [34]. [40] Assessed domestic energy demand of coastline of Niger Delta in Nigeria. HOMER hybrid optimization software was used to estimate the demand for determining the best PV system reporting a daily load demand estimate of 5.640 kWh. By 2015 installed capacity of Tanzania was 1129 MW which was not enough to serve both rural and urban areas due to high consumption rate [41], [42]. Sparse demography is one of the factors that hinder national grid development in rural and semi urban areas making it costly to set up [43], [44], [44]. This makes renewable sources like wind and solar promising in creation of energy access to consumers [46], [17].

2. Materials and Methods

Successful design and development of a suitable renewable energy system requires investigation and analysis of the critical parameters that determine the amount of solar radiation reaching the earth's surface. In solar PV assessment factors such as latitude and longitude of the selected site,

solar declination angle, PV module, and orientation and inclination need to be investigated to enable optimum solar harvest from the available insolation.

2.1 Solar PV Estimation using PVGIS

A typical hardware setup to estimate PV potential for energy production in a site entails data logger, solar PV modules and sensors. The online simulation software was used to determine the various parameters of the solar PV system at Machakos County. Depending on the input parameters it estimates the daily and monthly irradiance, yearly PV energy yields, yearly solar in-plane irradiance and the total system losses [27]. The simulation was done through the following steps

Step 1: Start the PVGIS online simulation

Step 2: Choose the data base- PVGIS-CMSAF.

Step 2: Enter the latitude and longitude of the zones A, B and C.

Step 3: Choose the PV technology- Crystalline Silicon

Step 4: Enter the systems installed capacity – 1kWp

Step 5: Enter the system loss allowance- 5%

Step 6: Choose the azimuth, the orientation angles and tracking option 10° and -180° respectively.

Step 7: Run the simulation. A report is produced containing all the required solar PV parameters at a specific site.

The three complements of solar energy conversion technology obtained from the simulation include the global horizontal irradiance (GHI) measured using unshaded pyranometer, diffuse horizontal irradiance (DHI) measured using shaded pyranometer and direct normal irradiance (DNI) measured using pyrheliometer [47]. DNI is the available radiation at about 5o view on a surface normal to the sun, DHI is the scattered radiation from the sky while GHI is the sum of DNI and DHI components given by equation 2.0 [48],

$$\mathrm{GHI} = \mathrm{DNI}\ \cos(\theta_z) + \mathrm{DHI} \qquad [2.0]$$

where θ_z is the zenith angle.

Solar irradiance was also measured by use of MS-602 model pyramometer mounted at 20 m above the ground level to avoid shading effects from building and trees. The sensor was connected to a data logger set to capture the irradiance values at a frequency of 1Hz. figure 1 and 2 show the plates of the solar radiation sensor and the data logging system used.



Plate 1: MS-602 Pyranometer used to measure GHI at the site



Plate 2: Data logging system

2.2 Energy load demand estimation

Primary data was collected by use of a suitable questionnaire designed to capture all parameters of energy consumption and the information on household's status. A survey was undertaken to assess the electrical energy load demand in the villages contained in each of the three zones A, B and C which contains 300 households on average. A sample of 100 households was used to investigate the load pattern in each zone and projection of the demand for the whole zone. Interviews were conducted for 20 days in rural homes, schools, shopping centers and the sampled households per zone to make a good judgement of the electrical appliance used, installed source of energy, household size, monthly income and the time of used of each electrical

appliance per day. The common household's loads in the three zones were phones, bulbs, TV sets, radio, heater, iron box, hoofers, hair drier and blenders. A few households contained appliances like fridge, oven and cookers which consume slightly higher energy.

Daily totals, averages load requirements per zone were determined by use of equations 2.1 and 2.2 respectively,

$$E_{Total} = \sum_i^N p^k t \qquad [2.1]$$

where E is the energy, P is the power rating of the appliance, k represents an appliance, t is the time of use and N is the number of appliances,

$$E_A = \frac{1}{N_H} \sum_i^N p^k t \qquad [2.2]$$

where E_A is the daily average value per zone, N_H is the total number of households per zone. Energy load demand and monthly income profiles were plotted which gave a good pattern of the energy consumption and economic status of the inhabitants in zones A, B and C.

3 Results and Discussion

3.1 Solar PV

Solar PV assessment results were analyzed and profiles generated using the PVGIS software. Figure 1(a), 1(b), 1(c) show the hourly range of global, diffuse, direct clear sky irradiance in Machakos sites compared monthly. Table 1 and 2 show the distribution of GHI, DHI, DNI at real sky and clear sky both at fixed plane and tracking option. Comparatively irradiance is higher when tracking option is used since the sun rays are always normal to the plane of the PV module.

Table 1: Daily average Peak Values of GHI, DHI, DNI and CSI at Fixed Plane

MONTH	GHI(W/M²)	DNI(W/M²)	DHI(W/M²)	CSI (W/M²)
JANUARY	898	682	215	1040
FEBRUARY	969	749	219	1100
MARCH	965	719	244	1140
APRIL	906	626	279	1130
MAY	741	434	306	1090
JUNE	638	326	311	1070
JULY	619	310	308	1080
AUGUST	649	325	324	1120
SEPTEMBER	853	596	256	1120
OCTOBER	882	609	273	1080
NOVEMBER	817	549	267	1030
DECEMBER	812	575	245	995

Table 2: Daily Average Peak Values of GHI, DHI, DNI and CSI at PV tracking

MONTH	GHI(W/M²)	DNI(W/M²)	DHI(W/M²)	CSI (W/M²)
JANUARY	1030	800	222	1190
FEBRUARY	1030	807	223	1180
MARCH	973	723	250	1150
APRIL	908	631	274	1140
MAY	770	464	301	1120
JUNE	660	347	307	1120
JULY	621	318	297	1120
AUGUST	650	326	321	1130
SEPTEMBER	867	611	255	1130
OCTOBER	915	628	285	1140
NOVEMBER	918	663	245	1160
DECEMBER	946	681	258	1170

Figure 1(a) and (b), 2(a) and (b), and 3(a) and (b) show the daily average irradiance profiles at fixed plane and tracking option in the March, October and June when maximum and minimum PV output is expected.

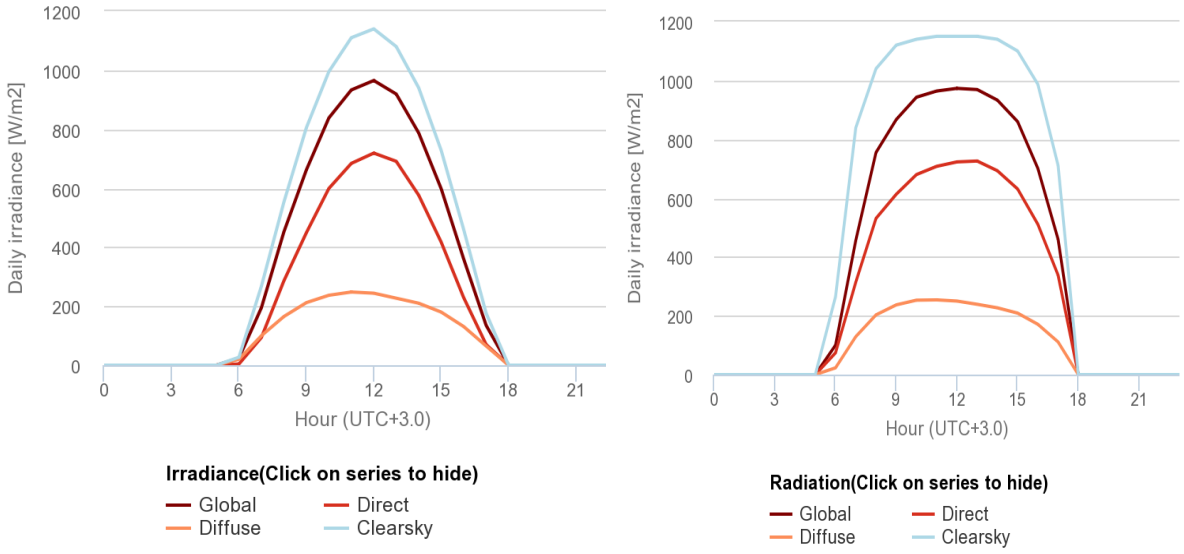


Figure 1(a) and 1(b): Fixed plane and tracking daily average irradiance in March

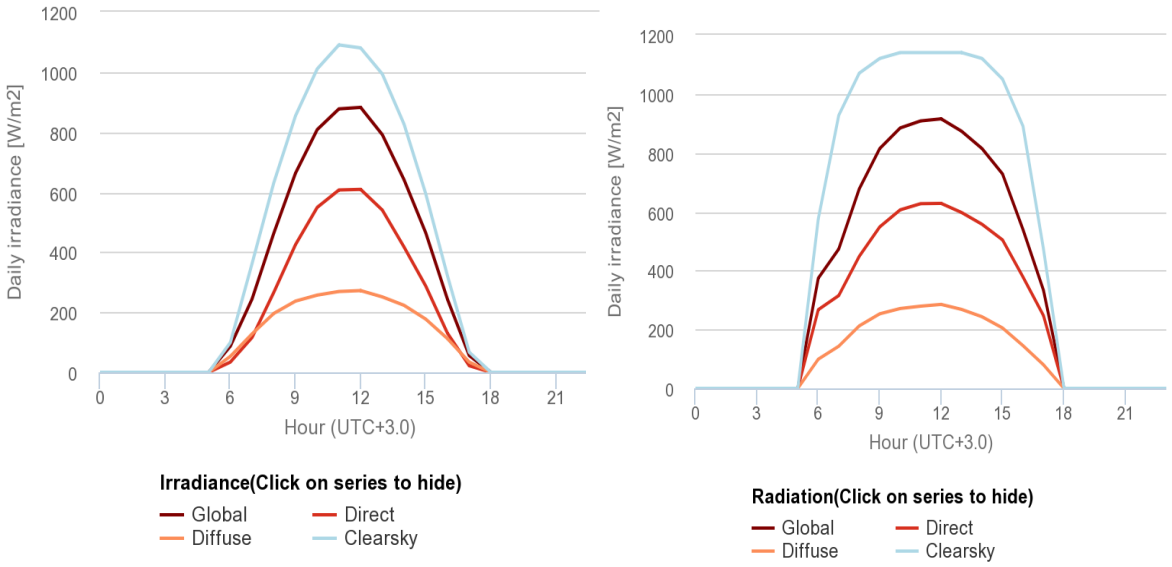


Figure 2(a) and (b): Fixed plane and tracking daily average irradiance in October

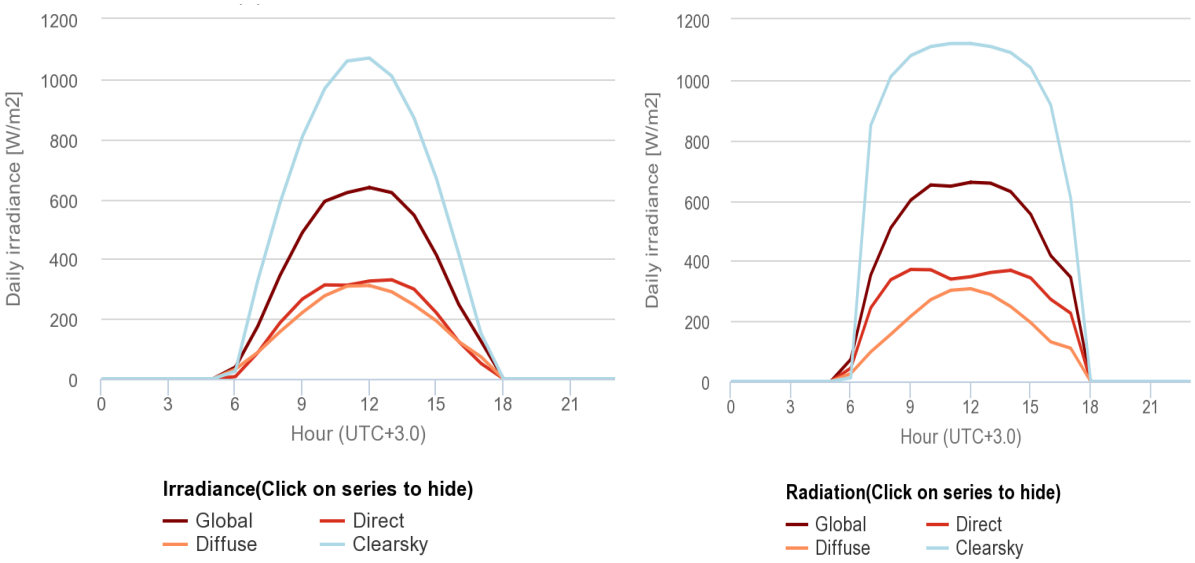


Figure 3(a) and (b): Fixed plane and tracking daily average irradiance in June

In the month of January to March and September to December, the peak global irradiance received is between 900 - 1000 W/m^2 and 850 - 900 W/m^2 respectively while in June and July 638-619 W/m^2 is received at fixed plane. Machakos region being near the equator experiences the four season's summer and Winter solstice and the equinox (vernal and autumnal). Daily solar intensity is maximum during the equinox in March and September when the earth rotates with the equator in line with the suns central plane.

Data analysis of measured solar irradiance values was done for comparison with the PVGIS simulated values. The data was tabulated on hourly and daily basis with the peak and average irradiance values. Table 3 shows the experimental average and peak GHI values in the month of March. Hourly and daily solar irradiance profiles were plotted to show the solar insolation pattern in Machakos. Figure 4 and 5 show the hourly and daily solar irradiance profiles.

Table 3: Hourly mean and peak solar irradiance

HOUR	AVERAGE GHI (W/M^2)	PEAK AVERAGE GHI (W/M^2)	PEAK GHI (W/M^2)
6-7 AM	8	58	100.3
7-8 AM	200	384	509.4
8-9 AM	435	659	973.3
9-10 AM	673	898	1049.6
10-11 AM	824	1121	1478.1
11-12 PM	918	1208	1518
12-1 PM	958	1228	1555.8
1-2 PM	904	1140	1383.3
2-3 PM	757	1035	1204.3
3-4 PM	597	816	1032.3
4-5 PM	387	578	692.7
5-6 PM	174	306	423.2

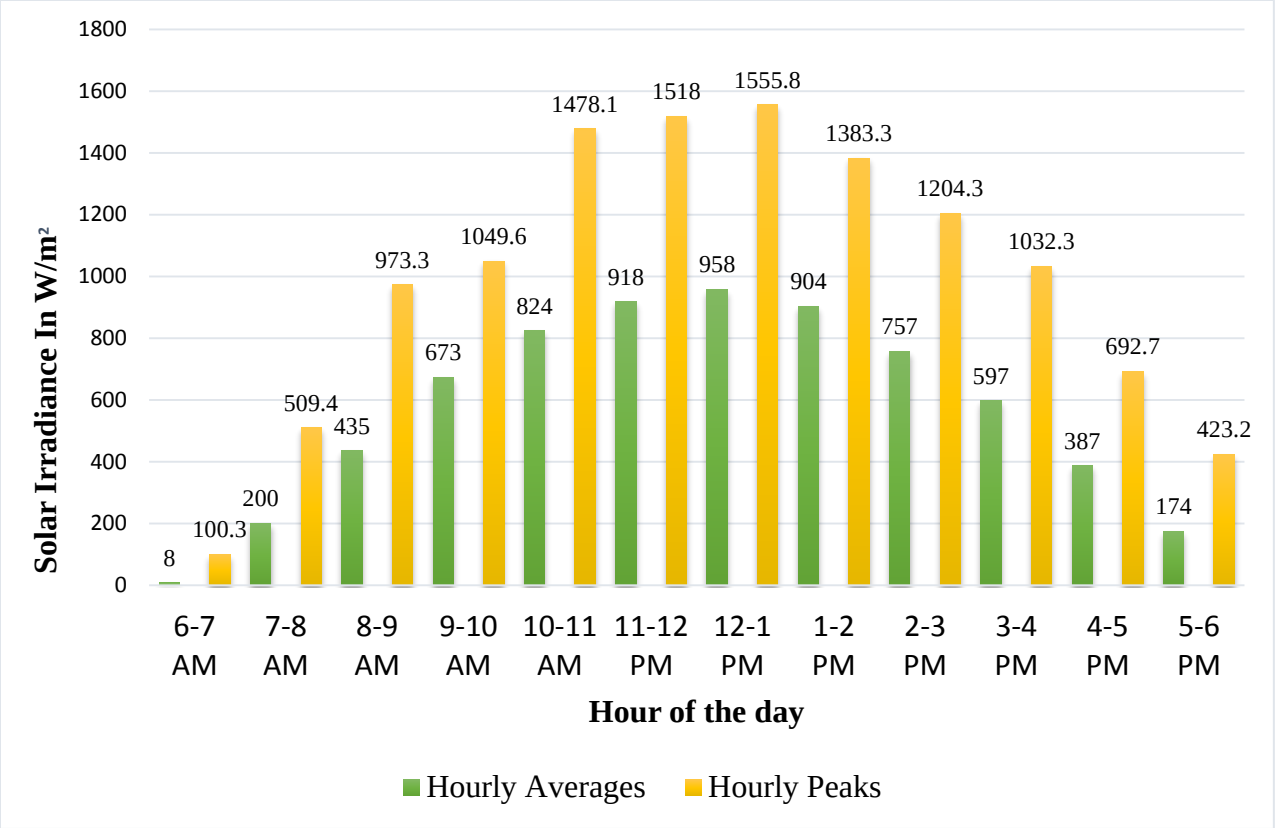


Figure 4: Hourly mean and peak solar irradiance

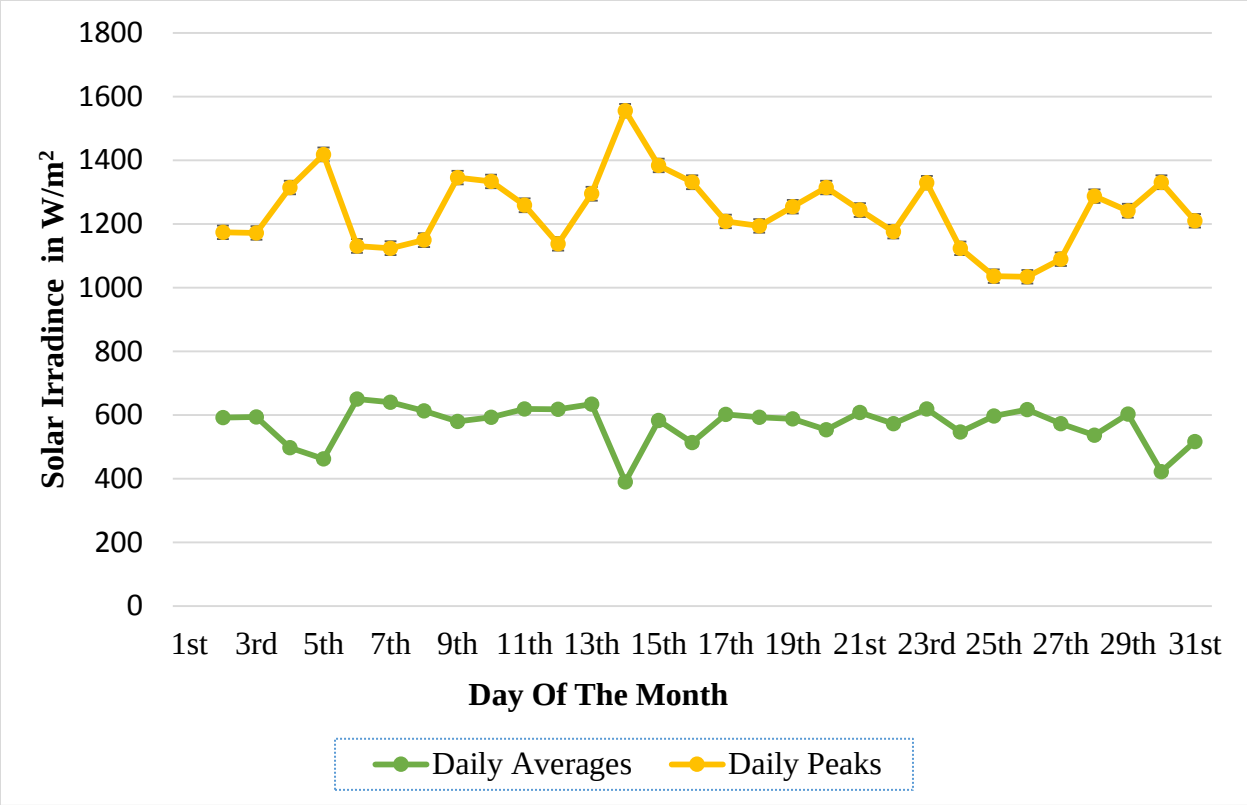


Figure 5: Daily mean and peak solar irradiance

Machakos receives solar insolation up to a maximum peak of 1555.8 W/m² with peak average of 1228 W/m² at noon during clear sky. Shading effect due to clouds reduces the hourly average peak to 958 W/m² which is still high at suitable for optimum solar PV energy harvest. Solar radiation was analysed on daily basis for 31 day. Peak solar insolation in Machakos lies between 1000 W/m² and 1600 W/m² and 400 to 600 W/m² as a result of cloud shading effect. This shows the huge daily and monthly solar PV potential Machakos County has.

Figure 6 shows the path of the sun and the solar window for Machakos county zones form June 21st to December 21st. The sun shines directly above the equatorial zones with a solar window of 12 hours between 6 am and 6 pm. In this zone the sun's declination is 0° and the radiation covers the shortest distance to reach the earth and from the laws of radiation the intensity of radiation is maximum, the earth surface if more hot than other seasons. Therefore, during the equinox the earth receives higher insolation which gives maximum solar PV energy at midday.

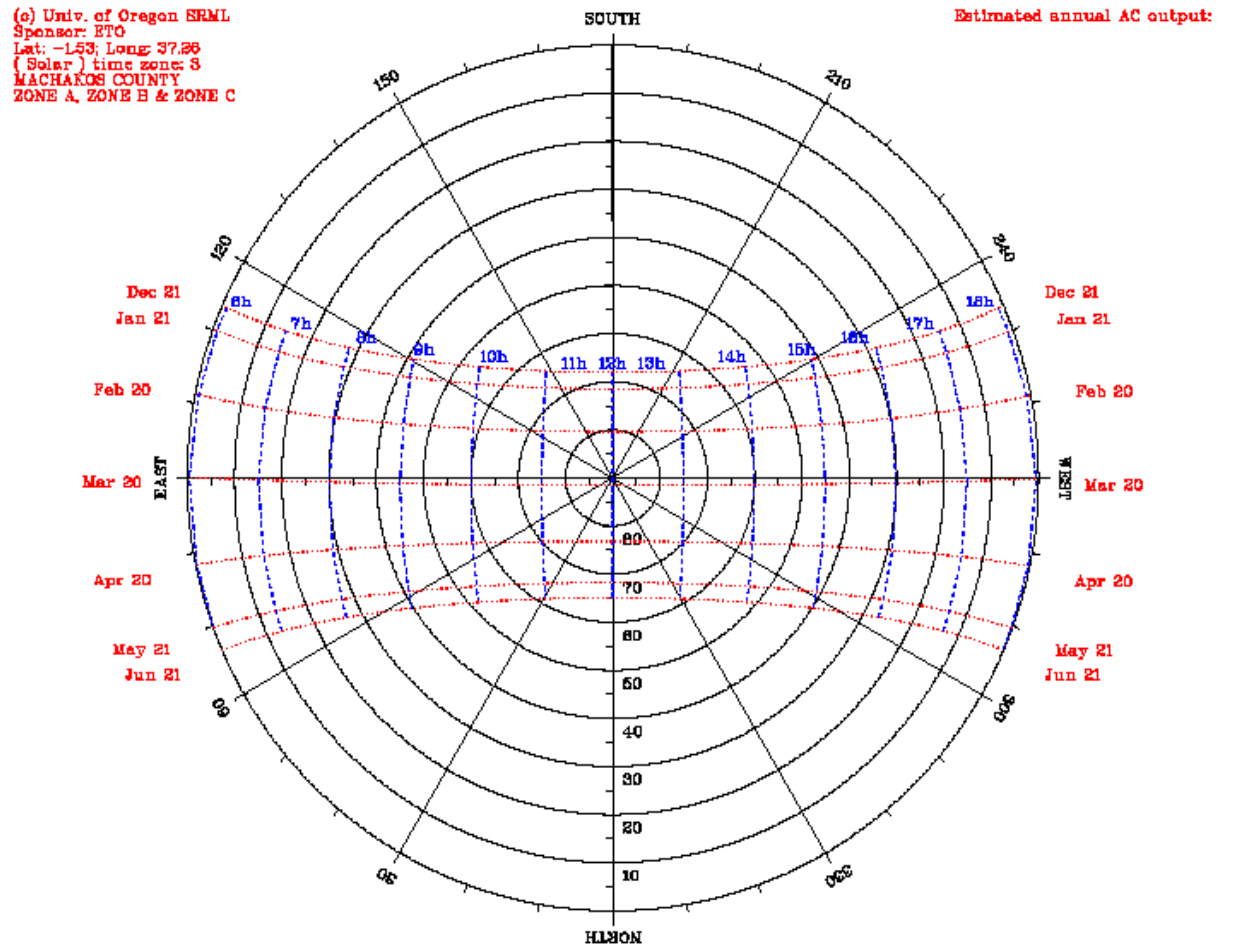


Figure 6: Sun path diagram for Machakos zone.

Due to its revolution in an elliptical orbit the earth experiences four seasons. During the Winter solstice the sun is at its shortest distance from the earth approximately 1.47×10^{11}m. The sun shine is at a declination angle of -23.5° directly on the tropic of Capricorn in the southern hemisphere maximum in December 21st. This increases the solar intensity for all the regions in the southern hemisphere like Machakos County. In June and July, the earth experiences the summer solstice and at the furthest distance from the sun, approximately 1.52×10^{11}m. The sun is high up shining directly at the tropic of cancer at a maximum declination angle of 23.5°. Solar intensity is high at northern hemisphere and low in southern hemisphere. This makes Machakos zones register low daily irradiance. Solar irradiance compared between azimuth angle of 10° simulated and analyzed. Figure 7 show the simulated monthly output values of irradiance at fixed angle. The simulated annual in plane irradiation at Machakos was 2130 kWh/m^2. This tilt makes the sun more direct to the panel than when in horizontal orientation

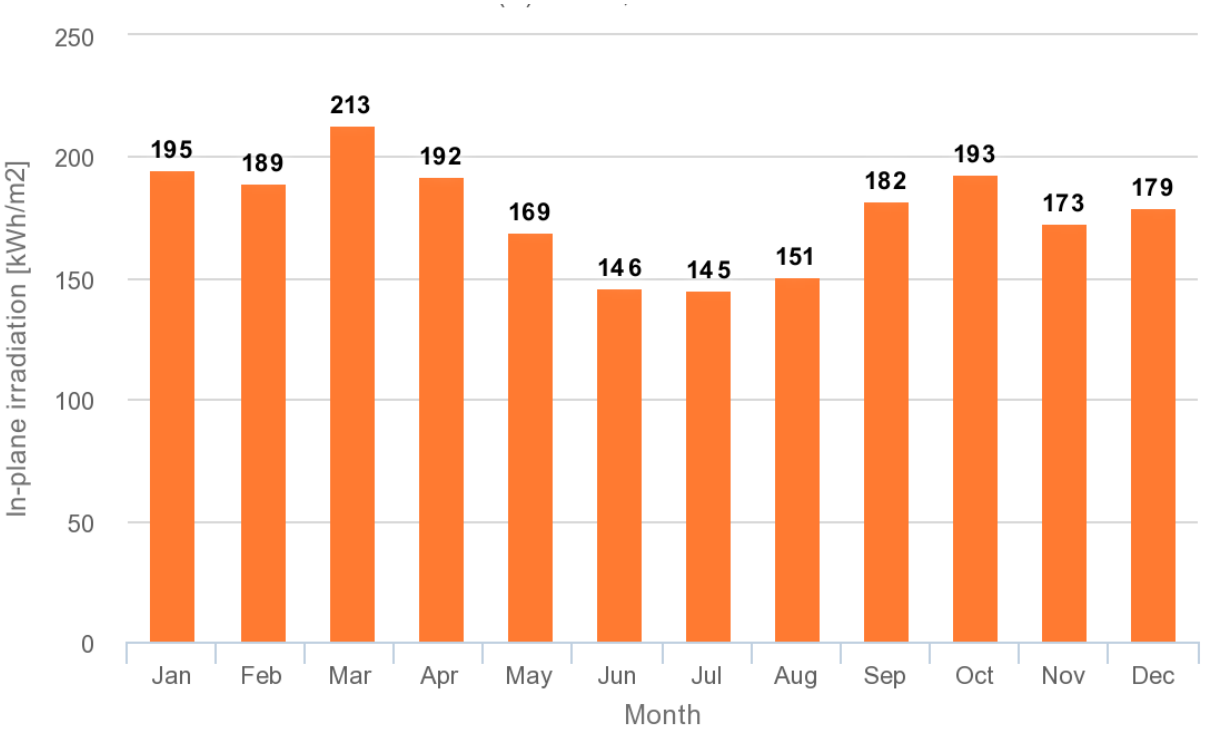


Figure 7: Monthly in-plane irradiance at fixed-angle solar PV system

.

The first and the last four months of the year have higher during the equinox and the winter solstice. The average monthly peak values are 213 kWh/m^2 and 193 kWh/m^2 in March and October. Yearly PV energy production was also investigated at 10° of panel tilt. Figure 8 show monthly energy output profile. Machakos region has a potential of producing an annual solar PV energy of 1740 kWh. The months when the sun is closest to the equator have a higher energy potential on average compared to months summer solstice months when the sun is furthest from the equator. The month of March has the maximum average potential of 170 kWh while June and July have the minimum potential of 123 kWh and 122 kWh respectively.

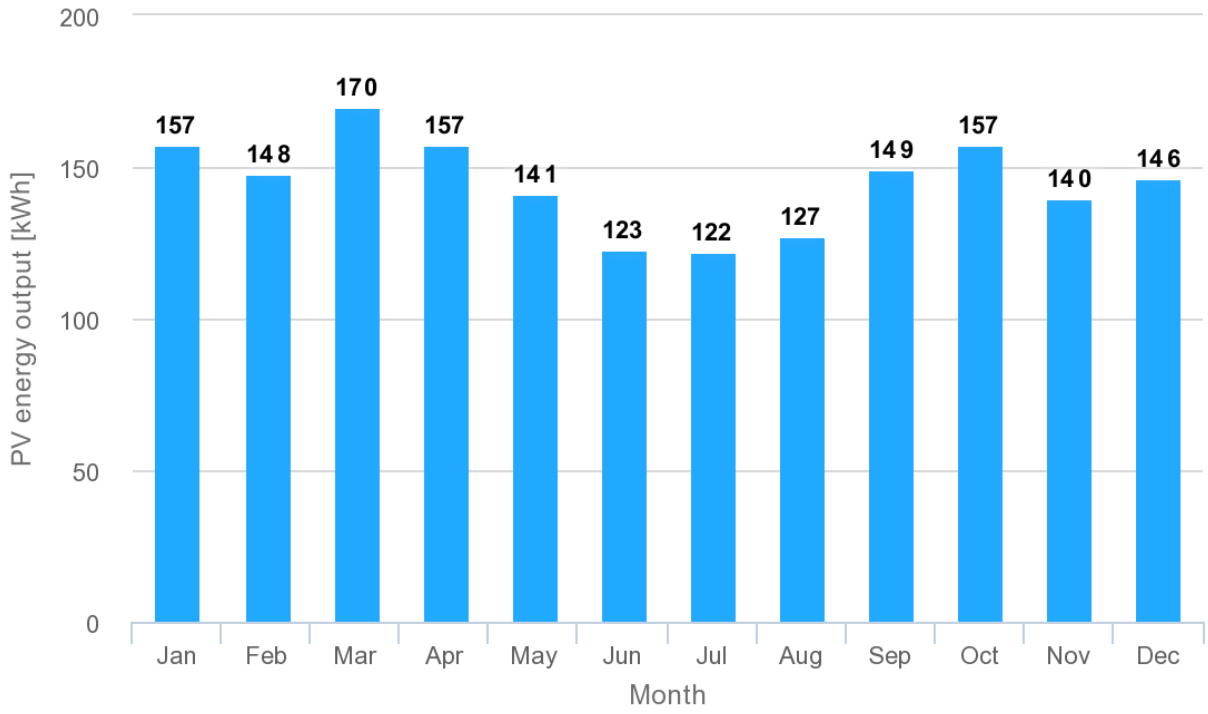


Figure 8: Monthly average energy production at fixed angle solar PV system

3.2 Load Demand

Daily energy load estimates, installed PV capacity estimates, PV module estimates and the battery storage capacity estimates per zone were tabulated as shown. Table 4 shows the loads estimates in zone A, zone B, and zone C.

Table 4: Daily Energy load demand estimates

	ZONE A-4.3 SQ.KM	ZONE B-4.2 SQ.KM	ZONE C-4.9 SQ.KM
Whole Zone	782.7 kWh	841.2 kWh	620.02 kWh
Average per household	2.429 kWh	2.26 kWh	2.347 kWh
Max household	9.09 kWh	5.37 kWh	7.844 kWh
Min household	0.24 kWh	0.052 kWh	0.135 kWh

Zone B is comprised of four villages and therefore has the highest daily load of 841.2 kWh while C has the least. On average Zone A consumes more energy per house hold compared to the other two zones. Peak household consumption was determined as 9.09 kWh in zone A and a minimum household energy consumption of 0.052 kWh. Table 5 shows the calculated installed capacities up scaled by a factor of 30% to cater for the system losses.

Table 5: PV System capacity Estimates

	ZONE A	ZONE B	ZONE C

Whole Zone	213.45 kW_P	229.4 kW_p	169.08 kW_p
Average per household	0.6624 KW_p	0.6163 kW_P	0.64 kW_P
Max House Hold	2.479 KW_p	1.4638 kW_P	2.139 kW_P
Min House Hold	0.0654 kW_P	0.014 kW_P	0.037 kW_P

The energy peaks were calculated using equation and the PV yearly energy production of 1740 kWh per kWp simulated using the PVGIS. Table 6 shows the estimated solar Modules based on the upscale solar peaks in the three zones. Canadian solar panel with an output power of 350 W was used in the estimations

Table 6: PV Module Estimate based on simulated annual PV energy production

	ZONE A	**ZONE B**	**ZONE C**
Whole Zone	610 Panels	655 Panels	484 Panels
Average per household	2 Panels	2 Panels	2 Panels
Max household	8 Panels	5 Panels	7 Panels
Min household	1 Panel	1 Panel	1 Panel

In comparison zone B requires more solar panels to meet the estimated load demand. On average 2 panels would meet the demands in most of the households with a minimum and maximum of 1 and 8 panels in some households respectively. Number of module estimation was also done based on the month with the minimum solar irradiance if 145 kWh/m2 and 4.6773 peak hours per day. Table 7 shows the estimated PV modules in the three zones based on peak hours.

Table 7: PV module estimate based on the minimum month solar irradiance

	ZONE A	***ZONE B***	***ZONE C***
Whole Zone	638 Panels	686 Panels	505 Panels
Average per household	3 Panels	2 Panels	2 Panels
Max household	8 Panels	5 Panels	7 Panels
Min household	2 Panel	1 Panel	1 Panel

The number of PV modules requires is comparatively similar on average and for the households with maximum and minimum energy consumption levels. Based on the month of June and July, each of the three zones would require slightly a higher number of panels for solar energy harvest to meet the same load demand. The minimum month approach is therefore more suitable in PV

system sizing since the PV system ought to operate normally throughout the year with all solar insolation variations factored in.

Energy storage battery capacities were also determined using the load demands in table 4. Lithium ion battery was considered due to its higher depth of discharge of approximately 80% compared to the lead acid accumulators which of about 50%. Table 8 shows the estimated battery capacities for the three zones.

Table 8: Battery Capacity Estimate based on the energy demands

	ZONE A	ZONE B	ZONE C
Whole Zone	81531.25 AH	87625 AH	64585.42 AH
Average per household	506.04 AH	470.84 AH	488.96 AH
Max household	1893.75 AH	1118.76 AH	1634.16 AH
Min household	100 AH	21.68 AH	56.24 AH

A comparative daily energy load and monthly income profiles were plotted to show rate of energy use at different hours and the economic status of the consumers in each zone as shown in figure 9. In three zones the energy use pattern is similar, higher from 1700 hours to 2200 hours and lowest from mid night to 0400 hours.

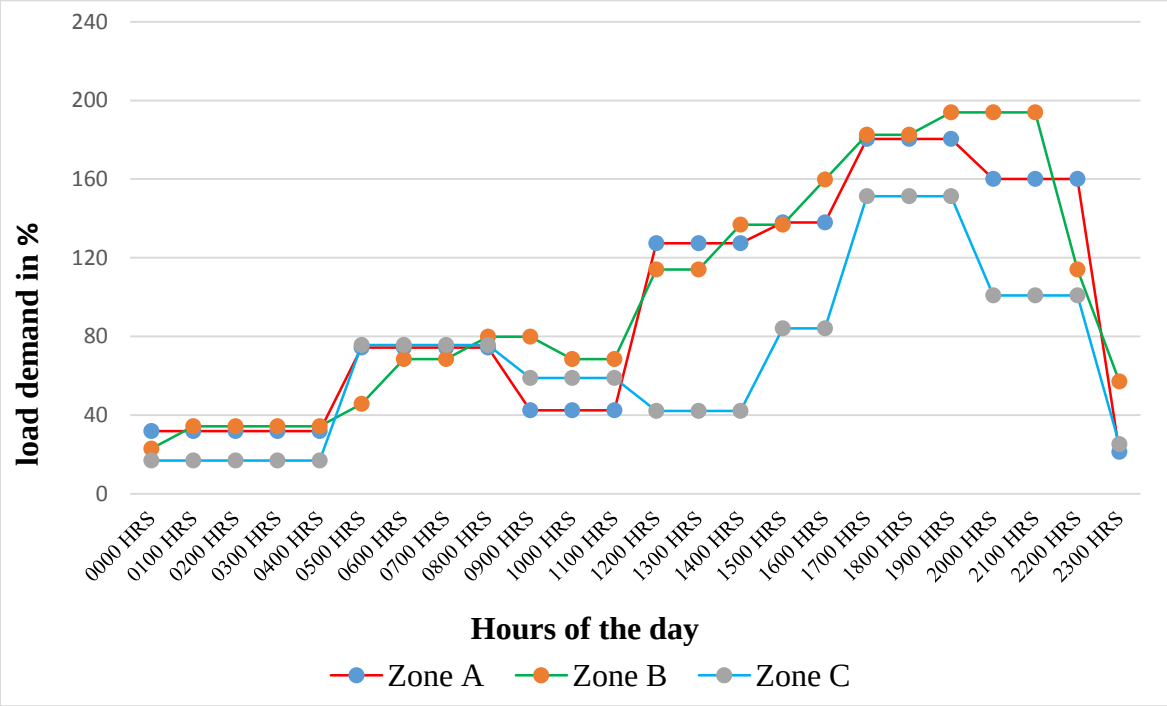


Figure 9: Daily load energy demand profile

High energy demand between 5 pm and 10 pm can be attributed to the fact that most of the household members are back home from their daily activities and make use of energy more than other times for the various domestic needs like lighting, entertainment and cooking. Demand is low from mid night since most of the people are asleep and therefore less energy is used probably for security lighting. From 5 am energy is used as people prepare to leave for work. This profile shows that there is no zero energy demand in the selected sites. This justifies the need for a constant electricity supply in the rural areas of Machakos County.

Economic status analysis was also done and data tabulated and analyzed as shown in table 8 and figure 10 respectively. Most of the occupants in the rural areas are low income earners with an average of ksh 15000 per month. This explains why most people in the zones lack expensive appliances like machines that consume huge amounts of power. Cost of electricity comprises of acquisition cost, operating cost, maintenance cost and replacement costs which are far beyond the financial ability of most people. A cheap renewable hybrid power system was therefore more suitable for energy generation in small scales for the rural zones

Table 8: Households monthly income per zone

Household Monthly Income in Ksh	*Zone A*	*Zone B*	*Zone C*
0-10000	50	44	32
10001-20000	29	28	28
20001-30000	8	17	14
30001-40000	4	7	13
40001-50000	3	3	9
50001-60000	1	0	2
60001-70000	2	1	1
70001-80000	2	0	0
80001-90000	1	0	1
90001-100000	0	0	0
100001-110000	0	0	0
110001-120000	0	0	0

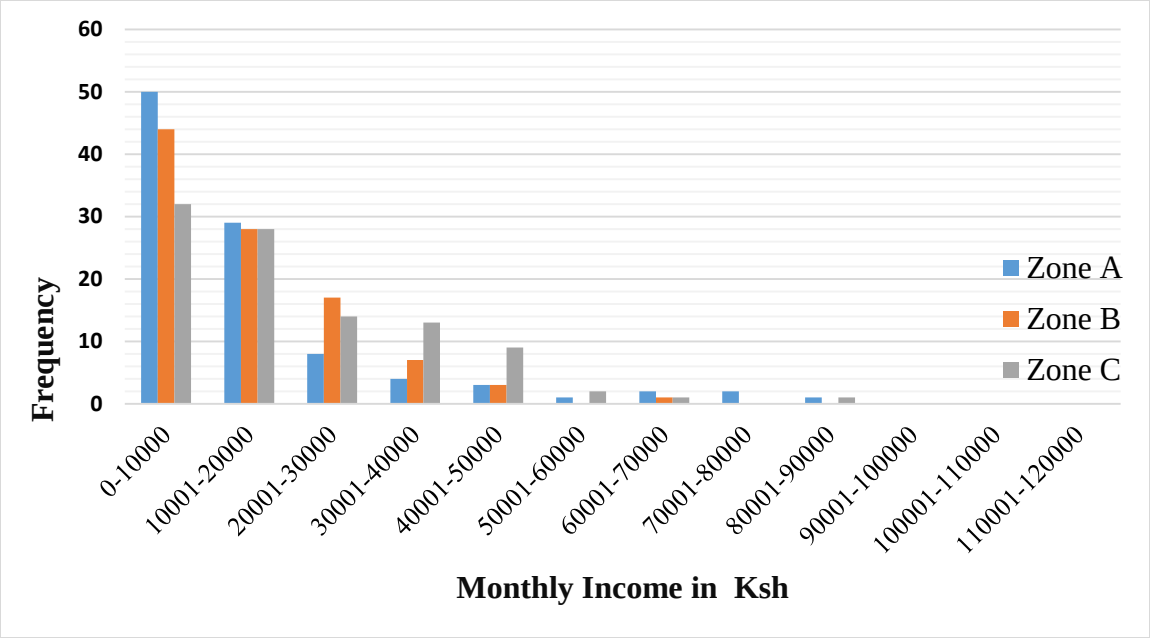


Figure 10: Monthly income profile

Conclusion

The solar simulation and experimental solar assessment results show huge potential of solar energy in Machakos County suitable for small scale hybrid system installation for PV energy production. Machakos County has a yearly average solar irradiance of 2130 kWh/m^2 with an average and peak hourly GHI of and 1556 W/m^2 respectively. Simulated PV energy production from these radiation levels gives a yearly average PV energy potential of over 1740 kWh at 1 kW peak installed capacity. Energy utilization assessment show that Machakos county rural areas consume less energy comparatively due to the type and number of appliances available. Much energy is used in the evening and at night when people are back home from job. Zone A, B and C consume 782.7 kWh, 841.2 kWh, and 620.02 kWh per day with a household average consumption of 2.345 kWh per day. The available solar insolation was used as reference in estimating the installed capacities and PV system size suitable for rural electrification in Machakos.

Recommendation

With the huge solar PV potential, Machakos County has the capacity to support a solar photovoltaic systems for off-grid electrification.

References

[1] Omer, A. M. (2008). Energy, environment and sustainable development. *Journal of Renewable and Sustainable Energy Reviews.***12**, 2265. (doi:10.1016/j.rser.2007.05.001)

[2] Mukulo, B., Ngaruiya, J., and Kamau, J. (2014). Determination of wind energy potential in

The Mwingi-Kitui plateau of Kenya, *Renewable Energy* **63**, 18-22.

[3] Kenya Climate Innovation Centre (). Kenya Solar PV Market and Assessment Report.

[4] Wakui, T., and Yokoyama, R., (2013). Wind Speed Sensor less Performance Monitoring Based on Operating Behavior for Stand-Alone Vertical Axis Wind Turbine. *Renewable Energy* **53**,49-59.

[5] AslamBhutta, M. M., Hayat, N., Farooq, A. U., Ali, Z., Jamil, S. R., and Hussain, Z. (2012).Vertical axis wind turbine-a review of various configurations and design techniques. *Journal of Renewable and Sustainable Energy Reviews.***16**, 1926–1939.

[6] Granqvist, C. G. (2007). Transparent conductors as solar energy materials: a panoramic review. *Solar Energy Materials. Solar Cells* **91**, 1529. (doi:10.1016/j.solmat.2007.04.031)

[7] Granqvist, C. G. (2003). Solar energy materials. *Advanced Materials.* **15**, 1789–1803. (doi:10.1002/adma.200300378)

[8] Granqvist, C. G. (1990) Window coatings for the future. *Thin Solid Films.* **193**–**194**, 730.

[9] Skretas, S. B. and Papadopoulos, D. P. (2009). Efficient design and simulation of an expandable hybrid (wind photovoltaic) power system with MPPT and inverter input voltage regulation features in compliance with electric grid requirements. *Electric Power Systems Research* **79**(9), 1271-1285

[10] *Abbess, J. (2009).*Wind Energy Variability and Intermittency in the UK *.Claverton-energy. com.* Archived *from the original in 2011.*

[11] Tarai, R. K. and Kale, P. (2016). Development of Rasterized mapping PVGIS for assessment of solar PV energy potential of Odisha. International Journal of Renewable Energy Research. ***6*** *(1).*

[12] International Funds Corporation (IFC). (2012). Utility scale solar power plants: A guide for developers and investors, South Asia Department, New Delhi, India

[13] Mulaudzi, S. K. (2016). An Assessment of the Potential of Solar Photovoltaic (PV) Application in South Africa.

[14] Syafawati, A. N., Daut, I., Irwanto, M., Farhana, Z., Razliana, N., Arizadayana, Z., and Shema, S. S.(2012) Potential of solar energy harvesting in Ulu Pauh, Perlis, Malaysia using solar radiation – Analysis studies, 2011 2nd International Conference on Advances in Energy Engineering (ICAEE 2011), Energy Procedia **14**,1503 – 1508

*[15] Redweik, P., Catita, C., and Brito, M. (2013). Solar Energy Potential on Roofs and facades in an urban land scape. Solar Energy.****97****, 332-341.*

[16] Theuri, D. (2008). Solar and Wind Energy Resource Assessment Report. SWERA National Team. Nairobi.

[17] Tigabu, A. (2016). A dest assessment on the overview of current solar and wind energy projects in Kenya. IREK report No: 1.

[18] Hulda, T., Mullerb, R. and Gambardella, A. (2012). A new solar radiation database for estimating PV performance in Europe and Africa*.* **86** (6), 1803–1815.

[19] Hofierka, J. and Suri, M. (2002). The solar radiation model for Open source GIS: implementation and applications. In*: Proceedings of the Open source GIS – GRASS Users Conference*. Trento, Italy, 11–13 September

[20] Suri, M., Huld, T. A., Dunlop, E. D., and Ossenbrink, H. A. (2007). Potential of solar electricity generation in the European Union member states and candidate countries. *Solar Energy* **81**, 1295-1305

[21] Suri, M., Dunlop, E. D., Huld, T. A., (2005). PV-GIS: A web based solarradiation database for the calculation of PV potential in Europe. *International Journal of Sustainable Energy 24* (2), 55–67.

[22] Njoku, H. O. (2014). Solar Photovoltaic Potential in Nigeria. *Journal of Energy Engineering,* 1-7.

[23] Brito, M.C., Gomes, N., Santos, T. and Tenedorio, J. A. (2012) Photovoltaic potential in a Lisbon suburb using LiDAR data. *Solar Energy.* 283-288.

[24] Gómez-Gil, F. J., Wang, X. and Barnett, A. (2012). Analysis and Prediction of Energy Production in Concentrating Photovoltaic (CPV) Installations. **5** (3), 770-789.

[25] Hofierka, J. and Kanuk, J. (2009). Assessment of photovoltaic potential in urban areas using open-source solar radiation tools. **34 (**10), 2206–2214.

[26] Suri, M., Huld, T. A., Dunlop, E.D., Albuisson, M. and Wald, L. (2006). Online Data and Tools for Estimation of Solar Electricity in Africa: The Pvgis Approach. 1-4.

[27] Dondariya, C., Porwal, D., Awasthi, A., Shukla, A.K., Sudhakar, K., Murali Manohar, S.R., and Bhimte, A. (2018). Performance Simulation of Grid-Connected Rooftop Solar PV System for Small Households: Case Study of Ujjain, India. *Energy Reports.* **4,** 546-553

[28] Kezerashvili, R. Y. (2009). Light and Electromagnetic Waves Teaching in Engineering Education. *International Journal of Electrical Engineering Education*. 343-353.

[29] Johnson, C. (2012. Mathematical physics of blackbody radiation. Icarus eBooks.

[30] Marr, J. M. and Wilkin, F. P. (2012). A better presentation of planks radiation law. *American Journal of Physics* **80**, 399.

[31] Cengiz, M. S. and Mamis, M. S (2015). A research on determining the panel inclination angle in terms if the place and seasons. *Journal of Multidisciplinary Engineering Science and Technology*. **2**(8), 2172-2177.

[32] Karafil, A., Ozbay, H., Kesler, M. and Parmaksiz, H. (2015). Calculation of optimum fixed angle of PV panels depending on solar angles and comparison of the results with experimental study conducted in summer in Bilecik, Turkey. 9th International Conference on Electrical and Electronics Engineering (ELECO), at Bursa, 971-976.

[33] Sproul, A. B. (2007). Derivation of Solar Geometric Relationships using Vector Analysis. *Renewable Energy*. **32**, 1187-1205.

[34] Urooj, R., Shabbir, R., Taneez, M. and Ahmad, S. S. (2013). Rural and Urban Household Demand Analysis for Electricity in Pakistan. International Journal of Emerging Trends in Engineering and Development. **3**(6), 185-191.

[35] USAID Kenya and East Africa. (2016). Development of Kenya Power Sector 2015-2020. Kenya Power Sector Report.

[36] Government of Kenya. (2015). Situational Analysis of energy industry, policy and strategy for Kenya. Institutive of economic affairs (IEA).

[37] Mwakitakima, I. J. (2015). Electricity Demand Evaluation for Rural Electrification. *IJERT.* 4(6), 1025-1028.

[38] Lin, B. Q. and Quising, P. F. (2003). Electricity demand in the People's Republic of China investment requirement and environmental impact, Asian Development Bank, **37.**

[39] Seppala, A. (1996). Load Research and Load Estimation in Electricity Distribution. Technical Research Centre of Finland.

[40] Diemuodeke, E. O., Addo, A., Dabipi-Kalio, I., Oko, C.O.C., and Mulugetta, Y. (2017). Domestic Energy Demand Assessment of Coastline Rural Communities with Solar Electrification. *Energy and Policy Research*. **4**(1), 1-9.

[41] Ondraczek, J. (2011). The Sun Rises in the East (of Africa): The Development and Status of the Solar Energy Markets in Kenya and Tanzania. 2nd Symposium Small PV Applications, Ulm.

[42] Msyani, M. (2013). Current status of energy sector in Tanzania: Executive exchange of developing an ancillary service market, from http://www.google.com, Feb-March.

[43] Kassenga, G. (2008). The status and constraints of solar photovoltaic energy development in Tanzania‖. Energy Sources, Part B, **3 (**4), 420-432.

[44] Kabaka, K. T., and Gwang'ombe, F (2007). Challenges in small hydropower development in Tanzania: rural electrification perspective. International Conference on Small Hydropower– Hydro. Sri Lanka.

[45] Government of Kenya. (2018). Updated Least Cost Power Development Plan. Study Period 2017-2037.Nairobi.

[46] Government of Kenya (2016). Sustainable Energy for All Kenya Investment Prospectus. Ministry of Energy and Petroleum Report. Nairobi.

[47] Stoffel, T., Renne, D., Myers, D., Wilcox, S. Sengupta, M. George, R. and Turchi, C. (2010). Concentrating Solar Power. Best Practices Handbook for the collection and Use of Solar Resource Data. Golden, Colorado. National Renewable Energy Laboratory. 146

[48] Zell, E., Gasim, S., Wilcox, S., Katamoura, S., Stoffel, T., Shibli, H., Engel-Cox, J. and Al Subie, M. (2015). Assessment of Solar Radiation in Saudi Arabia. *Solar Energy*. 119, 422-438

A Service Oriented Architecture Approach to Implementing an Omnichannel Personal Health Record System.

Hesbon Kipchirchir Kiptoo[1], Benard Mutisya Nzyoka[1], David Muchangi Mugo[2]

[1]*University of Nairobi, Nairobi, Kenya*

[2]*University of Embu, Kenya*

(kiptoohesbon@gmail.com, mnmutisya@gmail.com, davemugo2005@gmail.com)

Abstract

Interoperability of eHealth systems has been a problem that has been unresolved due to variations in platforms, protocols, data formats, patient matching criteria and lack of universal patient identification. Most of the eHealth systems are owned and controlled by individual hospitals and not exposed to other third parties by choice or fear of losing competitive advantage when they share with other institutions The popular Personal Health Record (PHR) systems, instead of patient centric, are also institution-specific, proprietary, expensive and mostly permit patients to collect and enter all their medical information manually as only few physicians or hospitals submit their medical information electronically to a PHR. Having a unique patient identifier that is consistent nationwide is the ultimate solution to patient matching across different healthcare provider's systems. There is also a need to manage and avail PHR data anytime, anywhere and to any terminal with patient consent. The data need to be kept up to date as soon as medical information is available preferably automated upload from EMR or in real-time from monitoring devices through open APIs. We thus designed an Omnichannel PHR solution based on Service Oriented Architecture to enable patients to sign up, manage profile and share medical information through cross platform mobile application, web application and monitoring devices in real time. IBM's Service Oriented Modelling and Architecture (SOMA) phases was used to model, identify, select, implement, deploy and monitor the services in the Omnichannel PHR solution. The main goal of using SOA was to provide consistent services across all channels, terminals or devices. This research therefore recommends open APIs using SOA for central identification and management of personal health records, use of open source technologies and adoption of Internet of Things to collect vital patient medical information in real-time.

KEYWORDS: Personal Health Record, Omnichannel, SOA, Service Oriented Architecture, mHealth, IoT, Internet of Things

Introduction

Interoperability of eHealth systems has been a problem that has been unresolved due to variations in platforms, protocols, data formats and patient matching criteria. Even with the availability of a multitude of message exchange standards, the systems still operate in isolation, with little or no potential to interoperate due to lack of universal patient identification. Most of the eHealth systems are owned and controlled by individual hospitals and not exposed to other third parties by choice or fear of losing competitive advantage when they share with other institutions (Ge, Ahn, Gage, & Carr). The popular Personal Health Record (PHR) systems are also institution-specific and have not been concerned with data interoperability and data protection with other PHR vendors, which explains why there is low uptake especially in Kenya (Jingquan, 2017). Existing mHealth solutions are proprietary, expensive and

hence unsustainable as patients are unwilling to use and pay for multiple applications which do not share data with other systems but stand-alone 'siloed' applications. As a result, patient records are spread across different institutions that cannot easily be accessed by patient nor caregivers. According to (Arzt, 2017), a universal identification of patients within a nation would result in a safe and secure exchange of patient healthcare information since it ensures an accurate, timely and efficient matching of the patient between different EMR systems, in and out of a healthcare facility. The burden of patient matching and lack of data exchange falls on the patients who are forced to pay for duplicate consultations, tests, treatments that were not necessary at all including succumbing to negative side effects of misdiagnosis, hence the need to establish and implement a framework for patient-centric universal patient identification and sharing of data. Most of the PHR solutions permits patients to collect and enter all their medical information manually as only few physicians or hospitals submit their medical information electronically to a PHR (PharmD, 2016). Therefore, there is need to manage and avail PHR data anytime, anywhere and to any terminal with patient consent.

Objectives of the study

The main objective of this research was to implement an Omnichannel Personal Health Record System based on Service Oriented Architecture (SOA) framework to facilitate patient centered selfcare and collaboration with health care providers. The specific objectives under the study was understanding people's perception on personal health record systems, identifying the current mechanisms of identifying patients in health facilities, developing a Service Oriented Architecture (SOA) model and prototype for the proposed Omnichannel PHR System, and finally testing, evaluation and validation of Omnichannel PHR prototype system developed.

Literature Review

Internet of Things

We are accustomed with internet of people, now we have internet of everything. Internet of Things refers to network of objects (things) that can sense and share information, with other objects, devices, machines through specified protocols. IoT encompasses Machine-to-Human communication (M2H), Radio Frequency Identification (RFID), Location-Based Services (LBS), Lab-on-a-Chip (LOC) sensors, Augmented Reality (AR), robotics, and vehicle telematics as it exists today (Lake, Rayes, & Morrow, 2018).

IoT devices are quickly evolving and adopted due to its characteristics such as they are typically small and inexpensive devices that are designed to operate autonomously anywhere, either in the field, embedded in other devices including human body. IoT's ability of building "intelligence" into "things" differentiates them from the ordinary internet (Keyur & Sunil, 2016). Such characteristics makes them suitable for healthcare, manufacturing, finance, agriculture and many other sectors.

IoT architecture consists of interrelated layers of technologies that allows the IoT devices to communicate and exchange data. The sensors allow interconnection to physical and digital worlds to collect data in real time. Examples include temperature, pressure, speed, etc. The sensors are small in size, require low power and need to connect to sensor gateways like GSM and GPRS to transmit data to physical world.

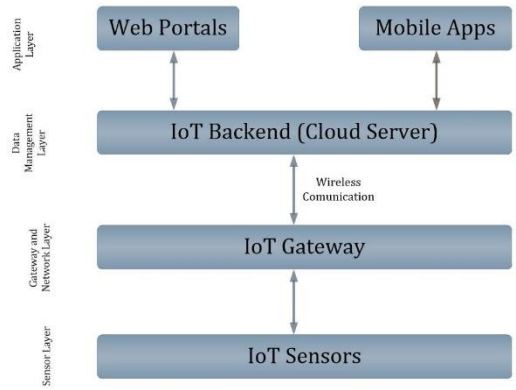


Figure 2: Internet of Things Architecture

IoT sensor devices produce lots of data and it requires a transport medium to communicate and exchange the data to the digital world (e.g. a cloud server) via a gateway. Gateway networks include GPRS, WI-FI, GSM. The network gateways and sensors are attached to a IoT (microcontroller, microprocessor). Data management service layer provides information access on need basis. This information can be accessed from other devices such as mobile apps and web applications. It also ensures that data privacy is ensured and the data is disclosed in the correct format. The application layer encompasses the end user applications such as the web, mobile and dashboard applications. The data and functionality is presented to specific consumers of the IoT data such as Agriculture, Health Care, Supply chain, Energy, etc

Service Oriented Architecture

Service-oriented architecture (SOA) is an approach to designing, implementing, and deploying information systems such that the system is created from components implementing discrete business functions called "Services" (Sonic Software Corporation, 2005) that can be distributed across geography, across enterprises, and can be reconfigured into new business processes as needed. It is an orchestration of services that interact with each other in servicing a business process in a client/server design approach (software services versus software consumers/service requesters). It is different from traditional client/server model in that it advocates for loose coupling of services and autonomy of services. SOA has key potential desirable benefits not limited to interoperability, reusability, loose coupling and protocol independence (Pulier & Taylor, 2006). According to Rosen et al. (2008), SOA divides the complex organisational environments into smaller functions called services, that are designed to do one thing hence re-usability. The services are exposed using standard Web Services using a Web Service Description Language (WSDL) that can be consumed by any programming language in any platform thus realising interoperability and protocol/platform/technology independence.

The discovery of Web Services and Extensible Markup Language (XML) has been embraced by many as a defacto integration framework. This led to the adoption of Enterprise Service Bus (ESB) which is still dominant today despite mushrooming of Micro Services. ESB uses Hypertext Transfer Protocol (HTTP) web services to expose business services to client systems while at the same time takes advantage of various existing messaging services like Java Messaging Services (JMS) for routing requests to and from disparate systems. ESB has been accepted as a single point of integration of organisation's business services in a service-oriented architecture (Masava, 2013).

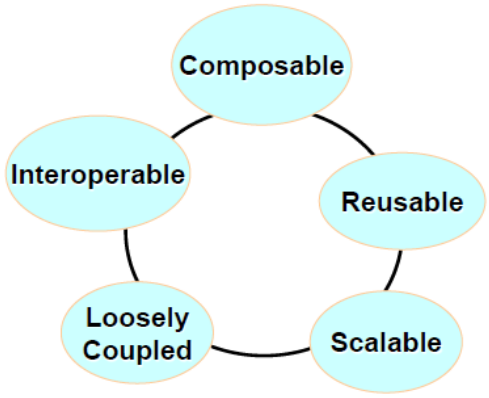


Figure 2: SOA Characteristics

In a Service Oriented Architecture, the business functions are packaged into services which are consumed by client systems as Web services. The service provider must first register the service in a service directory. The service consumer will search for the business service in a service directory, bind and then invokes the web service provider's endpoint address.

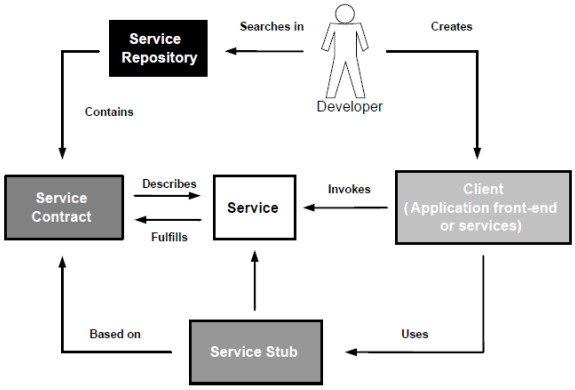


Figure 3:SOA Components

Methodology

The nature of this research was to address patient data interoperability. Purposeful sampling was used to select patients or individuals for study. This method is suitable in that participants will be chosen according to the need of the study. Questionnaires and interviews were the main data collection tools. Patients (individuals) and healthcare personnel were given questionnaires. The participants were asked to confirm if they were familiar or had used a PHR and if it was useful to them, and if so, they were also asked about the aspects of a PHR that would be most helpful in their own care. The sampling frame for the health providers included 1 health care provider in Nairobi. It also included all patients and identified caregivers from hospitals and clinics. Healthcare personnel were also interviewed about the current patient identification methods and medical data handling processes.

IBM's Service Oriented Modelling and Architecture (SOMA) phases was used to model, identify, select, implement, deploy and monitor the services in the Omnichannel PHR solution. Service-oriented modelling is a phase-oriented process for modelling, analysing, designing, and producing a SOA that aligns with business processes and goals (Arsanjani, 2004). SOMA was developed by IBM to guide the

design and building of SOA-based application. It consists of seven phases as shown in figure below:

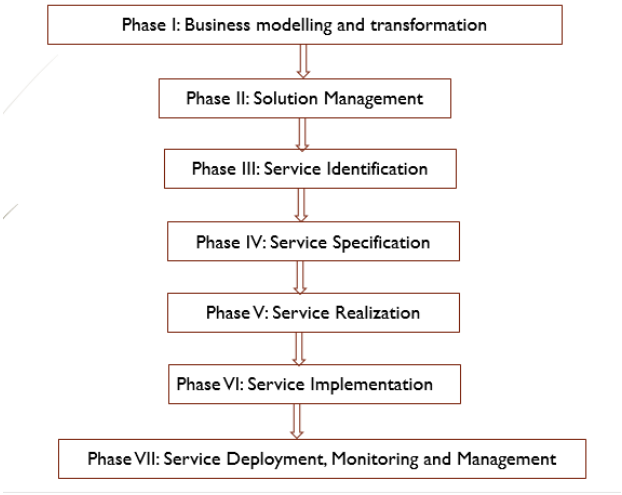


Figure 4:SOMA Phases

First, a business model was defined, along with a set of templates for each of the possible integration solutions. Thereafter, the Omnichannel PHR services were idenfied and included in the solution architecture as required. The services were refactored, rationalized and specified as part of a SOA architecture while others were deferred for later implementation (out of scope of this research project). Finally, the critical services were selected as per need and priority, implemented, deployed and monitored. As soon as the web services were designed and developed, database was designed and the channels were developed (mobile application, web portal and temperature monitoring device) and they consumed the deployed web services. At the end of study, the artefacts created included a SOA Model, Mobile App, Web Portal, Open API Webservices and a temperature monitor (IoT device).

Technology Description

The Omnichannel PHR web services was designed and implemented using the Service Oriented Architecture and Modelling Methodology phases described in the literature review and methodology section.

The prototype was designed using open source technologies such as: -

Java Enterprise Edition (Java EE) programming language

HTML5 and JavaScript technologies for user interface design

C-programming for temperature monitoring hardware device interfacing

Tomcat Enterprise Edition (TomEE) application server

MySQL community edition database

Jasper reporting tools

Linux Operating System (Ubuntu)

Netbeans Integrated Development Environment (IDE)

Cross platform Mobile Applications

Arduino Mega 2560 Board, Ethernet LAN Network and LM35 Temperature Sensor

The database and third-party integrations functionalities were exposed via REST APIs to end-user applications and web interface. These services were hosted on Tomcat Enterprise application server. Representation State Transfer (REST) APIs were chosen for this project over Simple Object Access Protocol (SOAP) as they were lightweight, produce human readable results and are easy to build as no toolkits are required. The message formats were in JavaScript Object Notation (JSON). However, the backend applications were able to support the various client protocols and message standards which can be continuously added or removed overtime. Thanks to Service Oriented Architecture and Modelling (SOMA) and agile software development methodology. Figure 5 illustrates the high level representation of the Omnichannel PHR solution whereas Figure 6 shows the SOA reference model.

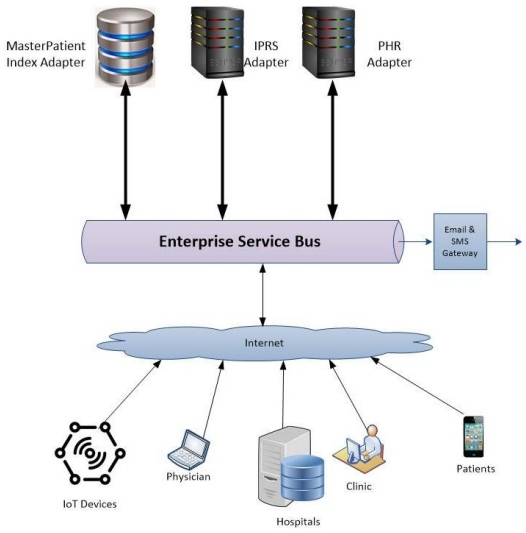


Figure 5:High-level representation of the solution

Agile testing methodology was adopted to allow the researcher fail early. The process was iterative in the sense that a specified user group (colleagues and friends of the researcher) were given the prototype to test specific services. It started with high fidelity wireframes for the mobile app. Amendments were made to the wireframes and the mobile application until the final system was implemented. System testing was inevitable as it evaluates the system's ability to fulfil the desired requirements.

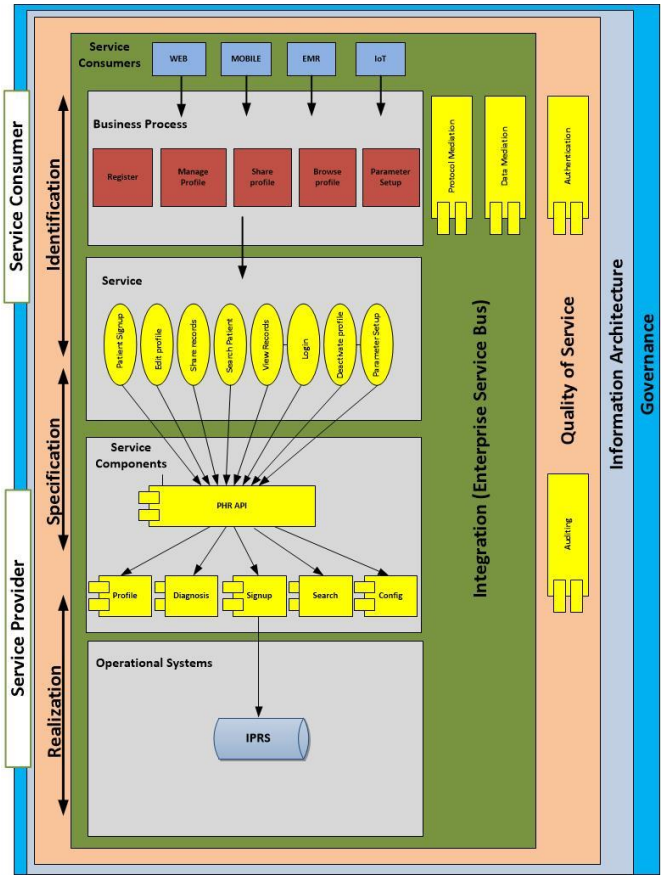


Figure 6: Instantiation of the SOA reference architecture for Omnichannel PHR Solution

Results

The findings of the study revealed that most patients have never heard nor used PHR systems whereas majority were willing to use it if they are recommended by their physicians. Despite the fact that more than half the health facilities in Kenya have unique patient identification scheme, they are not interoperable between hospitals which further hamper medical data sharing among health care facilities. Post implementation results revealed that data sharing between patients and healthcare personnel significantly improved by rolling out device agnostic ways (omnichannel systems) where patients and healthcare personnel (physicians) can share and access medical history using web, mobile or other platforms. This was facilitated by adoption of Service Oriented Architecture.

In evaluating the proposed prototype's features for patient medical data recording and sharing, a 5-point Likert scale was used. On Average, more than 78% of the respondents agree that the PHR features listed have met their objectives to a large and very large extend cumulatively.

PHR features	*no extent at all*	*small extent*	*moderate extent*	*large extent*	*very large extent*
Storing illnesses and hospitalizations	0	0	12	29	59
Storing allergies and adverse drug reactions	0	0	0	24	76
Storing medical Prescription record	0	0	0	18	82
Laboratory test results and image reports	0	0	6	29	65
Transfer medical information to doctors and specialists	0	0	18	76	12

Discussions

The findings have implications on patient care improvement, lower costs of treatment and reduced cases of misdiagnosis. Having a unique patient identifier that is consistent nationwide is the ultimate solution to patient matching across different healthcare provider's systems. Having centralized storage of PHR data that is available anytime, anywhere, any terminal and to any healthcare provider with patient consent is the most effective way of ensuring medical data interoperability across medical institutions. The data needs to be kept up to date as soon as medical information is available preferably automated upload from EMR or in real-time from monitoring devices (IoT) through open APIs. The Service Oriented Architecture was useful in providing consistent services across all channels, terminals or devices.

Conclusions

The findings of this research study and evaluation of the prototype demonstrated interoperability can be easily achieved by giving the patients the ability to record their own medical information using different platforms (web and mobile) without having to carry papers whenever they seek medication. Health care professionals can assist the patients in updating their profiles whenever they seek medical treatment. Patients are very cautious about the privacy of their data and were comfortable by having control on who can read or write their records.

Finally, the Service Oriented Architecture provided integration layer that will facilitate interoperability of different channels, devices and third-party systems or applications. As such PHR will make data to be available anytime, anywhere, any terminal over cloud technologies.

As the government of Kenya is working towards rolling out the Kenya Health Enterprise Architecture, it should consider adopting Service Oriented Architecture. Lessons learnt from the universal identification of patients using a single source of truth (IPRS) which has been predominantly used by

banks, should be used as well. Implementers of mHealth applications or PHR solutions are encouraged to create solutions that are able to share data with other institutions and systems (mHealth, EHR) as patients are unwilling to use and pay for multiple stand-alone 'siloed' applications.

Future Work

Since not all aspects of PHR were implemented (like reminders, medical device integrations, health insurance, wellness information) future work should focus on these aspects. Future researchers are also encouraged to implement linkage of existing patient data with PHR systems and also adopt distributed ledger technologies to improve security and usability of the PHR system. Although Blockchain technology is still in its infancy, distributed ledger technologies have great potential in solving most of the healthcare issues especially on data sharing, security and speed of transactions. Private permissioned blockchain is recommended like IBM Hyper Ledger Fabric.

References

AHIMA, M. T. (2011). Managing the Master Patient Index in an Integrated Delivery System. *Journal of AHIMA 69, no. 1 (1998)*.

Arsanjani, A. (2004). Service-oriented modeling and architecture, How to identify, specify, and realize services for your SOA. *IBM Developer Works*.

Arzt, N. H. (2017). Is There a National Strategy Emerging for Patient Matching in the US? *KEI Journals*.

Bell, G., & Sethi, A. (2001). Matching records in a national medical patient index. *Communications of ACM*.

e-estonia. (n.d.). *e-estonia Healthcare*. Retrieved May 06, 2018, from e-estonia: https://e-estonia.com/solutions/healthcare/

Erl, T. (2005). *Service-Oriented Architecture: Concepts, Technology, and Design.* Upper Saddle River, NJ: Prentice Hall.

Ge, Y., Ahn, D. K., Gage, D. H., & Carr, J. J. (n.d.). Patient-controlled sharing of medical imaging data across unaffiliated healthcare organizations. *Journal of the American Medical Informatics Association*, 57 - 163.

Genevieve Morris, Greg Farnum, Scott Afzal, Carol Robinson, Jan Greene, & Chris Coughlin. (2014). *Patient Identification and Matching Final Report.* Baltimore: Audacious Inquiry, LLC.

Good Practices for the Implementation and Management of a National Master Patient Index. (2015, Sept 01). Retrieved May 14, 2017, from MEASURE Evaluation: https://www.measureevaluation.org/resources/publications/fs-15-147/at_download/document

GSMA. (2011). *A High Level Reference Architecture.* New Fetter Lane, London EC4A 3BF UK: GSMA Mobile Health.

Hasan, H. (2003). Information systems development as a research method. *Australasian Journal of Information Systems*.

HealthLeaders Media Magazine. (2015). *A Framework for Cross- Organizational Patient Identity Management.* Health Leaders Media Magazine.

Heerden, A. v., Tomlinson, M., & Swartz, L. (2012). Point of care in your pocket: a research agenda for the field of m-health. *Bulletin of the World Health Organization*.

InApp. (n.d.). *Service Oriented Architecture*. Retrieved Oct 9, 2017, from InApp: https://inapp.com/service-oriented-architecture/

ITU. (2012). *E-health Standards and Interoperability ITU-T Technology Watch Report April 2012.* International Telecommunication Union, (cited 19 February 2017); http://goo.gl/VTjdo 2012.

Jamie, T. (2015, Jun 15). *Client Registry Resource Library*. Retrieved Oct 09, 2017, from Jembi: https://jembiprojects.jira.com/wiki/spaces/RHEAPILOT/pages/9437901/Client+Registry+Resource+Library

Jingquan, L. (2017). A Service-Oriented Approach to Interoperable and Secure Personal Health Record Systems. *EEE Symposium on Service-Oriented System Engineering (SOSE)*.

Karimi, O., & Modiri, N. (2011). Enterprise Integration using Service Oriented Architecture. *Advanced Computing: An International Journal (ACIJ)*.

Kenya National e-Health Policy 2016-2030. (2016). *Kenya National e-Health Ploicy 2016-2030.* Ministry of Heakth. Retrieved 10 05, 2017, from https://www.medbox.org/kenya-nation-e-health-policy-2016-2030/download.pdf

Kenya National e-Health Strategy (2011-2017). (2011). *Kenya National e-Health Strategy (2011-2017).* Ministry of Medical Services and Ministry of Public Health and Sanitation. Retrieved 10 5, 2017, from https://www.isfteh.org/files/media/kenya_national_ehealth_strategy_2011-2017.pdf

Keyur, P. K., & Sunil, P. M. (2016). Internet of Things-IOT: Definition, Characteristics, Architecture, Enabling Technologies, Application & Future Challenges. *International Journal of Engineering Science and Computing*.

Kolly, V., Cleaphas, A., Bovier, P. A., Ganerin, P., & Perneger, T. V. (2004). Acceptability of identification bracelets for hospital inpatients. *Quality and Safety in Health Care*.

Lake, D., Rayes, A., & Morrow, M. (2018, July 8). *The Internet of Things - The Internet Protocol Journal,*. Retrieved from Cisco Systems: https://www.cisco.com/c/en/us/about/press/internet-protocol-journal/back-issues/table-contents-57/153-internet.html

Lenson, C., RHIA, & M, L. (1995). Preparing the Master Patient Index For an Integrated Delivery System. *Journal of AHIMA*, 56-60.

Li, J. (n.d.). A Service-Oriented Approach to Interoperable and Secure Personal Health Record Systems.

Masava, V. L. (2013). *An Electronic Government Integrated System using Service Oriented Architecture (SOA).* Nairobi: University of Nairobi.

Nadhan, E. G. (2004). Service-Oriented Architecture: Implementation Challenges. *Microsoft Architect Journal*.

NEMIS. (n.d.). *NEMIS User Manual*. Retrieved May 29, 2018, from Ministry of Education.

OpenHIE. (n.d.). *Client Registry*. Retrieved May 14, 2017, from OpenHIE: https://ohie.org/client-registry/

Papazoglou, M., & Heuvel, W.-J. (2007). Service oriented architectures. *Very Large Database Journal*.

PharmD, J. Z. (2016, Nov 8). *Benefits, Risks, and Drawbacks of an Electronic Personal Health Record*. Retrieved Sept 12, 2017, from Centerpoint Clinical Services: https://www.centerpointclinicalservices.com/blog-posts/benefits-risks-and-drawbacks-of-an-electronic-personal-health-record/#ref5

Phil Bianco;Rick Kotermanski;Paulo Merson. (2007). *Evaluating a Service-Oriented.* Hanscom AFB: Software Architecture Technology Initiative.

Pulier, E., & Taylor, H. (2006). *Understanding Enterprise SOA.* USA: Manning Publication.

Purkis, B., Morris, G., Afzal, S., Bhasker, M., & Finney, D. (2012). *MASTER DATA MANAGEMENT WITHIN HIE INFRASTRUCTURES: A FOCUS ON MASTER PATIENT INDEXING APPROACHES.* Office of the National Coordinator for Health Information Technology.

PWC. (2014). *Emerging mHealth: Paths for growth.* PWC.

Qiang, C. Z., Yamamichi, M., Hausman, V., Miller, R., & Altman, D. (2012). *Mobile Applications for the Health Sector.* Washington DC: ICT Sector Unit World Bank.

Rosen, M., Lublinsky, B., Smith, K. T., & Balcer, M. J. (2008). *Applied SOA: Service-Oriented Architecture and Design Strategies.* Wiley Publishing, Inc.

Rouse, M. (2017, Aug 01). *Enterprise Master Patient index (EMPI)*. (WhatIs.com) Retrieved Nov 09, 2017, from TechTarget: http://searchhealthit.techtarget.com/definition/master-patient-index-MPI

S, P. C., L, L. S., & H, G. R. (n.d.). Barriers to the Adoption and Use of Personal Health Record Systems. *ProciConference*.

Scott , S. (2010, Sept 30). *Approaches to statewide patient identification: pros and cons*. Retrieved May 7, 2017, from Healthcare IT News: https://www.healthcareitnews.com/blog/approaches-statewide-patient-identification-pros-and-cons

Sonic Software Corporation, A. I. (2005). *A NEW SERVICE-ORIENTED ARCHITECTURE (SOA) MATURITY MODEL.* Retrieved from http://www.omg.org/soa/Uploaded%20Docs/SOA/SOA_Maturity.pdf

Terry, K. (2015, Aug 18). *National patient identifier struggles for life*. Retrieved May 7, 2017, from CIO: https://www.cio.com/article/2972266/healthcare/national-patient-identifier-struggles-for-life.html

Supporting Green Growth and Knowledge Economy through Research, Innovation and Technology for Sustainable Development

Title: The History of TIRDO and Industrialization in Tanzania up to 2018.

(By Osmund Kapinga[1] and Victoria Gores[2]) [1]St. Augustine University of Tanzania, email: kapinga4@gmail.com, [2]Mwenge Catholic University, email: victoriagores91@gmail.com

Abstract

This paper examines different areas which are the prerequisites of industrialization. It focuses on the issues of research and innovation as imperatives in industrialization from historical point of view, the paper utilizes the case study of Tanzania Industrial Research and Development (TIRDO) as a research institution established for the purpose of advancing industrialization in Tanzania. The paper focuses on the circumstances which prompted the establishment of the institution and the purpose for which it was established. The functions and roles of the institution have been reviewed and dissected from the historical point of view. The successes, challenges and future prospects have been discussed in line with industrialization. Methodologically the paper has been designed from historical exploratory design utilizing a case study strategy. The approach engaged in this paper is that of qualitative nature utilizing both primary and secondary historical sources to gather information through in depth interviews, oral histories, observation and intensive archival documentary review. Research instruments such as interview guides and checklists were designed to facilitate smooth collection of the required data. Most of the secondary data were generated from libraries at SAUT, MWECAU, UDSM, National Library DSM, Mwanza Regional Library and Kilimanjaro Regional Library. The findings revealed that TIRDO was created with very strong ambitions to advance industrialization in Tanzania. However, the functions of which were marred by lack of commitment and unnecessary bureaucratic bottlenecks. Budgetary problems and structural organizational inconsistencies crumbled the smooth functioning of the institution.

Key Words: Industrialization, Innovation, TIRDO, Research, Local industries

Introduction

The search for new knowledge based on human experience is as old as human society itself. In all countries, Tanzania inclusive, there has been some form of this search for many years. It all depends on the society to organize its search into a well thought out, a well planned, and a purposeful one, which is aiming at conquering problems within its environment in order to ensure a future healthier, more productive and worth living-in environment. This is a continuous move, and each move gravitates around previous experiences and observations. This is termed as organized research, a purposeful search for a new knowledge based upon past

experience.[28] This paper discusses the position of TIRDO as a research institution to advance science and technology to support the process of industrialization in Tanzania as well as to achieve sustainable economic development.[29]

Conceptually and historically countries have all over the world achieved industrial development and successful sustainable economic development through investing in research and innovation. The research centers and institutions are established and well financed to cater for these research activities. Since the area of research is a sensitive undertaking the political will of those in power was very important because it was all about national and human security issue. The political economy of research and innovation is therefore not ideologically free. The colonialists for example did not engage in researches which were to develop their colonies. Instead the research centers were mainly to improve their economies such as raw material research based (crops, minerals and animal researches). It therefore goes without saying that all developing countries were to make research as one of their priority if they were to achieve industrial progress and sustainable development.

Tanzania has had some kind of organized scientific research for years. This was done by a number of isolated research centers owned by the government and the East African Common Services Organization (later East African Community). There had been achievements in creating and establishing research centers and later the opening of the University of Dar es Salaam in 1961. The university starting with a Law Faculty and later other faculties including agriculture, science, medicine and engineering were put in place.

Series of other research centers and institutions continued being established. A number of technology supporting institutions are already in place, these include: Tanzania Industrial Research and Development Organization (TIRDO) 1979, Tanzania Bureau of Statistics (TBS), Centre for the Development and Transfer of Technology (CDTT), Tanzania Industrial Studies and Consulting Organization (TISCO) Institute for Production Innovation (IPI), National Construction Council (NCC), Building Research Unit (BRU), National Radiation Commission (NRC), Small Industries Development Organization (SIDO), and others.[30]

Research and Innovation Under Colonialism

Serve for Indigenous Knowledge research under precolonial era, Tanzania has had some organized scientific research in the past years. It all began with the advent of the German colonialists *(Deutsch-Ostafrika)* who established a research center at Amani in Tanga in 1902

[28] R. Mazengo, Scientific Research in Tanzania, in Gabriel Ruhumbika, (ed.) *Towards Ujamaa: Twenty years of TANU Leadership,* East African Literature Bureau, Dar es Salaam, 1974:147

[29] TIRDO, Research Policy and Guidelines, June 2004

[30] Benedict C. Mukama and Charles S. Yongolo, Tanzania Commission for Science and Technology (COSTECH), Development of S & S System and Experience of Tanzania on S&T Data Collection, 2005

where they established the Usambara *Kulturstation*.[31] This center started up as an agricultural and biological center and came to be known as Amani Biological-Agricultural institute.[32] The institute later expanded enormously into the areas of research in the following years. "The Amani Institute soon became a 'tropical scientific institute superior to anything in the British colonies and protectorates and comparable with Pusa in India or the Dutch establishment at Buitenzorg in Java."[33] In early years practical research concentrated on plants most relevant for Eurpean agriculture, mainly coffee, rubber, tea, and sisal. The results were popularized in two journals of the institute *(Berichte über Land- und Forstwirtschaft in Deutsch-Ostafrika and Der Pflanser)* in courses and seminars organized for planters and officials.[34] The Germans had a number of other research centers in the colony notably in the northern parts of Tanganyika.

"Although Amani was the most famous of Germany's colonial research stations, representing a 2-million-mark investment, it was only one of several German agricultural stations in the northern region. Another, named Kwai farm and located in the nearby West Usambaras, preceded Amani as the colony's chief center for agricultural and livestock experiments. Kwai lacked Amani's international reputation, but it one the less held a prominent place in the minds of the Africans who lived in its shadow."[35] Other research centers were Kibong'oto in Moshi charged with research on agriculture and cattle and cattle diseases in the fastest growing white settlement. Experimental farm and cotton school was established at Mpanganya in 1904 as a training and propaganda station for African cotton farmers.[36] More experimental stations for agriculture were established in the districts of Tabora, Lindi and Mrogoro which concentrated on cotton.[37] The Germans built other facilities, including schools and hospitals, in different parts of the country while ruling the colony (1891–1918). One of their biggest colonial achievements was in scientific research at the institutes they established in German East Africa, especially at Amani.

---

[31] Juhani Koponen, *Development for Exploitation;: German Colonial Policies in Mainland Tanzania, 1884-1914,* 1994:252

[32] Henderson, W.O.; "German East Africa 1884 – 1918," in Vincent Harlow, E.M. Chilver, Alison Smith, eds., *History of East Africa, II*, London: Oxford University Press, 1965:134

[33] Report of the East Africa Commission, *Cmd. 2387 (1925), p. 86.*

[34] Koponen, op. cit. p. 252

[35] Conte, Christopher-Allan; "Imperial Science, Tropical Ecology, and Indigenous History: Tropical Research Stations in Northeastern German East Africa, 1896 to Present," in Gregory Blue, Martin Bunton and Ralph Croizier, eds., *Colonialism and the Modern World: Selected Studies*, New York: M. E. Sharpe, Inc., 2002

[36] Koponen op.cit. p.423

[37] Ibid. p.424

After the Germans lost the First World War the German East Africa colony went to the British and was named Tanganyika Territory in 1920. The British took over as a League of Nations Mandate, after the German Empire lost World War I. The Amani Research Station was renamed the East African Agricultural Research Institute.[38] From about 1927 to 1948 Amani Institute was transferred to Muguga near Nairobi, the station made impressive record of very productive research especially soil science and agronomy and plant breeding of crops such as cassava, maize and groundnuts. Many scientific papers were produced though they hardly reached the farmer.

After the Second World War many agricultural research stations were established. The main aim was to find solution to problems facing export crops so as to increase their production. Therefore the Sisal Research Station was set at Mlingano near Tanga, in 1934, the Coffee Research station was established at Lyamungo near Moshi in 1934, the Empire Cotton Growing Corporation posted scientific staff to Ukiriguru near Mwanza to develop cotton crop in 1939, and the Overseas Food Corporation had a strong scientific wing.[39] Tations ike Tengeru was established to undertake research on food crops. The Mpwapwa Research Station was established near Dodoma to undertake research on animal husbandry whose programmes were not included in Amani prgramms. Although the Amani Research Institute became world-famous during German colonial rule as a scientific research centre,[40] it retained its international reputation after the British received control of the colony they named Tanganyika.[41]

Other areas of research were added to the institute in 1960. During World War I, the Amani Research Institute reinforced its international reputation in research when scientists at the centre developed various products. They included medicine and chemical products, from local material to meet war needs and those of the German settlers at a time when the colony was cut off from the rest of the world and could not import anything. "Considerable ingenuity was shown in producing in the colony manufactured goods and medical supplies normally imported from Europe. Quinine was made at the Amani Institute and at Mpwapwa....Dye-stuffs were made from native barks. In the first eighteen months of the war the Amani Agricultural Research Institute 'prepared for use from its own products 16 varieties of foodstuffs and liquors, 11 varieties of spices, 12 varieties of medicines and medicaments, 5 varieties of rubber products, 2 of soap, oils and candles, 3 of materials used in making boats, and 10 miscellaneous substances. Many of these were prepared in comparatively large quantities, e.g.15,200 bottles of whisky and other alcoholic liquors, 10,252 lb. of chocolate and cocoa, 2,652 parcels of toothpowder, 10,000 pieces of soap, 300 bottles of castor oil'[42]

---

[38] Mazengo, op.cit. p.149

[39] Mazengo, op. cit. p.149

[40] Conte, Christopher-Allan; *Highland Sanctuary: Environmental History in Tanzania's Usambara Mountains*, Athens, Ohio: Ohio University Press, 2004:13

[41] Mwakikagile, Godfrey *Life in Tanganyika in The Fifties*; Dar es Salaam, Tanzania: New Africa Press, 2010, p. 164

[42] *Report of the East Africa Commission*, Cmd. 2387 (1925), p. 86....Owing to the blockade, overseas trade came to an end....The long drawn-out conflict inflicted serious damage on the colony." Cf. W.O. Henderson, "The

After the British took over, they were "impressed both with Amani's international reputation and the quality of research conducted there...and continued operating it as a research institute under the British postwar government. Amani therefore continued to function as an important center of botanical research and became a flash point for arguments over the value of pure versus applied research in Britain's East African colonies."[43] The institute also became famous for its research in malaria during British colonial rule and was transformed in 1949 into the East African Malaria Unit. The research centre served not only Tanganyika but also Kenya, Uganda, Zanzibar and British Somaliland in the prevention and control of malaria and other vector-borne diseases. It became the East African Malaria Institute in 1951 and was renamed the East African Institute of Malaria and Vector Borne Diseases in 1954. In the present day it maintains a high reputation in research, as the Amani Medical Research Centre, in the Tanga Region of Tanzania.

After British colonial rule ended, the institute continued to play an important role as a research centre in Tanzania. In 1977, it was renamed Amani Medical Research Centre of the National Institute for Medical Research, covering a wide range of areas in medical research.

Scientific and Technological Initiatives in Tanzania

In 1961 Tanganyika got her independence from Britain.[44] In 1964, independent Tanganyika united with Zanzibar to form the United Republic of Tanzania.[45] At independence Tanzania inherited colonial economic structure which had kept its umbilical code intact with the metropolitan economy. The subsequent development plans took on board the colonial structure hence industrial research was not a priority. The East African governors of Uganda, Kenya and Tanganyika established several regional boards to help coordinate the war effort proposals for the future management of the inter-territorial services in East Africa which resulted into the establishment of East Africa (High Commission) Order in Council 1947.[46] The East African Common Services Organization research facility continued to offer services to the nation.[47] However, things started changing with the collapse of EAC in 1977. Tanzania had to make a decision on how industrial research should be conducted. It was out of this situation the idea to establish TIRDO was conceived. Other East African countries came up with similar initiatives, Kenya Industrial Research and Development Institute (TIRDI) in Kenya and Uganda Industrial Research Institute (UIRI) in Uganda.

war economy of German East Africa, 1914 - 1917," *Economic History Review*, xiii, 1943.Ref. Henderson, 1965, pp. 160 – 161; Henderson, 1943, pp. 104 – 110.

[43] Conte, 2002, op. cit. p. 246; Conte, 2004, op. cit.p. 13.

[44] Tanganyika Independence Act 1961, and The Tanganyika (Constitution) Order in Council, 1961

[45] An Act to ratify the Articles of Union between the Republic of Tanganyika and the People's Republic of Zanzibar

[46] East Africa (High Commission) Order in Council 1947,

[47] The East African Common Services Organization Ordinance, 1961. Cf. Benedict C. Mukama Charles S.Yongolo, Development of S & T System and Experience of Tanzania on S&T Data Collection, Tanzania Commission for Science and Technology

Tanzania Industrial Research and Development Organization (TIRDO)

The history of TIRDO started when it was established as a public sector institution to support the industrial sector through the Act of Parliament of the United Republic of Tanzania No. 5 of 1979.[48] Its establishment was conceived as a means to support the process of industrialization in Tanzania as well as achieve sustainable economic development. As a body corporate which have perpetual succession and an official seal; can sue and being sued; capable of holding, purchasing or acquiring any movable or immovable property and of disposing of any of its property.

This act granted TIRDO broad mandate to initiate and undertake applied research, to evaluate and to disseminate the findings related to the strengthening and improving the performance and technological base of manufacturing industry.[49] As well as offering technical services related to solving problems and constraints in industries.

What Prompted the Establishment of TIRDO

From the time of the Arusha Declaration 1967 the government of Tanzania considered the weak technological research and development base as the stumbling block towards industrialization. To alleviate this problem the government considered to set up centers of excellence in research and development.[50] One of these institutions was TIRDO which commenced its operations in 1979. However, global demands for science and technology were the effects of decisions, recommendations and reports of a number of major inter-governmental or non-governmental conferences such as those associated with meetings organized within the framework of the World Conference on Science. A brief list of various critical UNESCO regional initiatives done to promote Science and Technology included the First United Nations Conference on the Application of Science and Technology (UNCAST) for the benefit of the less developed world that was held in Geneva in 1963 in which Tanganyika participated.

UNESCO sponsored the International Conference on the Organization of Research and Training in relation to the study of Conservation and Utilization of Natural Resources that was held in Lagos, Nigeria – August 6, 1964. In 1974 the First Conference of Ministers responsible for Science and Technology in Africa (CASTAFRICA I) was held in Dakar, Senegal. As a follow up to

[48] The Tanzania Industrial Research and Development Organization ACT 1979

[49] The Act ibid. Article no. 4

[50] Bartelt Bongenaar and Adam Szirmai (1999), Development and Diffusion of Technology The Case of TIRDO, in Adam Szirmai and Paul Lapperre, (eds), *The Industrial Experience of Tanzania*, Palgrave Macmillan, p. 171

the 1963 Geneva Conference; the Second United Nations Conference on the Application of Science and Technology for Development (UNCASTD) was held in Vienna, Austria in 1979.[51]

On the African continent the Organisation of African Unity (OAU) rekindled the UNESCO initiative by a series of meetings in Monrovia and Lagos whose final act was the promulgation of the joint 1980 declaration of the "*Lagos Plan of Action for the Economic Development of Africa: 1980-2000*." The Contents of the Lagos Declaration was a sure indication of the seriousness of the political willingness to utilize science and technology in all its forms as a vehicle for development; of which chapter V is on Science and Technology. The declaration called for three major actions for effective application of science namely: formulation of national science and technology policies that will contain essential elements contained in the UNESCO call of 1963. It was the UNESCO call that gave birth to OAU declaration. The establishment of national science and technology systems comprising of ministries and councils for effective for administration and implementation of the national science and technology policies and commitment of funding of research and development activities in science and technology to a minimum of 1% GDP (set up previously by UNESCO) in 1980 rising to 3% GDP (as seen in most development countries) by the year 2000.

National initiatives as a result of the United Nations Conference on science and development, UNCSTD, Vienna 1979 and the statements on science and technology issues in OAU Lagos Plan of Action; Tanzania had taken the following measures for stimulating science and technology for development. Measures included the establishment of the Tanzania National Scientific Research Council in October 10, 1968.[52] The Council was inaugurated on June 25, 1972 marking the first step towards the establishment of the national coordinating mechanism for research activities in Tanzania. Later, following the collapse of the East African Community, a structural problem arose of how to co-ordinate research activities in Tanzania. As a measure of necessity, all the research institutions that were under the defunct East African Community were placed under the management of their sectoral ministries to create a conducive environment for the establishment of an effective national co-coordinating mechanism.[53] The Act No. 17 was passed to amend the Tanzania National Scientific Council Act of 1968.

The 1985 National Science and Technology Policy spelled out national goals and objectives generally and by sector. In addition, it enunciated specific statements for attainment. The policy's specific aspirations included, among others, a section on a national system for co-coordinating research and development institutions as a way of monitoring research activities in the country. This was followed by the establishment of COSTECH through the Act of Parliament No.7 of 1986 and the establishment of the Ministry of Science, Technology and Higher Education in November 1990. The Ministry's involvement in research and development matters was through one of its departments responsible for Science and Technology. COSTECH on the other hand, with its wide range of Science and Technology responsibilities, reported to the Ministry.

---

[51] Benedict C. Mukama and Charles S. Yongolo, op.cit

[52] Parliament Act No. 51, Tanzania National Scientific Research Council in October 10, 1968

[53]Act No. 17 on November 30, 1977,

In implementation of the Lagos Plan of Action in 1984 the Government of Tanzania formulated the National Science and Technology Policy document that was subsequently approved and published the policy in 1985. Due to the changing socio-economic factors for development a new Science and Technology Policy was drafted, delivered to Cabinet for approval late in 1995 and subsequently made public in April 1996.

Establishment of COSTECH led to all research and development institutions became affiliated to COSTECH. This meant that the Commission's role of co-coordinating and monitoring research in Tanzania involved a very wide range of research activities ranging from medicine to social sciences and to engineering. Committees for each priority sector in the country were given the responsibility of advising COSTECH on policy issues related to its sector and recommend allocation of research funds and manpower development in connection with the Sector's contribution to production.

The 1985 Policy on Science and Technology advocated for ministerial cabinet status of Science and Technology in order to arguably draw the attention of the Central government. Consequently this ministry was established in November 1990 with one directorate dedicated to science and technology. In line with this spirit several governing policies on research and development were passed which apparently became the guideline for research and innovation at TIRDO. These policies included National Research and Development Policy 2010, National Science, Technology and Innovation Policy of 2010, Sustainable Industrial Development Policy of 1996-2010, Five year Development Plan of 2011-2016, National Development Vision of 2025 and Integrated Industrial Development Strategy (IIDS) 2025 - Master Plan of 2011.

Functions and Roles of TIRDO

According to the law which formed this public organization it was envisaged that the core functions of TIRDO should be but not limited to the following:[54] To conduct research, development and technical services on industrial processes and products, while utilizing local materials in partnership with industries. To carry out research in various aspects of local and foreign industrial techniques and technologies and evaluate their suitability for adaptation and alternative use in local industrial production. To provide and promote facilities for the training of local personnel for carrying out scientific and industrial research. To monitor and coordinate applied research carried out within Tanzania or elsewhere on behalf of or for the benefit of the government of Tanzania and to valuate he findings of the research. To establish the system of registration of and to register the findings of applied research carried out within Tanzania and to promote practical application of those findings in industrial production. To establish and operate a system of documentation and dissemination of information on any aspect of applied research carried out by or on behalf of the organization. To provide to the government and or organizations engaged in industrial production technical and advisory services and advice and guidance on technical matters necessary for the furtherance of, or relating to industrial activity. To advise the government and firms or organizations engaged in industrial production on the adaptation of technology in industrial production. To provide to the government and firms or organizations involved in industrial production advice and assistance relating to the provision of technical facilities in industrial enterprises and processes, so as to improve performances of

[54] The TIRDO Act op. cit.

industrial pollution. To advise the Government and Firms engaged in industrial production on the adoption and adaptation of technologies in industrial production. To provide an advisory technical service relating to the establishment of systems for the control and regulation of industrial processes to the firms engaged in industrial production so as to improve performance and to avert or minimize the sources of industrial pollution. These were among the important functions TIRDO was charged to perform in order to accelerate industrialization according to the law which established it.

Industrialization and TIDO Activities

At independence the industrial sector in Tanganyika remained tied to the colonial structure hence research and innovation was also externally connected to the industries. The 1967 Arusha Declaration and its subsequent nationalization of industries created a big public sector of industrial enterprises.[55] Nationalized industries included Bata Shoes, East African Breweries, textiles, skin and hides, Tanganyika Packers, British American Tobacco, and Metal Box, banking industry, export-import businesses, mills and food manufacturing firms.[56] The demand of the Three Year Development Plan (TYDP) between 1961 and 1964 followed by the First Five Year Plan (FFYP) between 1964 and 1969[57], the Five Year Development Plan of 1981 – 1986 and the Basic Industrial Strategy (BIS) 1975-1995 increased the industrial sector in Tanzania.[58] The TIRDO Industrial Information/Industrial Extension Department began operation in September 1981. Industrial information was provided to industries in the areas of engineering, textiles, foods, fibres, chemical processes, mining and metallurgical processing, ceramics, energy and instrumentation.[59] Sixty-one information requests were received in 1983. Five industries (glass, edible oils, soap, salt, and farm implements) were using the TIRDO Information Service on a recurring trial basis with the possibility of future subscription service.[60]

The TIRDO Industrial Extension Service, during the period 31 September 1981 to 15 March 1983, had contacted 160 industries, technical institutions and industry associations. These visits identified 115 technical problems confronting the productive sector. Twenty four industries have indicated problems of production, process design or modification, or analysis and testing, which TIRDO may be able to solve. The TIRDO Engineering Energy Audit/Conservation Unit

---

[55] The National Industries Licensing and Registration Act of 1967

[56] Dias, Clarence (1970) "Tanzanian Nationalizations: 1967-1970," *Cornell International Law Journal:* Vol. 4: Iss. 1, Article 4. Available at: http://scholarship.law.cornell.edu/cilj/vol4/iss1/4

[57] Samuel Wangwe, Donald Mmari, Jehovanes Aikaeli, Neema Rutatina, Thadeus Mboghoina, and Abel Kinyondo; The performance of the manufacturing sector in Tanzania Challenges and the way forward, World Institute for Development Economics Research, 2014: 5

[58] Ibid. pg. 6

[59] UNIDO: Technical Report: Evaluation of the Project Performance and Problems of Implementation, 1983:1

[60] Ibid. p.viii

began to function in December 1982, upon completion of training of two TIRDO staff members and acquisition of necessary equipment.

The working of TIRDO was constraint by some events essentially aggravated by the global economic crisis of that decade late 1970s to mid 1980s. First of all TIRDO was unable to accomplish its construction plan due to lack of financial ability. Some of its laboratories and office blocks were not completed until to date. Equipment for the completed buildings was not available.[61] This made it difficult to perform most of its applied researches or TIRDO had to establish ad hoc arrangements to use laboratories and equipment in other parastatal institutions. Scarcity of financial resources constrained the recruitment of competent and sufficient manpower for the purpose of their research agenda and priorities.

In the second half of 1980s the Tanzanian economy in general and industrial sector in particular was at crossroads. Structural Adjustment Programmes (SAPs) were adopted though with deep pains "the double edged sword" solution as President Mwinyi put it.[62] With the *ruksa* policy advocated by President Mwinyi which allowed importation of manufactured goods from outside Tanzania, the entire industrial sector suffered the most. The advent of neo-liberal policies and globalization in 1990s dealt a death blow to the industrial sector. TIRDO amid this situation was in very precarious condition as most of the public industries were privatized.[63] The rest of the industries were closed. It was out of this situation TIRDO considered it wise to review its research and innovation strategies coming up with the Research Policy and Guidelines of June 2004. The policy contained strategies for sustaining research and consultancy to sustain both private and public manufacturing sector resulting in national development.[64]

Improving the available technical capacity at TIRDO was another aspect considered in the new research policy. The technical capacity at TIRDO was built on Physical Laboratories and Pilot Plants for Applied Research, Technology Development, and Industrial Advisory Technical Support Services. The laboratories include Food and Microbiology Laboratory which is the only Accredited Laboratory at TIRDO since 2009 through the South African National Accreditation Systems (SANAS) Efforts are underway to accredit three (3) more laboratories which include: Environment and Occupational Safety Laboratory, Agro Technology and Industrial Chemistry Laboratory, and Materials Testing Laboratory/Non destructive testing Laboratory (NDT) and The Food and Microbiology Laboratory The aspect of human resource capacity was also taken into consideration in order to be effective in research. Currently TIRDO has 80 workers of which 45 are Scientists, Engineers and Technicians and the rest consists of Administrative personnel. The number is analyzed as follows; PhDs (9) (3 undertaking PhD studies) MScs (23) and Technicians (10). There is need of support for capacity building in terms of Equipment maintenance and calibration, Accreditation of Laboratories Purchase of specialized Equipment in the fields of Environment Monitoring Specialized Skills Development in the areas of Non Destructive Testing

[61] Ibid. cf. Dr. Msabila interviewed November 2018

[62] President Ali Hassan Mwinyi Speech 1986

[63] Public Corporation Act, 1992, which was made into a law (and amended in 1993, 1999, and 2001)

[64] TIRDO, Research Policy and Guidelines, June 2004

(NDT) on Concrete Structures Specialized Training on Equipment Utilization. Industrial research department boasts of Agro Processing and Industrial Chemistry, Environmental Technology and Occupational Safety, Food Processing and Bio-Technology

Priority Areas of Research for Collaboration from 1990s

Agro processing technologies, gas and petrochemical technologies, textile and leather technologies coal, iron and steel technologies, natural and medicinal products technologies, nanotechnologies (water and energy) and biotechnologies. Ongoing technical services to industry and establishments offered by TIRDO include; physical , chemical and microbiological testing of foods and water quality (metals and non metals), fuels, determination of calorific values. Environmental monitoring of air quality, waste water streams, sound levels, lighting levels, flue gas and particulate matter. Energy audit to industry , government buildings, institutions, and establishments. Non destructive testing on gas and oil pipelines, buildings and metal structures.

The role of TIRDO as local technology service provider was a mediator between MNEs and the local innovation system (IS), in Tanzania. The two collaboration projects between two MNCs subsidiaries in Tanzania, Tanzanian Cigarette Company (TCC) and Coca Cola Kwanza Ltd, and the Tanzanian Industrial Research and Development Organization (TIRDO), paying specific attention to how learning takes place between the MNEs and the local technology service provider on the one hand and, on the other, to how this knowledge is transformed, transferred and applied by local users.[65]

TIRDO Contribution to the Industrialization Process[66]

In the field of industrial development the following services were offered by TIRDO; the industrial technical audit and advisory services, industrial feasibility studies, product development and testing, monitoring and evaluation of industrial projects. In the field of oil and gas sector the following were made available by TIRDO; professional welder's qualification and non-destructive testing of oil and gas pipelines and tanks and industrial pressure vessel and process equipment.

In the field of coal sector the following services were offered by TIRDO were laboratory and pilot plant for coal quality assessment and coal utilization technologies development. In the field of Iron and Steel Sector the following services were offered by TIRDO; Metallurgical services in development of spongy iron and, iron and steel products quality assessment. In the field of Cleaner Production in Industries the following services were offered by TIRDO Environmental services for waste minimization, improved occupational safety and maximized productivity. In the field of ICT and Electronics Sector the following services were offered by TIRDO Cyber Security Training and technical assistances to industries, Maintenance of electronic, scientific equipment through instrumentation unit. In the field of Leather and Textile Sector the following

65

66 Dr. Msabila, interviewed at TIRDO premises 2018

services were offered by TIRDO Quality assurance and technical services in the textile and leather industries and, leather waste recycling.[67]

TIRDO Communication System

In the field of communication TIRDO communicates with the government formally through circular orders and letters. Other formal communication systems of email, telephone are used to communicate with the Government. Any information during communication must be in written form for formalization. TIRDO communicates with its Customers through the formal communication system which involves institutional email, letters, telephone, fax and face to face (physical visit) is used to communicate with the customers. Internal communication system is done through TIRDO participation in exhibitions, trade fair, Mass communication in radio, newspapers and television

Cooperation with Stakeholders[68]

To advise the Government and Firms engaged in industrial production on the adoption and adaptation of technologies in industrial production. To provide an advisory technical service relating to the establishment of systems for the control and regulation of industrial processes to the firms engaged in industrial production so as to improve performance and to avert or minimize the sources of industrial pollution. eg. Researching on the standard/quality of local technology for better improvement

Ongoing Industrial Support Services

TIRDO has embarked on providing support services to numerous industries. The recipients were prisons and PPF integrated leather factory feasibility study and Simiyu cotton based industries feasibility study. Due diligence to a pipe manufacturing factory Morogoro, canvas factory technical audit and revival, Cassava zero waste project, Industrial energy audit Analytical services in coal, chemistry and food, Industrial environmental audits and environmental and social impact assessment (ESIA)

Technologies Developed and Transferred by TIRDO

TIRDO has been able to invent and develop some technologies including a solar drier (semi cabinet) the drying technologies for vegetables and fish products, orange juice extractor, essential oil distillation unit, cassava processing machines and palm oil processing machine

[67] TIRDO, Industrial Support Services Provided by TIRDO, Presentation Made Before Public Relations Society of Tanzania (PRST), Dar es Salaam Tanzania May, 2018

[68] Prof Mkumbukwa Mtambo, Director General TIRDO interviewed November, 2018

developed for medium scale pilot plants for small and medium enterprises.[69] Other technologies developed and transferred include production of particle boards using cashew nut shell liquid glue, traceability systems in coffee, tea, fish and cashew nut industries and GS 1 company in Tanzania, bio control methods for prevention of ochratoxin A in coffee processing. A patent has been secured for Cashew Nut Shell Liquid (CNSL) – Tannin Wood Adhesive for chipboards particleboards in 2004.[70]

Successes and Challenges faced by TIRDO from 1979 to 2018

The Act gave TIRDO the mandate to undertake applied research to strengthen and improving the performance and technological base of manufacturing industry. And to offer technical services related to solving problems and constraints in industry. Therefore the success of TIRDO will be evaluated by the relevance of its research done on problems in the industrial sector and by the speed and success in offering solutions to the problems of the industries. TIRDO was to formulate research policy which would have accommodated the prevailing research and development needs of industry and the existing globalized environment. The established work plans and priorities should take into account the available manpower resources, financial resources and the existing infrastructure.[71]

Foreign Bodies of Knowledge in the Tanzanian Economy

Due to the presence of Multinational Enterprises (MNEs) in the local system, some of the knowledge that is flowing in the system constitutes a foreign body of knowledge. Through the increasing internationalization of production and Foreign Direct Investment (FDI), this body of knowledge forms a solid part of the local system. Additionally, inward FDI links domestic actors to economic units outside the national ones. The extent of cross-border knowledge exchange varies from system to system. Innovation systems connect domestic and foreign bodies of knowledge,[72] and this is generally the case in Less Developed Countries (LDCs) where the foreign knowledge base is particularly important. For local institutes, such as TIRDO, this is the context in which they are operating. MNEs constitute bodies of leading knowledge in the wider local

[69] Dr. Msabila, interviewed January 2019

[70] TIRDO Records in custody of Dr. Msabila

[71] TIRDO, Research Policy and Guidelines, 2004 p. 3

[72] Rajneesh Narula, Multinational Investment and Economic Structure: Globalization and Competitiveness, Routledge, 2002,

context.[73] Effective knowledge sharing: the Tanzanian Industrial Research and Development Organization as mediator between the foreign and local sector.[74]

The domestic knowledge base is further developed by the technology and knowledge transferred from the foreign sources. However, the domestic system needs to be in a position to internalize the input of the foreign knowledge sources. This ability to develop adequate capabilities to absorb the knowledge output of the collaboration with MNEs is one important challenge. With regards to macro implications for the SI, there need to be appropriate conditions not only within technology service providers, but also within the whole economy and society, i.e. social capabilities need to be present. Another challenge is related to the general gaps in the systems that exist in LDCs. Even if LDCs can learn from MNEs, due to increased cross-border activities, there is the problem of internalizing the input and the question of relevance of the input.

Regarding the rather basic problems that many companies in Tanzania are facing, concepts such as those conveyed to TIRDO through the collaboration with both Coca-Cola are of secondary priority. The local firms have to struggle with problems as for example low level of human and physical resources. Consequently, issues like improving the working environment are not prioritized. The input of ideas resulting from the collaboration with MNEs is therefore only productive and with potential for wider application where the ideas can be transferred to different contexts. This means, not directly from the foreign firm to a local one, but rather finding a form for application in another context.

Forms of interaction between a foreign affiliate, as representative for the private, foreign industries, and TIRDO a local technological service provider. It is investigated how knowledge of importance for economic development is shared and diffused between various actors in the economy with TIRDO being the key translator between the foreign and the local actors.

Challenges

The domestic industry in Tanzania is still characterized by an inadequate base of technology and research and development activities, due to an unfavourable environment for the research and development activities. It has also been argued that domestic industries are not sufficiently informed about the existing research and development institutions and their potential for solving technical problems.

The weak technological research and development base prompted the Tanzanian government to establish sector-based centres of excellence. This has been done because a broader institutional framework is needed to support the development of the private sector. Research and

---

[73] A. Szogs and L. Wilson. 2006, Effective Knowledge Sharing: the Tanzanian Industrial Research and Development Organization as Mediator between the Foreign and Local Sector

[74] Knowledge Management for Development Journal KM4D Journal 2(1): 92-104, ww.km4dev.org/journal

development in Tanzania is primarily carried out by governmental institutions.[75] It has been shown that if the research and development capacity of the country is de-linked from the private sector, it will contribute only little or nothing to technological upgrading at the firm level.[76] The main task of the industrial support organizations is to provide services, including technological advice to industry, and to help them with innovative work on their products and processes.

The role that science and technology play in the development process has not been recognized by many industrial firms, demonstrated by lack of commitment to more innovative undertakings. Even with a few that are aware, there are other barriers including financial resources, inadequate human skills and weak information system.

There is absence of strong private sectors that appreciates in research and development contribution, and the same lacks willingness to adopt local innovations in technological services. Inadequate labour force with industrial experience which is compounded by inadequate educational system which does not consider the Tanzania industrial development policy. Improper utilization of natural resources, for example high quality coal is used in cement industry instead of iron and steel industry as energy sources. The other issue is lay in inadequate awareness to industrialists in sustainable industrial systems such as energy efficiency. More important is the Inadequate budgetary resources for research and development.

In view of the low level of industrial development in Tanzania, the economic situation and the needs and problems of the productive sector, the main functional activities of TIRDO have been largely limited to providing technical services of a problem-solving nature. Even with use of other laboratory facilities, TIRDO is unable to undertake other than limited applied research. TIRDO is providing the kind of assistance (information, energy audits, instrument repair, chemical analysis,) which the productive sector requires.[77]

Future Prospects and Outlook of TIRDO

As an institution for research and innovation for industrial development in Tanzania TIRDO has been focusing on improving its future prospects and outlook for the national development. To support environment for research and technology development and formulate policies to support research and development, innovation and entrepreneurship. Tanzania has the political will to ensure that research and development is the National Agenda. TIRDO looks forward for accreditation of all laboratories so as to acquire international recognition of services. TIRDO is making effort to have the establishment of more laboratories in Government strategic areas such as leather and textile, metallurgy and energy technologies. Establish and strengthen collaboration with industry, academia and other research and development institutions locally and internationally.

---

[75] Bartelt Bongenaar and Adam Szirmai (1999), Development and Diffusion of Technology The Case of TIRDO, in Adam Szirmai and Paul Lapperre, (eds), *The Industrial Experience of Tanzania*, Palgrave Macmillan, p.172

[76] (UNCTAD 2001)

[77] UNIDO, op.cit. p. 11

Conclusion:

The industrialization campaign under the banner of *nchi ya Magufuli itakuwa ya viwanda* was supposed to take into account the role of TIRDO as a research and development organization. In the 1940's and 1950's a full 20% of United States of America's economic growth stemmed from research and development.[78] However, Tanzania just like all other developing countries has its manufacturing sector very weak. This is partly explained from the effects of colonial experience which concentrated on production of primary raw material products. For the colonial state to harness research and innovation in colonies would have been tantamount to committing economic suicide. This is exactly what happened in Tanzania under both German and British rule. The effort to establish self reliant economy as per Arusha Declaration and the establishment of TIRDO for the purpose of harnessing research and innovation in the manufacturing sector was a positive step towards strengthening of the local manufacturing sector.

The performance of TIRDO however, was not encouraging just like other public sectors created by Tanzania government. The poor performance of TIRDO according to this paper is attributed to a number of factors. The legal framework provided by the Act did not provide mechanism to the organization to enforce the exercise of its mandate to the manufacturing sector. Again the law did not provide a framework for the organization to be accountable in case of misdeeds. Placing TIRDO under the ministry though with its independent governing board crippled its power in decision making and above all in raising and managing its funds. The TIRDO budget being appended to the ministry budget rendered TIRDO unable to get what it needed at the right time. The status of public institution accorded to TIRDO made less autonomous from the shackles of government authoritative mighty. When public institutions started shaking amid economic crisis TIRDO was not spared.

The government treated TIRDO under the normal operation of other government organs. However, TIRDO as a research institution required extra care because it was sensitive to the manufacturing sector in terms of disseminating knowledge, research findings, consultancies and innovative services. This exercise is expensive and required vast investment in terms of human resources, financial resources, time resources and friendly infrastructure. Failure to care and fulfill these necessary demands for TIRDO rendered it weak to perform its noble mandate of advancing the industrial sector.

Recommendations

Government which is committed to advance industrialization as the campaign of president indicates should have taken initiatives to appreciate the role of research and development in the envisaged industrial development by giving TIRDO a central position. The initiative could be in the form of increased budgetary allocation for research and development in niche sectors of the economy. Currently there is no money made available for research activities at TIRDO. Government is urged to put in place a strategy for capacity building by allowing TIRDO to employ researchers and the supporting staff. Currently TIRDO has to ask permission from the ministry of to employ workers. There should be a staff development programme so as to develop the existing staff to the levels of MSCs and PhDs. Completion of the physical infrastructures

[78] F. K. A. Allotey, Science, Technology and Development, The University of Michigan

construction which was planned from the time of TIRDO's inception is another area to be addressed to. There are many laboratories missing including incubation centers, food processing, chemistry, metallurgy, textiles and biotechnology. The laboratories must be furnished with the necessary equipment for the applied researches to be conducted at the TIRDO premises.

A legal framework should have been put in place for industrialists compelling them to embrace technical services offered by TIRDO for improving productivity and product quality. Besides, TIRDO complains that its mandate as provided in the Act establishing it has been taken by COSTECH and Tanzania Bureau of Standards (TBS). This anomaly needs to be adjusted by removing the existing duplication existing in these parastatal organizations. Public Relations Society of Tanzania (PRST) needs to play its advocacy role during this process of industrialization

Bibliography

Astrid Szogs and Lugano Wilson, 2006, Effective knowledge sharing: the Tanzanian Industrial Research and Development Organization as mediator between the foreign and local sector, KM4D Journal 2(1): 92-104 www.km4dev.org/journal

Benedict C. Mukama and Charles S. Yongolo, Tanzania Commission for Science and Technology (COSTECH), Development of S & S System and Experience of Tanzania on S&T Data Collection, 2005

F. K. A. Allotey, Science, Technology and Development, The University of Michigan

Gabriel Ruhumbika, (ed.) *Towards Ujamaa: Twenty years of TANU Leadership,* East African Literature Bureau, Dar es Salaam, 1974

Gregory Blue, Martin Bunton and Ralph Croizier, eds., *Colonialism and the Modern World: Selected Studies*, New York: M. E. Sharpe, Inc., 2002

Henderson, W.O.; "German East Africa 1884 – 1918," in Vincent Harlow, E.M. Chilver, Alison Smith, eds., *History of East Africa, II*, London: Oxford University Press, 1965:134

Juhani Koponen, *Development for Exploitation;: German Colonial Policies in Mainland Tanzania, 1884-1914,* 1994:252

Report of the East Africa Commission*, Cmd. 2387 (1925), p. 86.*

TIRDO, Industrial Support Services Provided by TIRDO, Presentation made before Public Relations Society of Tanzania (PRST), Dar es Salaam Tanzania May, 2018

TIRDO, Research Policy and Guidelines, June 2004

United Republic of Tanzania, The Tanzania Industrial Research and Development Organization ACT 1979

Venâncio Massingue, Challenges Facing Science and Technology in Developing Countries, Africa Regional Workshop on Science, Technology and innovation Maputo, 28th of November 2007

SUB-THEME 5: ENERGY, WATER, CLIMATE CHANGE AND ENVIRONMENTAL SUSTAINABILITY

Importance of Applied Geology in Mining

Bernard K Rop, Jackson M Mwendwa, Caroline Maina, Wycliffe H Namwiba and Philemon Kiprotich

Jomo Kenyatta University of Agriculture Technology

Abstract

Mining sector provides most of the raw materials used on a daily basis in infrastructure, food and energy production, electronics and agriculture. The sector continues to play a leading role in Facilitation of improvement to life for mankind across the globe. Mining activities of the sector

Require knowledge and technical skills from geoscientific and engineering specialties to yield Optimal results. Applied geology as one of the geoscientific specialties contributes a fair share of the required knowledge and skills. It has continued, in the past decades, to play an important role in mining by focusing on the application of geological knowledge in harnessing of natural resources while simultaneously addressing issues that are related to mining activities and Environmental impact caused to the mining sector. The geological knowledge focuses on core areas of; volcanology, engineering geology, ore deposits, environmental geology, hydrogeology, mineral resources, energy resources, marine geology, soil mechanics, rock mechanics, applied geophysics, applied geochemistry, geo-hazards and allied mitigation measures. These core areas are of great significance as they need to be captured in the engineering design of mining and mineral processing systems before carrying out any mining operations. Indeed, these core areas provide vital information on the genesis of natural deposits, their geotechnical perspectives and methodologies on how to locate residence of the deposits.

It all begins with gathering the relevant geological information that is essential for surveying Geological environments in which natural resources occur. The natural resources that are surveyed include; petroleum, natural gas, coal, geothermal, ore deposits, gemstones, ground water and geological materials for construction needs. Vital geotechnical information is learned from surveys that are usually in the areas of remote sensing, geological, geophysical and geochemical mineral explorations, and/or drilling. The information learned also provides useful leads to environmental issues that need to be mitigated. Furthermore, provision of impact assessment and audit report for mining engineering projects is mandatory for approval and implementation of such projects that are of national concern. Learning applied geology is also vital for understanding dynamics of natural hazards, particularly on earthquake and landslide related events since relevant geotechnical parameters learned can be factored in engineering designs. The parameters are also of benefit to construction needs for projects that are related to mining engineering. Furthermore, understanding past geological processes, including geohazards, climatic and hydrogeological processes enhances capabilities of designing 90% of remedies for environmental problems that occur in mining and construction industries. Applied geology provides appropriate technologies for making relevant objective decisions that are practical. The decisions made can then be reviewed and evaluated as projects progress thereby enhancing optimal economic performance. Thus, applied geology will develop a firm foundation for understanding fundamental concepts and solving pertinent problems that are related to mining engineering for self-reliance and to the satisfaction of stakeholders in the mining, geological and infrastructural industries. This paper aims at evaluating the importance of applied geology in mining activities because success of future mineral exploration and mining investments will highly depend on the input realized from its core areas if applied appropriately while protecting the environment forthwith.

Keywords: Applied geology, mining engineering, natural resources, mineral exploration, mineral extraction, geohazard, environment impact and mitigation

Introduction:

Applied geology is one of the specialties in geosciences. It has continued, in the past decades, to play a noble role in mining by focusing on the application of geological knowledge in harnessing of natural resources while simultaneously addressing issues that are related environmental protection. Application of geological concepts and skills are required in design of mining systems both for surface and underground mining activities. An applied geologist is well acquainted with the necessary concepts, from understanding of mineralization processes to exploration methods and techniques that are applied and related environmental aspects including geological challenges that can be encountered in different geological mining environments. There are mineral deposits that occur in unique geological environments. Such mineral deposits include gold which occurs in slightly metamorphosed Archean Rock formations, diamond in ultrabasic intrusives, evaporites in saline water bodies, gemstones in orogenic belts etc. Archean rocks, in which gold occurs as a mono-mineralic crystalline substance, were subjected to orogenic processes that were related to plate techtonics. Similarly, diamond is a constituent of elemental carbon which occurs as a native element similar to gold. It is also prevalent in unique geological environment. The mineral occurs in ultrabasic intrusives, particularly kimberlitic lamproite pipes at great depths of high rock pressure. Studies have revealed that single crystalline diamonds were formed in a free fluid environment by growth mechanisms of layer by layer, (Bulanova, 1995).

Other types of minerals that are not monomineralic include evaporites, gemstones etc. Evaporites refer to naturally occurring chemical compounds that develop in supersaturated water bodies. Typical evaporites that are widely used in chemical industry, construction activities and agricultural farming practices include; Trona ($Na_2CO_3.NaHCO_3.2H_2O$) from which soda ash is derived, gypsum ($CaSO_4.2H_2O$) that retards setting time in Portland cement (a widely used construction material), Rock salt (NaCl) that is also referred to as common salt etc. Mining and processing of these compounds is accomplished in a shorter duration and at a cheaper cost compared to ore deposits. Gemstones, unlike evaporates are prevalent in pegmatitic bodies, mainly in orogenic belts, having been evolved from hydrothermal processes. The pegmatites can contain gem minerals like corundum, tourmaline, garnet, beryl, fluorite, apatite, topaz etc. They may also be enriched with rare elements such as uranium, tungsten, and tantalum etc.

Mineral mining requires that a mineral deposit be quantified and valued so as to determine viability of a proposed mining venture. The information is required by the mining engineer for planning and mine design purposes. Field occurrence of the deposit provides necessary information in terms of rock types, nature of the mineralization, geotechnical features as well as hydrogeological conditions of the proposed site. An applied geologist has to undertake these investigations which include interpretation of geological maps of the area to capture drawing of geological cross sections and determination of deformational structures. Usually, Mineral exploration can be carried out on large scale by using remote sensing and geospatial information system followed by field visits to confirm the actual geological status and to undertake field sampling for detailed laboratory analysis and even recommend drilling. In addition, geophysical

and geochemical methods can be employed. Geophysical investigations can be conducted on the surface of the earth to determine various features of rock strata which include discontinuities and intrusive structures such as ore bearing rock bodies etc. The investigations carried out depend on variation of physical parameters like rock density, velocity, conductivity, resistivity, magnetic and electromagnetic as well as radioactive elements if present in rock mass dealt with. Geophysical methods involve measuring signals from a natural or an induced phenomena of physical properties for sub surface formations with the aim of determining localities that have different magnitudes of those properties (anomalies). The main geophysical methods which can be used to locate the potential zones of ore bodies for further investigation particularly drilling are Electrical, Seismic, Gravity, and Magnetic methods. Geochemical prospecting for minerals also involved delineating anomalies. In this case, geochemical anomalies refer to any high or low chemical element variation that is not explained by a natural geochemical variation. Anomalies may be formed either at depth by igneous and metamorphic processes or at the earth's surface by agents of weathering, erosion, and surficial transportation as sedimentary processes.

Mining activities are expected to be undertaken while addressing the safety of workers in compliance with occupational health and safety act. For instance, when using heavy excavation plant on a site of weak deposits particularly weathered sedimentary deposits a mining engineer has to consider ability of the deposits to support the heavy earth moving machines, thereby avoiding possible failure of the floor of the mine. Furthermore, slopes for subsurface mines requires to be engineered of which benched geometry is the most common practice for minimizing impact caused by rock fall. Geotechnical information for mine formations is provided by an applied geologist to be captured in the engineered design for the slopes. Other than rock fall, other challenges associated with mining include excessive seepage of ground water into both surface and underground mines, high temperatures, inflammable gasses and poisonous gasses.

Rock blasting has continued to be an excavation method for hard rocks for several decades. It results into weakening and fragmentation of rock mass for a purpose. In mining activities, the blasting design has to capture rock characteristics amongst other constraints. After excavation has been performed, support of the exposed rock mass may be required, particularly for underground works. The support system to be adopted requires to be engineered so as to guarantee safety and durability of the structure to be installed. Indeed, the design to be done has to utilize geological knowledge of which an applied geologist has to provide

2.0 Unique natural resources

There are mineral deposits that occur in unique geological environments. If a mining engineer were to prospect for such mineral then the engineer has to have relevant knowledge for such environments, of which the applied geologist is already acquainted with. Mineral deposits that occur in unique host rocks include gold in slightly metamorphosed Archaen formations or hydrothermal bodies of similar age, diamond in ultrabasic intrusives, evaporites in saline water bodies, gemstones in orogenic belts etc. Furthermore, Hydrocarbon fluids are not minerals but energy resources. These fluids, represented by petroleum and natural gas, are normally prospected in stratigraphical traps and when encountered are pumped out from their hideouts after rock drilling has been perfected.

(a) Archean orogenic Gold deposits

Gold is a mono-mineralic crystalline substance which is normally prospected in rocks that are unique in both character and age. The rocks can be named based on age alone or type of rock itself. However, the most widely accepted term is Archean orogenic gold deposits. The Archean orogenic gold deposits are found in specific rock types in which the gold formed in zones of high strain caused by orogenic processes that were related to plate tectonics in the Archaean times, particularly, at convergent plate boundaries. The increased pressure and temperature forced fluids from the mantle up into the crust along major structural features and rock boundaries. Typical goldbeating rocks and rock sample as shown in figure 1.

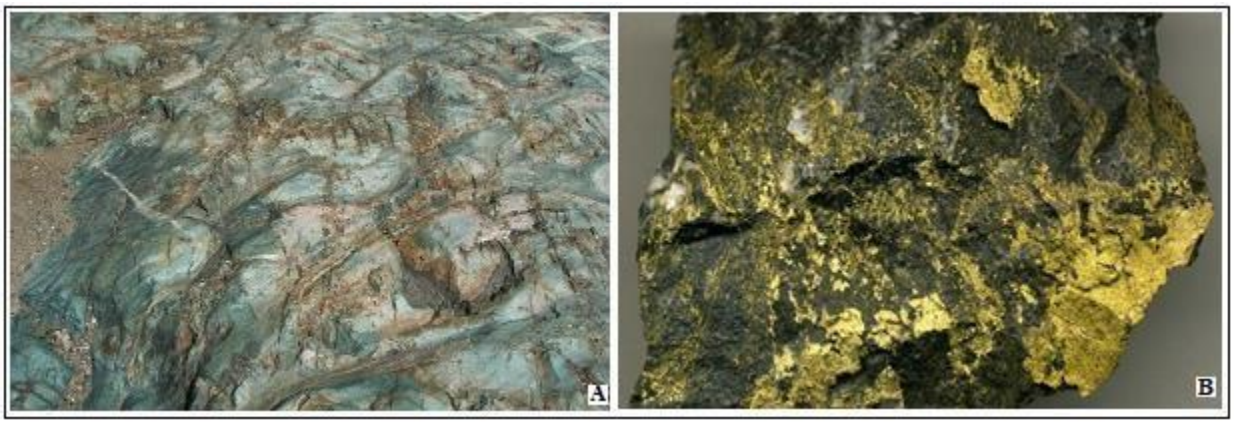


Fig.1: Pillowed basaltic gold bearing exposure of green schist facies (A) and Spectacular gold ore sample from the Red Lake greenstone belt, Ontario, Canada (B)

Archaean Greenstone Belts are most widespread and are basically metamorphosed volcanic belts. The belts have been interpreted as having been formed at ancient oceanic spreading centers and island arc terranes. They primarily consist of volcanic rocks, dominated by basalt, with minor sedimentary rocks inter-layered between the volcanic formations. The Greenstones, apart from containing basalts, also contain several types of metamorphic rocks particularly; greenschist, whiteschist and blueschist. The rocks earn the term 'Greenstone' due to the crystallization of green coloured minerals i.e. chlorite, serpentine, epidote, and platy minerals such as muscovite. The Greenstones are prevalent in the Slave craton, northern Canada, Pilbara craton and Yilgarn Craton, Western Australia, Gawler Craton in South Australia, and in the Wyoming Craton in the US. Similar gold bearing cratons are found in South Africa i.e. Kaapvaal craton and Eastern Africa as well as in the cratonic core of Madagascar and West Africa. Cratonic land masses also occur in Brazil, northern Scandinavia and the Kola Peninsula of Baltic Shield. The distribution of greenstone crustal rocks in Northern Tanzania and western Kenya is as shown in figure 2.

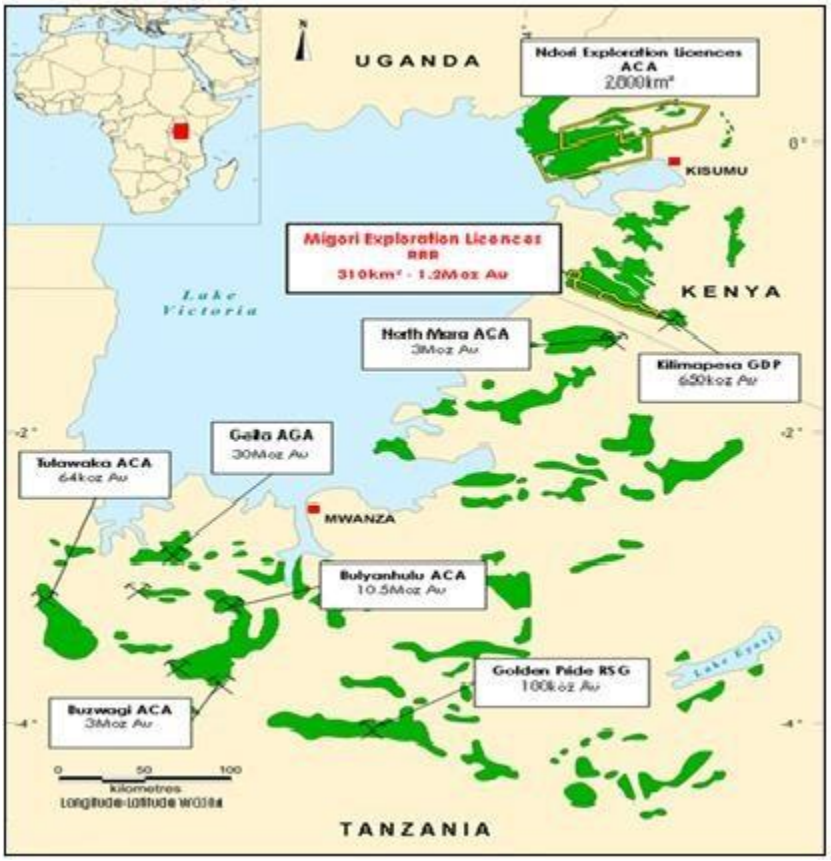


Fig. 2: Distribution of Greenstone Granite Rocks in Tanzania and Kenya

In Africa, Witwatersrand gold system, an Archean greenstone belts, continues to be one of the richest source of the invaluable natural resource while most of the gold deposits in Canada's

Superior Province are hosted in Abitibi Greenstone Belt, particularly from Timmins area (Wyman,

2003). Similarly, most of the gold mined from Australia's Yilgarn Craton comes from the Kalgoorlie camp which accounts for more than half of the mined gold (Philips et al., 1996). Interestingly, although these gold bearing cratons are far apart, they have similar geology and mineralization styles. This scenario suggests that the processes leading to the formation of their ore systems must have been similar starting from the ground preparation to the mineralization process. For instance, in the Tanzania Craton the giant Bulyanhulu lode gold deposit is also similar to the giant deposits found in the Timmins and Kalgoorlie areas, of Canada and Australia respectively. The similarity is in terms of mineralization style, mafic host rocks, ages, deformation styles and the short pre-mineralization crustal history according to Bateman and Bierlein (2007).

In Kenya, Migori Greenstone belt (MGB) forms part of the Nyanzian supergroup that is a northern extension of the gold-enriched Archaean Tanzanian craton. The belt hosts world class

producing gold mines i.e. North Mara and Geita mines etc. The Tanzanian craton is of a similar age to other significant orogenic gold belts such as the Yilgarn in Australia and the Lake Superior province in Canada. The mineralization and stratigraphy of the MGB is similar to that of the Lake Victoria Greenstone belts in Tanzania and other Archaean greenstone deposits such as Red Lake in Canada Gold enrichment within the MGB is predominantly found in and around shear zones associated with quartz-carbonate veining and significant alteration, as well as banded iron formations (BIFs) and poly-metallic Volcanogenic Massive Sulphides (VMS). The dominant lithologies are felsic and mafic intrusive, BIFs and metasediments of the Nyanzian system. They are overlain by younger Kavirondian volcaniclastic sediments and intruded by younger granitic intrusions.

The Migori Gold covers an area approximately 310km² of prospective greenstone geology, extending for 63km along the strike. The belt has a rich history of colonial and artisanal mining, with Goldplat Kilimapesa as a licensed active gold mining operator.

(b) Diamond

(i) Evolution of diamond: Diamond is a constituent of elemental carbon which occurs as a native element similar to gold. It is prevalent in ultrabasic intrusives such as kimberlites lamproite pipes at great depths of high rock pressure. Studies have revealed that single crystalline diamonds were formed in a free fluid environment by growth mechanisms of layer by layer, (Bulanova, 1995) . the fluids crystallized within the mantle from a slightly supersaturated solution of carbon in a sulphide-silicate melt. Most diamonds nucleated heterogeneously to form diamond monocrystals as both eclogitic and peridotitic parageneses evolved during early igneous events within the upper mantle in “diamond stability zone”. The zone was located where temperatures and pressures were favourable i.e. temperature of over 1,000 degrees Celsius and pressure of about 20Kbars at depth of about 150 kilometers below the Earth’s crust. Studies involving photoluminescence and infrared light absorption of diamonds from mantle xenoliths were carried out in Yakutian kimberlite province by Spetsius (1995). The studies aimed at identification of specific characteristics and distinctions between, the diamonds of the peridotitic and eclogitic parageneses. It was confirmed that most if not all diamonds in kimberlites were derived from mantle peridotite and eclogite. Apart from the Earth’s mantle, there are a couple of other obscure places that provided suitable condition for diamond crystallization. For instance, rsearchers at NASA found extremely small pieces of diamonds in extraterrestrial bodies. The diamonds in such bodies were considered to have been formed either in outer space or in the mantle of other planets. Some diamonds have also been encountered in subduction zones, where two different tectonic plates come together. This process can occur at slightly lower temperatures and shallower depths than those for those diamonds that develop in the "diamond stability zones.". a possible model for such formation is as shown in figure 3.

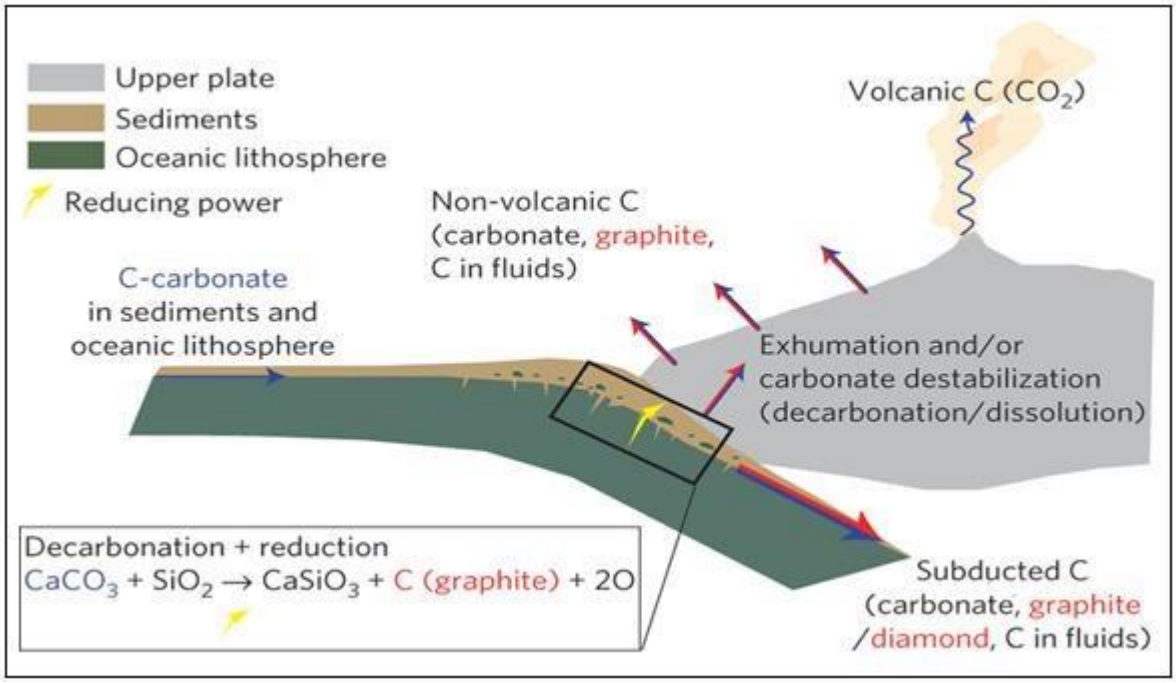


Fig.3: Model for graphite and diamond generation from carbonaceous sediments in a subduction zone

(ii) Hardness: Diamond is the hardest known natural material. The hardness is very significant in rock dressing and excavation works particularly when selecting excavation tools or excavation plant to be used. Two scales of hardness were developed i.e. Vickers scale and the Mohs scale.

The Mohs scale of mineral hardness is a qualitative ordinal scale characterizing scratch resistance of various minerals through the ability of hardest mineral being able to scratch a mineral of which crystal structure is weaker. The mineral samples that were selected are all different. Diamonds are at the top of the scale. The hardness of a material is measured against the scale by finding the hardest material that the given material of known hardness can scratch, or the softest material that can be scratch the given harder mineral. For example, if some material is scratched by apatite but not by fluorite, its hardness on the Mohs scale would fall between 4 and 5. "Scratching" a material for the purposes of the Mohs scale means creating non-elastic dislocations visible to the naked eye. The Mohs scale is a purely an ordinal scale. For example, corundum (9) is twice as hard as topaz (8), but diamond (10) is four times as hard as corundum. The table below shows the comparison with the absolute hardness measured by a sclerometer, while considering other material and mineral types as well.

Table 1: Typical mineral and material for Mohs Scale of hardness

Grade	Standard mineral	Chemical composition	Alternative mineral/Material
1	Talc	$Mg_3Si_4O_{10}(OH)_2$	Asbestos (Tremolite, Anthophyllite, Actinolite)
2	Gypsum	$CaSO_4 \cdot 2H_2O$	Coal, Evaporites
3	Calcite	$CaCO_3$	Mica, Copper, Arsenic
4	Fluorite	CaF_2	Iron, Nickel
5	Apatite	$Ca_5(PO_4)_3(OH^-,Cl^-,F^-)$	Zirconium, Palladium
6	Orthoclase	$KAlSi_3O_8$	Feldspars, Amphiboles, Pyroxens, Oxides,Steel
7	Quartz	SiO_2	Olivines Osmium, Vanadium
8	Topaz	$Al_2SiO_4(OH^-,F^-)_2$	Cubic Zirconia
9	Corundum	Al_2O_3	Tungsten Carbide
10	Diamond	C	Carbonado

Table 1 shows that it is not the type or number of elements that constitute a material which contributes to resistance to scratching, hence cutting. The resistance rests on bonding of the constituent elements for the mineral at hand. Indeed, diamond consists of one element only i.e. carbon but its strong bonding, having evolved under high pressure and temperature condition makes the diamond strongest possible material. The scale can aid in selection of cutting tools by a mining or construction engineer. For instance, cutting blades or drilling bits meant to excavate or dimension rock material rich in feldspars and quartz require consideration of tungsten or carbide material but not one that constitutes of steel material. Sand paper material used for smoothening timber uses hard crystal for the smothering as a polishing measure. The mineral crystals used are often garnets or corundum as exemplified in figure 4.

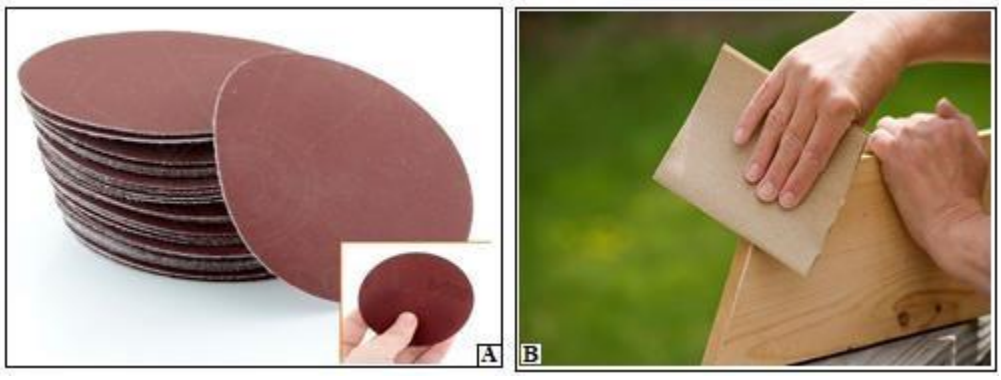


Fig.4: Typical sandpaper pieces (A) and sand paper material in use (B)

Rock panels for gladding are often produced by using cutting saws that have diamond crystals of industrial grade fitted on the saws. Likewise, drilling bits and tunneling excavation equipment have diamond crystals fitted in the system to scratch minerals that constitute the rocks to be cut. Typical drilling bits for such purpose are as shown in figure 5.

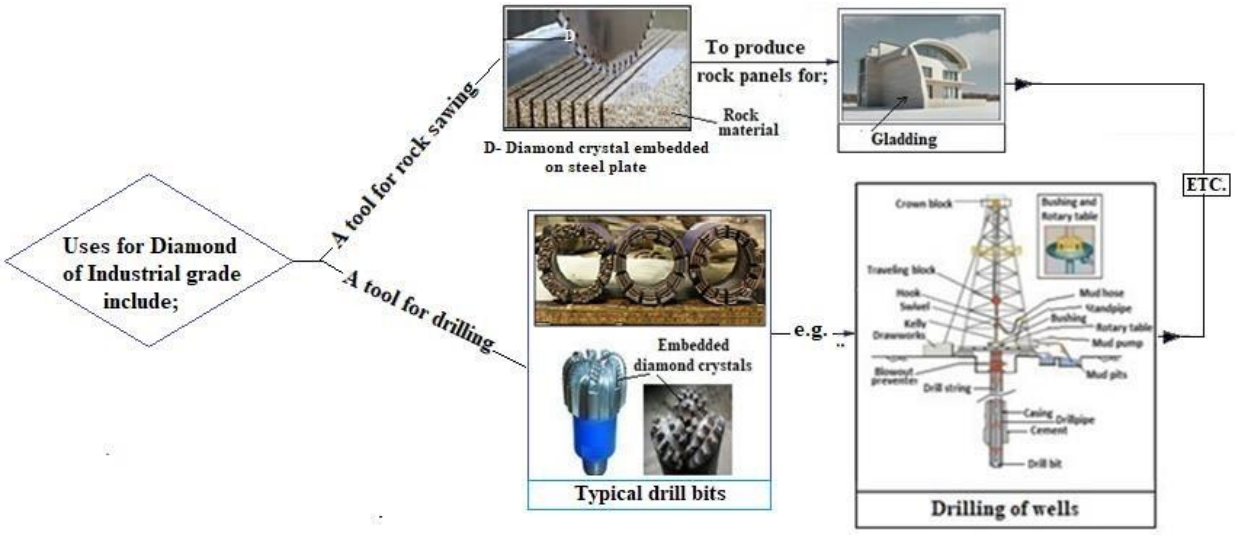


Fig. 5: Typical uses for diamond of industrial grade

(c) Evaporites

Evaporites refer to naturally occurring chemical compounds that develop in supersaturated water bodies. Mining and processing of these compounds is fairly different compared to ore mineral deposits. Processing of these compounds is accomplished in a shorter duration and at a cheaper cost. Typical evaporites that are widely used in chemical industry, construction activities and agricultural farming practices include; Trona ($Na_2CO_3.NaHCO_3.2H_2O$) from which soda ash is derived, gypsum ($CaSO_4.2H_2O$) that retards setting time in Portland cement (a widely used construction material), Rock salt (NaCl) that is also referred to as common salt etc. Evaporites continue to develop from geologic past to presently. For instance, figure 6 shows trona accumulation of lake Magadi Kenya and halite accumulation on shores of Dead sea being world's largest accumulation of the salt in present times. Whereas halite is a suitable material for food seasoning, the same natural crystalline material has a construction application. The halite effectively dissolves snow and ice cover on existing road surfaces during seasons of extreme decrease in temperatures. Thus, the halite has a vital industrial application in regions that experience destructive snowing and ice cover accumulations.

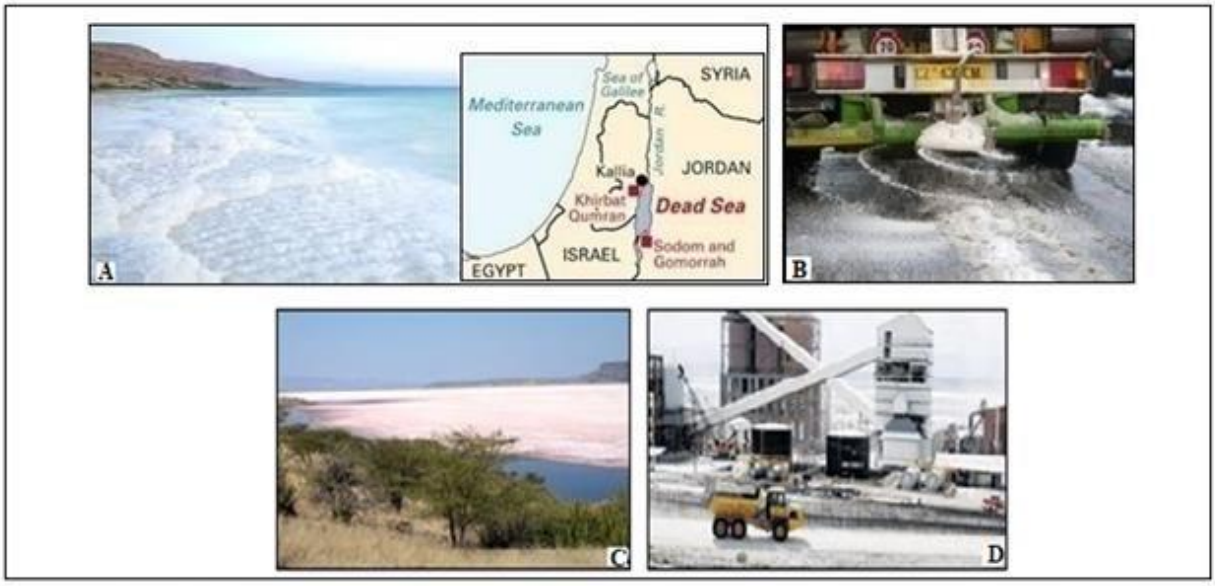


Fig. 6: Natural formation of Halite(A), Truck spreading halite on snow covered pavement(B), Trona cover (C) and Soda ash processing plant at lake Magadi Kenya(D)

Evaporites that accumulated in the geologic past are now bedded sedimentary rocks. A typical deposit is for trona formation in Green river deposit which is located in Wyoming Utah in USA(fig.7). Indeed, Wyoming mine is currently the largest producer of trona, the raw material for soda ash. With the largest reserves of naturally-occurring trona on earth, the Green River area of Sweetwater County, Wyoming is indisputably the "trona capital of the world". The Green River Basin is currently estimated to contain 134 billion tons of mineable trona. The trona extends over a 2590 km^2 area, ranging in depth from 244 to 670 m below the surface. The largest concentration of white pristine gypsum sand in the world is located at the northern end of the Chihuahuan Desert of Southern New Mexico. It constitutes a basinal structure which was formed by the collapse of a dome made up of the gypsum sand about ten million years ago.



Fig. 7: Typical bedded evaporites; Trona mining, Wyoming Utah,USA (A) and Bedded gypsum in unspecified locality(B)

(d) Gemstones

(i) Pegmatites and mineralogy: Pegmatite is a textural term that refers to a very crystalline, intrusive igneous rock of hydrothermal nature that is composed of interlocking crystals larger than 2.5 cm in grain size. The pegmatites are known to have the greatest range of grain sizes compared to other rock bodies of any rock types and range from sub-millimeter to tens of meters. They are renowned for their spectacular development of giant crystals. Almost all of the world's largest crystals that are well developed (euhedral) to partly developed (subhedral) come from pegmatites.

These rock bodies are known to be the source of the world's finest gemstones. The minerals present are a source of more than 70% colored gemstones. Although pegmatites contain important rare earth elements, they are mined mainly for gemstones instead of ore minerals that they contain. Pegmatites have a composition that is quite similar to that of other intrusive igneous rocks and are normally distinguished by using a modifier, e.g., granitic pegmatite or gabbroic pegmatite. However, pegmatites occur most commonly in granitic composition, when traversing granitic bodies. The term applied alone, usually refers to a medium to coarse grained hydrothermal body of granitic composition enriched with other elements. A simple granite pegmatite may contain only quartz, feldspar, and mica. While More complex pegmatites are often zoned and can contain gem minerals like tourmaline, garnet, beryl, fluorite, lepidolite, spodumene, apatite, topaz etc.

Pegmatites may also be enriched with rare elements such as uranium, tungsten, and tantalum etc.

(ii) Geo-environment for Pegmatites: Pegmatites are widely distributed in metamorphic orogenic belts, the Mozambique belt being a typical example. The belt. About 1200 to 400MA in age, traverses Kenya from Mozambique through Eastern Africa towards Ethiopia and Sudan up to Sinai in Egypt. The belt is well represented by Turoka Grop in Taita-Taveta County, Ukamba Group in Machakos and Kitui, Turbo Group in Turbo area as it extends into Kitale to west Pokot towards north of the country. The youngest metamorphics for this belt is represented by Ablun series in Embu area including other low grade meta-sediments of Moyale Area. Orogenic eposodes that evolved rocks of the belt involved folding, faulting and granitization to produce rocks of different grades and metamorphic facies. Rocks of highest grade occur in Taita-Taveta county. The county is blessed with a wealth of gemstones in the orogenic belt. The gemstones have continued to be mined by artisanal small scale miners for decades. They occur in many different and varied geological settings, and each deposit usually has its own characteristics (Simonet et al, 2000). Typical gem varieties in Taita-Taveta county, that are significant include; Corundum (red coloured variety- commercial name ruby), Blue coloured corundum known as sapphire, tourmaline (a beryl mineral variety) and iolite as well as rhodolite. These gems developed as a result of metasomatic phenomena involving felsic rocks, fluids of metamorphic origin, and ultramafic rocks (Rop and Namwiba, 2018; Pohl and Horkel,1980; Key and Ochieng, 1991). Tsavorite and tanzanite deposits are also locally available. They are usually hosted in Graphite-rich gneisses (Pohl and Niedermayr, 1979; Key and Hill, 1991, etc.). A typical green variety of garnet being Grossularite (commercially known as Thavorite) prevalent in Taita-Taveta county is as shown in figure 7.



Fig.7: Thavorite when raw (A) and when faceted (B) (Rop, 2014)

Some gemstones such as aquamarine, amazonite or topaz occur in medium-size pegmatite bodies (Keller, 1992). According to Simonet (2000b) minerals such as spinel, ruby, and tourmaline, are associated with meta-limestones, either as rock forming minerals or as the product of metasomatic reactions between fluids and the meta-lime-stones. Typical mining activity for gemstones in the Taita-Taveta county is as shown in figure 8.



Fig.8: Kasigau mine in Taita-Taveta County (A), Marble hosting Sapphire (B) and Ruby(C)

3.0 Exploration

Mineral mining requires that the mineral be quantified and valued so as to determine viability of a mining venture. The information is required by the mining engineer for planning and mine design purposes. Field occurrence of the deposit provides necessary information in terms of rock types, nature of the mineralization, geotechnical features as well as hydrogeological conditions of the proposed site. Mineral exploration can be carried out on large scale by using remote

sensing and geospatial information system followed by field visits to confirm the actual geological status and to undertake field sampling for detailed laboratory analysis and even recommend drilling.

(a) Geological information

An applied geologist has to undertake these investigations which include interpretation of geological maps of the area to capture drawing of geological cross sections and determination of deformational structures. Geological cross sections for faulted areas are very vital since they reveal clearly the effect caused to the affected strata. For instance, a reverse fault results in repetition of faulted beds unlike a normal fault which results into lateral separation. Reverse faults are prevalent in coal bearing beds. If a shaft were to be sunk at the ground surface between locality W and H i.e. between lateral separation caused by a normal fault (Heave) then, the shaft would completely miss a targeted mineralized host rock such as for the case illustrated in figure 9. Such information should not be missed by a mining engineer.

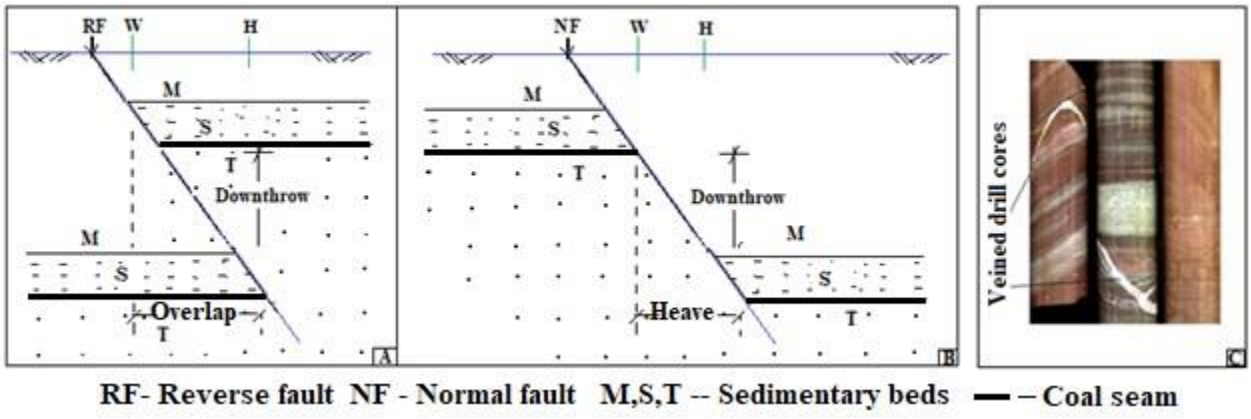


Fig.9: Geometric distinction between Normal fault (A) and Reverse fault (B) and typical drill core samples(C)

Rotary drilling with core recovery, recommended after preliminary investigations, is undertaken to intercept anticipated deposits. The drilling done does reveal more information particularly, microstructures, position of water table, presence of tectonic joints and even faults if present in the area mapped but are concealed. Normally, core logging is performed and provides best fresh rock samples from underneath for laboratory investigations. Such typical core samples that can be realized are as shown in part 'C' of figure 9.

(b) Geophysical Survey

Geophysical investigations can be conducted on the surface of the earth to determine various features of rock strata which include discontinuities and intrusive structures such as ore bearing rock bodies etc. The investigations carried out depend on variation of physical parameters like rock density, velocity, conductivity, resistivity, magnetic and electromagnetic as well as radioactive elements if present in rock mass dealt with. Geophysical methods involve measuring signals from a natural or an induced phenomena of physical properties for sub surface

formations with the aim of determining localities that have different magnitudes of those properties (anomalies). The main geophysical methods which can be used to locate the potential zones of ore bodies for further investigation particularly drilling are Electrical, Seismic, Gravity, and Magnetic methods. For instance, Geoelectrical prospecting for a copper-sulfide mineralization was conducted in Camaquã sedimentary basin, Southern Brazil in 2016 (Ariena et al,2016). A summary of the geology for the surveyed area is as shown in figure 10.

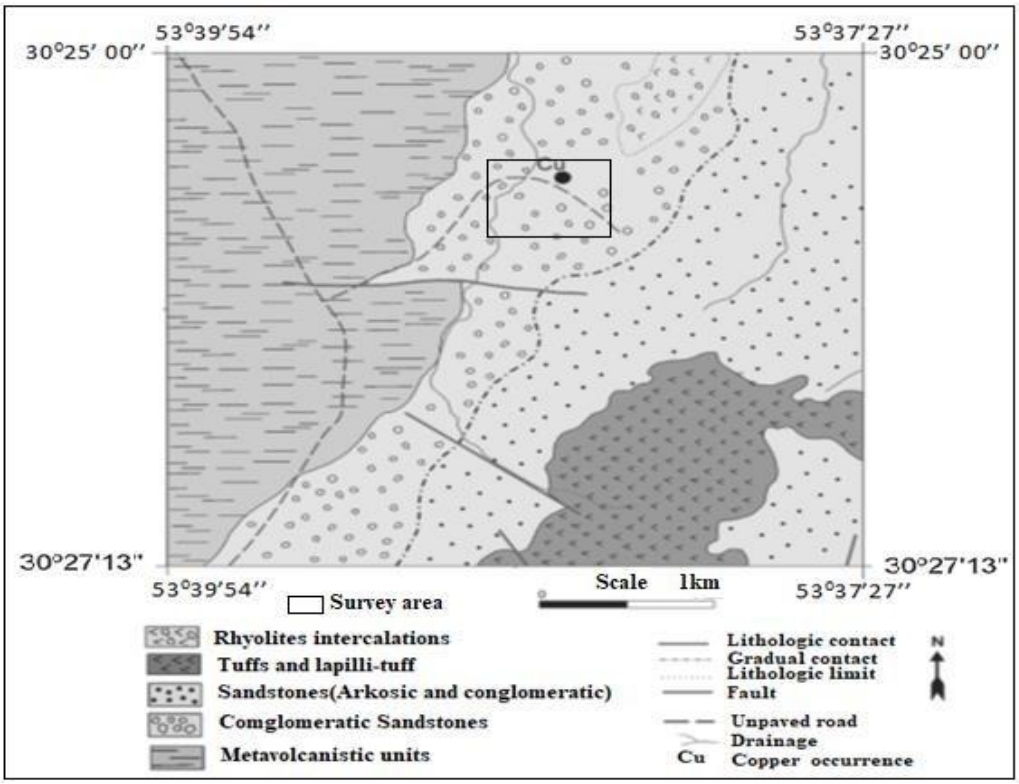


Fig.10: Lithology for the surveyed area

The copper mineralization is hosted in a metamorphosed, silicified and fractured sandstone with abundant presence of malachite and azurite in the fractured planes of the rock. The DC resistivity method was employed by electrical resistivity tomography technique (ERT) in Wenner-Schlumberger array. The Wenner-Schlumberger array is a hybrid arrangement that combines the Wenner and Schlumberger arrangements. The arrangement consisted of a set of electrodes with the same constant spacing of 10m and 520 m long (Milson & Erikssen, 2011). The 10m spacing between non-

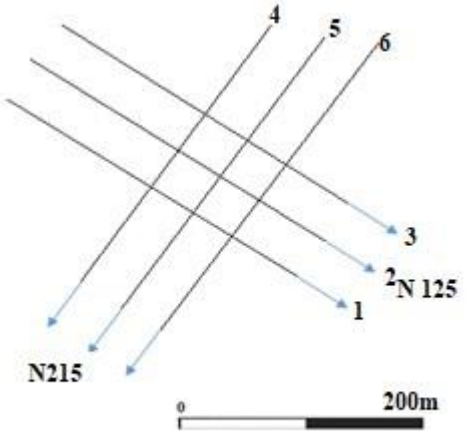


Fig.11: Survey profiles

polarizable porous-pot electrodes allowed percolation of $CuSO_4$ supersaturated solution in the ground. The configuration aimed at reducing the contact resistance and nullification of parasitic currents generated by the use of metallic electrodes. The lines were arranged in a regular grid, according to the structural criteria established in previous works which considered crossing of major regional structures (Silva, 2010). In this way, lines 1, 2 and 3 were distributed in the direction N125 and lines 4, 5 and 6 were arranged in the direction N215, all spaced 40 m from each other as illustrated in figure 9. Topographical data was acquired using a Differential Global Positioning System (DGPS) and a vibrant Trimble software.

Resistivity results obtained for 2D sections were obtained in terms of distance versus depth, with a logarithmic color scale. The values ranged between 6 Ω.m and 590 Ω.m. In general, the sections exhibited a predominance of high values at shallow depths and intermediate portions as well as low values at higher depths. A graphical plot for profile 5 is as shown in figure 12.

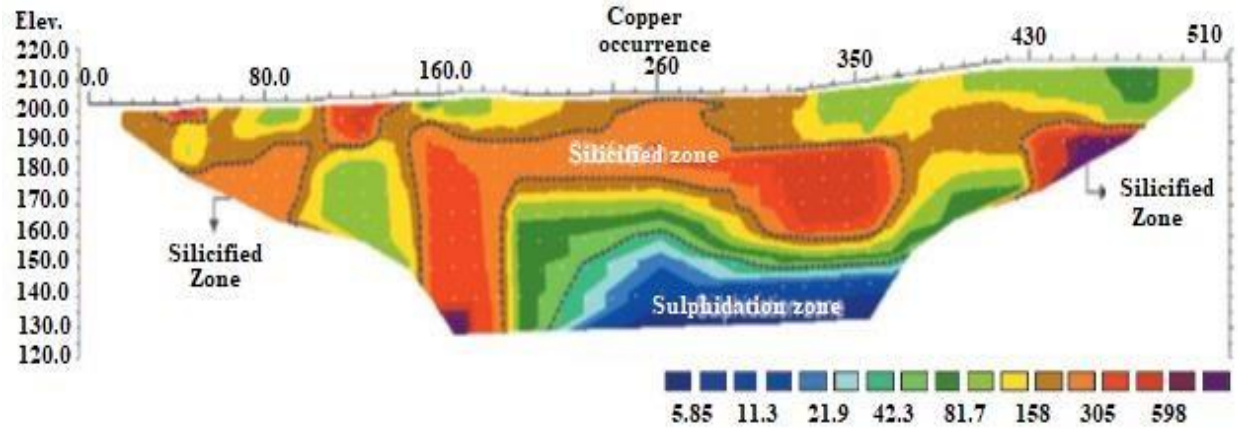


Fig.12: Variation of resistivity with depth

The top resistive zone i.e. area above the sulfide zone represented intense silicified rock outcrop, cut by subvertical veins of copper carbonate. The area with low resistivity values on the other hand indicated an occurrence of highly conductive materials. Normally, electronic conduction in metallic minerals, due to free movement of electrons, reduces the resistivity of metal-bearing rocks, particularly at high ore concentrations. This feature confirmed the existence of a zone enriched in metal ore minerals, probably represented by copper sulfide minerals, as such as chalcopyrite, calcosite and bornite that were then confirmed from geochemical analysis. Accordingly, the conductive area located at 60 m depth represented a possible area of sulphide ore body that was elongated and oriented in the NW-SE direction, surrounded by the silicification zones. Ultimately, it was concluded based on the results obtained from the resistivity method, combined with geological data and field recognition that the surveyed are was characterize by mineralization of copper carbonates (malachite and azurite), which occur in form of silicified and impregnations in fractured metarenite deposits. The mineralized area was concluded as being a promising target for direct prospecting campaigns through drilling surveys.

(c) Geochemical Survey

General: Geochemical prospecting for minerals involves a systematic process of investigating chemical properties of naturally occurring materials by analyzing concentration for elements of interest in those materials. Normally, investigations are carried out so as to identify locations of geochemical anomalies i.e. any high or low element variation that is not explained by a natural geochemical variation. Anomalies may be formed either at depth by igneous and metamorphic processes or at the earth's surface by agents of weathering, erosion, and surficial transportation as sedimentary processes. Geochemical anomalies are referred to as either primary when deep seated or secondary when occurring at shallow depth. A typical geochemical survey was carried out on gold mineralization in Ilesha northwest of Nigeria by Elueze and Olade (1985). The area has a humid tropical climate with an annual rainfall of 1500 mm. Although the area lies in a zone tropical rain forest, the vegetation now consists of secondary growth on account of intensive cultivation and deforestation. Chemical weathering is generally intense, penetrating to depths in excess of 20 m, particularly in areas that are underlain by greenstone rocks.

The geochemical survey was initiated by the Nigerian Mining Corporation through strem sediment sampling followed by geochemical analysis. The stream sediment survey was undertaken in the Ilesha district so as to delineate areas that were potential for gold mineralization in correlation with distribution of selected path finders.

Topography and geology of the Area of study: Ilesha area consists of an undulating topography with an average elevation of 400 m above sea level and an inselberg landscape to the southwest of the area. The area is drained by a few main streams and numerous tributaries. Upper parts of the drainage system are covered by alluvial sediments that are dominated by sandy silt. However, downstream parts of the area often comprise of clays which are rich in organic matter. The area of interest was geological map of Ilesha district which showed that the area was consisting mainly of mafic rocks that were known to be associated with gold mineralization. Indeed, the dominant rocks for the area were are metamorphosed mafic volcanics and volcaniclastics which included amphibolites, ta1c-tremolite schists, chlorite and mica schists. A summarized geology for the area is as shown in figure 13.

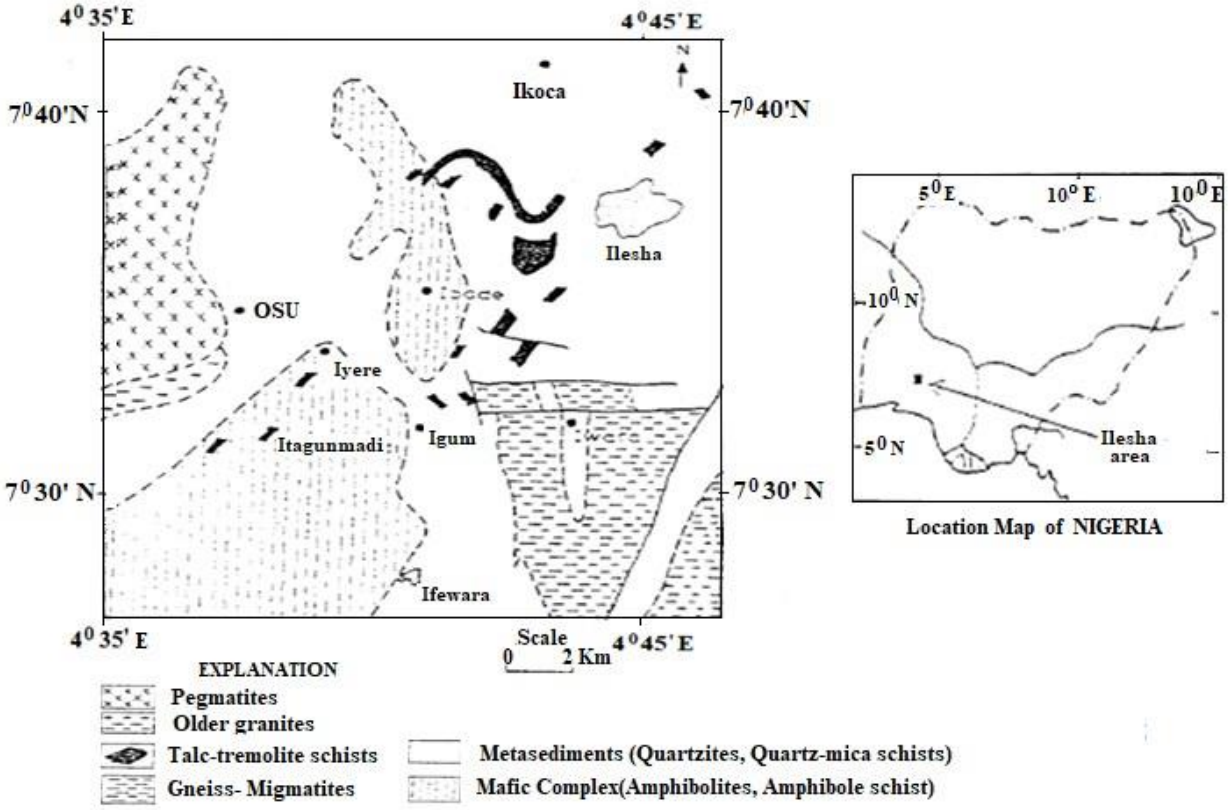


Fig.13: Study Area-Ilesha, Nigeria

(iii) Sampling and analysis: More than 300 stream-sediment samples were collected from carefully selected sites which represents a sample density of about one sample per km^2. A strong acid digester is most suitable for all round multi-element detection where the target and pathfinder elements are both weakly and strongly bound in ferruginous and weathered lithic components. Aqua regia, a mixture of concentrated nitric and hydrochloric acids, being one part of nitric acid to three parts of hydrochloric acid by volume, was used as a digester. It was able to dissolve elemental gold, as well as breakdown iron and manganese oxides/oxyhydroxides, carbonates, sulphates, sulphides and many clays. Usually the agua regia not release elements or minerals included within quartz (including silcrete) or other insoluble silicates nor dissolve resistive minerals such as chromite, rutile, cassiterite, ilmenite, zircon. The digested samples were then analyzed using atomic absorption spectrophotometry to determine concentrations for various elements including Arsenic, Nickel, Gold etc. Statistical treatment of the analytical data obtained involved construction of frequency distribution and probability plots. The statistical results obtained assisted in determining threshold for the anomalous values. Similarly, maps to facilitate assessment of the geochemical patterns were also prepared (Fig. 14 and 15).

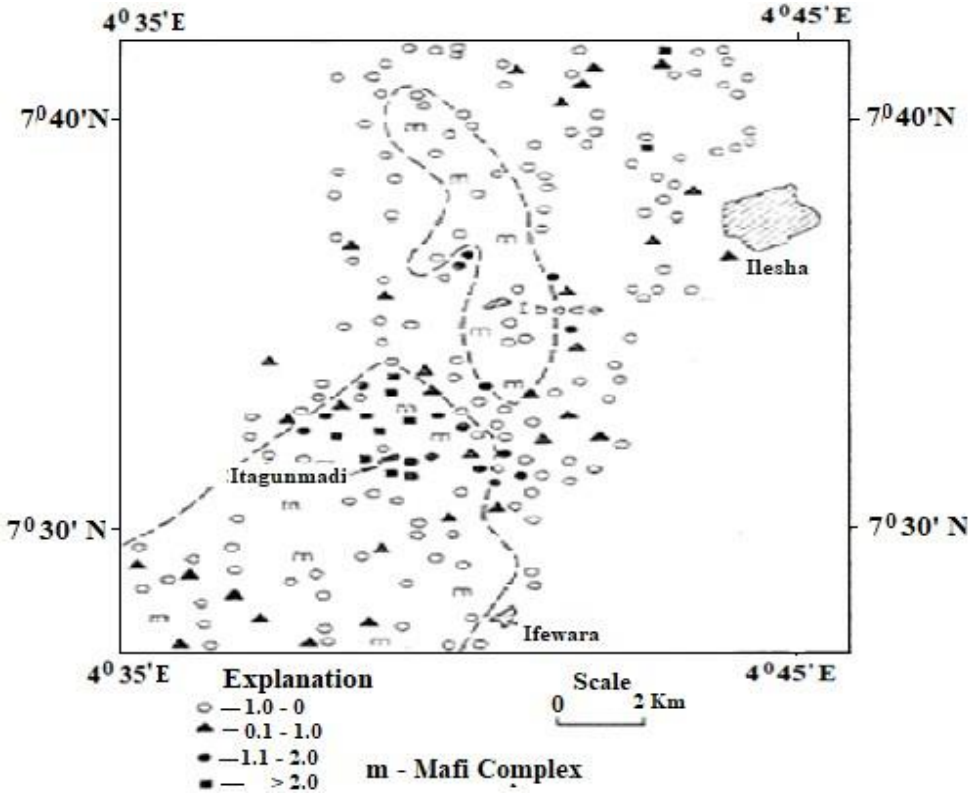


Fig.14: Distribution of As in stream-sediments in the Ilesha area (after Elueze and Olade, 1985)

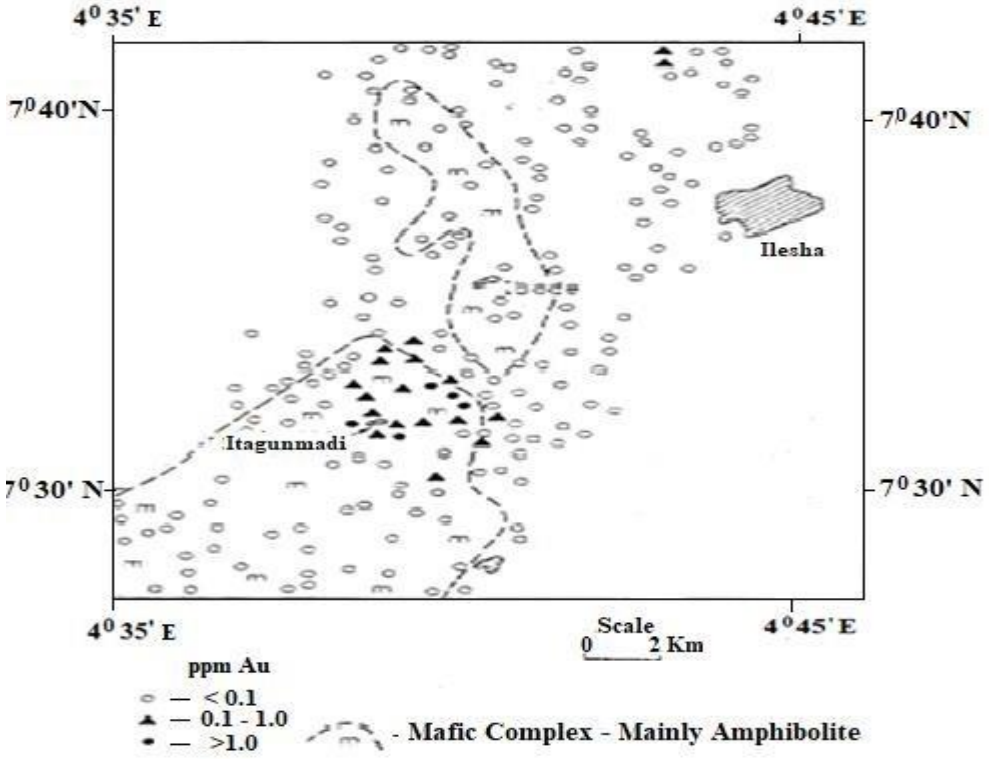


Fig.15: Distribution of Au in stream-sediments in the Ilesha area (after Elueze and Olade, 1985)

(iv) Results and Conclusion

Arsenic values were found to range from less than 10 to 97 ppm, those in excess of the regional threshold of 21 ppm being confined to the area around Itagunmodi and also in an area 3 km north of Iyere (Fig.14). In these areas, the occurrence of sulphide-bearing auriferous quartz stringers and disseminations in amphibolite had already been reported.

Enhanced arsenic values that were obtained was related the formation of sulphide-bearing auriferous quartz stringers in the area of study, particularly arsenopyrite veins.

Gold values in active stream sediments were generally low and erratic, only a few values exceeding 1 ppm as shown in figure 15. The area around Itagunmodi, that contained highest density of old gold values was characterized by Au values that exceeded 0.1 ppm.

Elueze and Olade (1985) concluded that the interpretation of stream-sediment reconnaissance geochemical data from the greenstone belt of the Ilesha area had showed that the areal distribution of trace elements is subject to strong lithological and environmental controls.

The high background concentrations and the viability in abundance of the chalcophile elements was attributed easily to the mafic-ultramafic bedrock and to the compositional variations within it. Arsenic, which is widely used as a pathfinder for gold in other greenstone belts, showed no clear-cut relation to any of the known mineralization in the Ilesha district. That was attributed

to the masking effect of the compositional variation in the bedrock. However, a general correlation between the Gold and Arsenic existed for Itagunmodi and Iyere areas.

Although slightly enhanced gold values are associated with streams that drain known alluvial workings, such as the area studied, gold cannot be regarded as a reliable indicator element in itself because of its erratic distribution and the possibly widespread distribution of natural background values caused by artisanal small scale alluvial mining.

Although the exact nature of the primary gold mineralization in the area did not reveal a clear picture, it was known that the rich gold ore Shoots were closely associated with abundant arsenopyrite veins of the area studied. Such areas were identified as most promising for further investigations, particularly the areas around Itagunmodi extending northwards to Iyere as shown in figure 15.

Further detailed stream-sediment geochemical analysis was recommended including geochemical soil survey and drilling which could be carried out at selected localities.

4.0 Benched excavations

Mining activities are expected to be undertaken while addressing the safety of workers in compliance with occupational health and safety act. For instance, when using heavy excavation plant on a site of weak deposits particularly weathered sedimentary deposits a mining engineer has to consider ability of the deposits to support the heavy earth moving machines. This is necessary so that the floor does not cave in or collapse leading to possible accidents. Adequate bearing capacity for weak deposits to support heavy dynamic loads such as the one illustrated in figure 16 has to be pre-determined.



Fig.16: Giant multipurpose plant(A) and agiant loader in action (B)

Mining or quarrying in hard rock deposits usually requires different techniques to those employed in unconsolidated deposits such as sand and gravel size deposits. Overall considerations for influencing factors, to be done by an applied geologist, are essentially similar.

The considerations include; establishing a viable resource, determining the available area for development, assessing volumes of waste, overburden and other allowances as well as identifying requirements for excavation, haulage and processing plant to be used. Furthermore, primary fragmentation is then pre-determined by the mining engineer so as to reduce the rock mass to a particle size that can be scooped from a loose pile. The fragmentation is indeed influenced by effectiveness of drilling and blasting that will have been carried out. Depending on the degree of weathering and fracturing of the rock mass, the fragmentation can be achieved by 'ripping' using a dozer or a combination of ripping and blasting. blasting, combined with the inherent rock fractures and weathering, creates kinematically free blocks of rock material. Other forces such as pore water pressure from groundwater etc. also contribute to rockfalls which can become a disaster if not addressed adequately. A designed benched profile is adopted as excavation progresses. A typical geometry for a benched excavation to address rock fall and ease transportation of material by tippers is as shown in figure 17. The benches arrest falling material from further downwards movement.

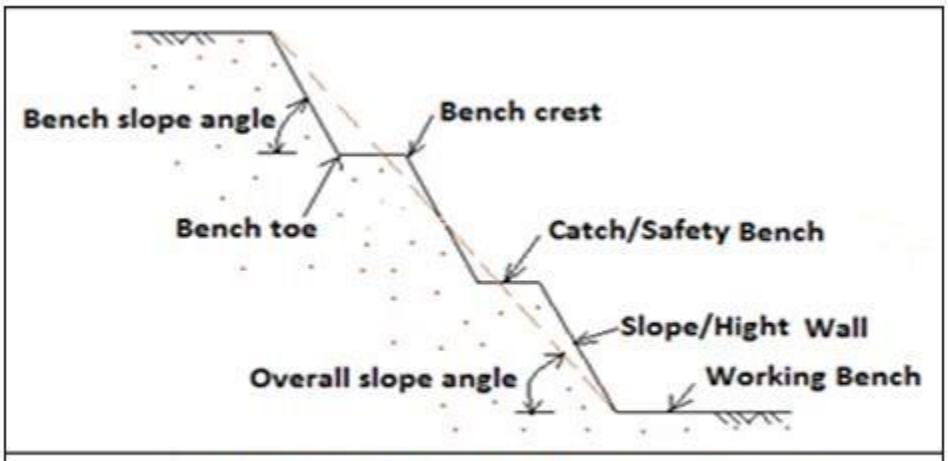


Fig.17: Typical benched quarry slopes for open cast mine

Stable slopes and minimizations of rock fall can also be addressed, for inclined strata by excavating in the direction of the dip of the strata. Figure 18 shows well developed bedding in a hard rock quarry site. The spacing and orientation of these discontinuities, and their dip, have influenced the development of the quarry benches. Design rules put in place addressed aspects such as direction of working and identification of areas to be approached cautiously. The direction of working can materially influence face stability and will therefore be a prime consideration in the preparation of the quarry or mining phasing plans.



C - Catch berm H - Haul road B - Shovel for loading haul tracks Dip direction for inclined beds
W - Bench Wall T - Haul track

Fig.18: A typical benched excavation for an inclined strata

5.0 Mine environment

Mine environments poses several challenges in actual practice. The challenges range from discontinuities that may have been concealed including associated problems such as excessive ground water seepage into both surface and underground mines, high temperatures, inflammable gasses poisonous gasses, rock fall etc.

(a) Ground water seepage

Fissures, pores and other voids in rocks are potential reservoirs for liquids and gases in rock masses. Sedimentary strata are the main hosts for these fluids. Ground water is the most common fluid that is encountered especially in rocks of well-developed interconnected fissure systems. Occurrence of the ground water can be investigated by using geophysical surveys, especially electrical resistivity methods. The investigations carried out should involve estimation of flow rate for the ground water. The flow rate as a discharge parameter can then be used to select suitable pump for dewatering mines when the water is encountered during actual practice. Usually, presence of ground water increases excavation costs and often halts some operations especially in mines during rainy seasons. Caverns are prevalent in limestones or permeable sandstone. Excavation done through calcareous rock formations may require intensive rock boring so as to determine the extent of cavern formation. Thus, underground works in such rocks require adequate preparations for de-watering activities. Similarly, Joints and faults are the main source of water in igneous rocks while in recent lavas, presence of vesicles that are undergoing chemical weathering contribute to seepage problems.



Fig.19: Encounter with underground water problem

For instance, San Jacinto tunnel in California (fig.19) had high water pressure encountered in large dry granite which had also been traversed by a major fault. Metamorphic rocks such as gneisses and schists are usually dry unless traversed by faults. However, in water bearing deposits like sands and gravels, cementation results into reduction of seepage that occurs through the deposits.

(b) Inflammable and poisonous gasses

Some gases which are inflammable or poisonous and may be encountered include; carbon monoxide, methane and hydrogen sulphide.

Carbon dioxide: Carbon monoxide (CO_2) is usually produced by slow oxidation of carbonaceous sediments such as coal or may be associated with magmatic activity in volcanic areas. The gas is nearly 1.5 times heavier than ordinary air.

Carbon monoxide: This gas is more toxic than CO_2 and is usually associated with coal bearing strata. Most explosive accidents in coal mines resulted from this gas when it became accidentally in contact with sparks.

Methane: This gas is carbonaceous in nature and diffuses readily from its source especially in organic material found in beds such as shales and clay stone as well as oil bearing rocks. Methane forms a highly explosive mixture when it comes in contact with hot air or is ignited by error. **Hydrogen sulphide**: This gas is highly toxic and explosive when mixed with air. It originates from decay of organic substances, disintegration of unstable minerals or from magmatic activity. **(iii) Other gases**: Other gasses include sulphur dioxide, hydrogen, nitrogen and nitrous oxide which may be held in voids, under pressure. Sudden liberation of such gases leads to rock burst which occurs in excavations, particularly in underground mines.

(c) High temperatures

Temperature gradually increases with increase in depth. The average temperature gradient is usually 1^0C per 30m increase in depth. High temperatures should be expected in areas of high volcanic activity e.g. New Zealand where Geysers are prevalent and are used for electrical power generation. Similarly, a temperature of 132 ^{0} F was encountered in Simpson tunnel, in Alps due to recent volcanic activity. The high temperature was accompanied by hot water. Another encounter of high temperature was Tecolonte tunnel in Californian. In this tunnel the temperature was as high as 65^0C and was associated with hot water.

6.0 Rock blasting and Support of Excavations

Rock blasting has continued to be an excavation method for hard rocks for several decades. It results into weakening and fragmentation of rock mass for a purpose. In mining activities, the blasting design has to capture rock characteristics amongst other constraints. After excavation has been performed, support of the exposed rock mass may be required, particularly for underground works. The support system to be adopted requires to be engineered so as to guarantee safety and durability of the structure to be installed. Indeed, the design to be done has to utilize geological knowledge of which an applied geologist has to provide.

(a) Rock blasting

Detonation theory: Concepts appertaining to blasting which explain the mechanisms of rock breakage in every situation continue to be developed. No single concept has been fully developed and accepted to date. Basically an explosion is a self-propagating, exothermic reaction for which stable end products are gases that are compressed, under an elevated temperature and at very high pressures. Sudden rise in temperature and pressure from ambient conditions results into shock waves, or a detonation traveling through the un-reacted explosive. The velocity of detonation (VOD) lies in the approximate range of 1500 to 9000 m/s), well above the speed of sound in the explosive material. As a result, chemical burning of explosive ingredients referred to as deflagration occurs at a rate well below the sonic velocity. The deflagration is associated with heat only and carries no shock due to its much slower reaction rate of an oxygen-balanced mixture that leads to gaseous products of chiefly water vapor (H_2O), carbon dioxide (CO_2), and nitrogen (N_2). In actual blasting practice, small amounts of noxious gases such as nitric oxide (NO), carbon monoxide (CO), ammonia (NH_4), methane (CH_4), and solid carbon are evolved. The work done by chemical explosives in the fragmentation and displacement of rock mass depends on the shock energy as well as the energy of the expanding gases. In addition, there is a conservation of mass, momentum, and energy

Blasting constraints: Blast design requires knowledge on aspects that include; geometry, explosives, geology, sequencing, and initiation. These are the key theory, tools and techniques used for most blasting applications. Normally, blast design is a semi-empirical systematic method that involves balancing numeric and qualitative assessments of rock properties, explosives to be used, and desired blasted products. Mining law presently, requires that environmental aspects also be addressed. Thus, internal and external environments require minimization of; wall damage, flyrock and noise as well as other safety aspects of working with explosives. Other constraints to be captured are; limitations posed by pit design, bench sizes, equipment, operating

room etc. in general, proper fragmentation should result into optimize loading, hauling, crushing, and grinding processes All these factors must be balanced with cost.

Geological influence on Blast Design: The geology of a site to be blasted needs to be well understood in terms of rock types, stratification and geological structures inherent in the rocks. This can be accomplished by studying existing outcrops in, around, or adjacent to the blast site. A detailed drill log indicating discontinuities at various depths, as undertaken by an applied geologist, can also prove to be useful. Blasting performance is usually influenced more by rock properties than by the properties of explosives to be used by the mining engineer when carrying out the blasting phase, whether in surface or underground works. Rock masses show numerous planes of weakness, tectonic or cooling joints, natural fissures, and cracks some of which could be due to previous blasting for sites that were once blasted. Thus, there are planes of preferential fracture orientation in any one or more directions relative to the blast hole's axis. Typical blast hole geometry is as shown in figure 20.

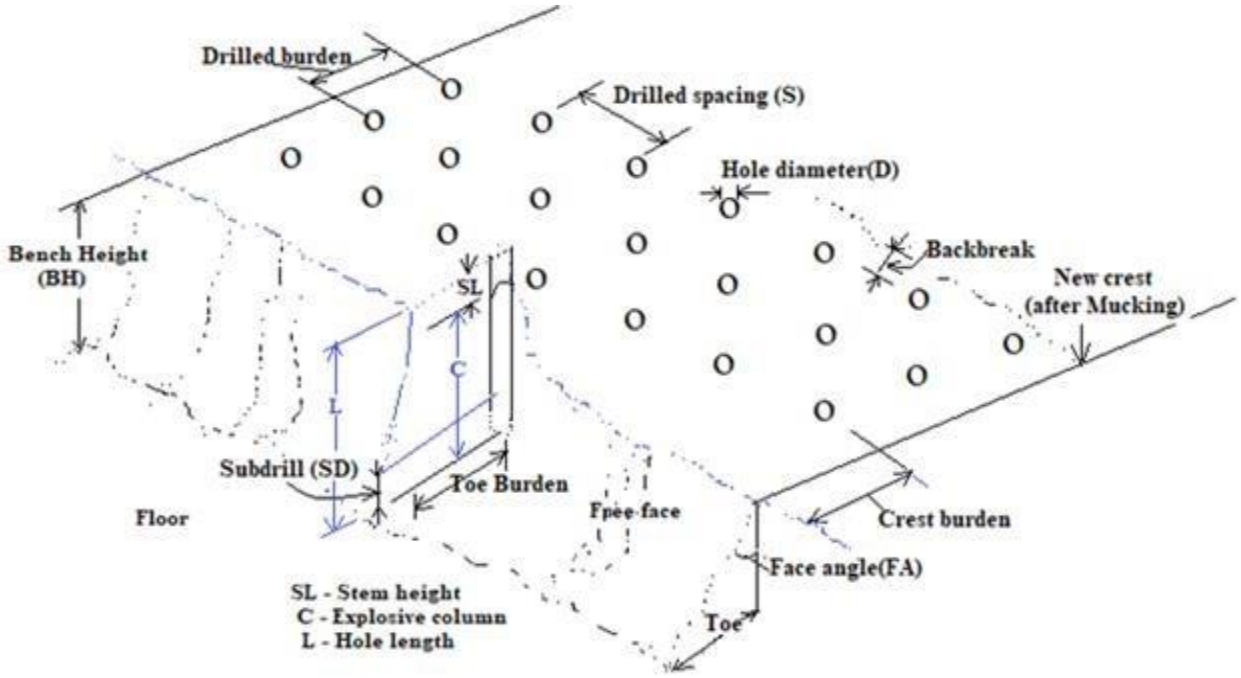


Fig.20: Typical drill hole geometry

The following properties of rock may have a significant influence on blasting results.

Dynamic Compressive Strength: If the explosive's outgoing strain wave exceeds the dynamic compressive breaking strength of rock, then an annulus of crushed rock is formed around the charge. This crushed zone is detrimental to the transmission of strain waves in the surrounding rock. Hence, it is important that the dynamic compressive strength of the rocks in situ be determined, and if rocks have low compressive strength values then an explosive of low density and low sonic velocity be used for blasting.

Elastic Moduli: Elastic modulus reveals behavior of rocks under stress and should be determined by using sonic techniques (dynamic moduli) rather than by the use of mechanical tests (static moduli). It has been found that the explosion pressure should not exceed 5% of the dynamic Young's modulus in order to obtain optimum results from blasting. The postdetonation gas pressure exerted in the cracks between the blasthole and the free face pushes the burden forward and produces heave. The bulk modulus of a rock has to be known so as to facilitate calculation of the heave.

Density: Density of a rock is closely correlated to strength of the rock. An increase in rock density often results in a decrease in the displacement of a rock mass fragmented by blasting.

Adequate displacement of a rock that has higher density can be achieved by;

Increasing the blasthole diameter,

Reducing the blasthole pattern, or

Changing to an explosive which has stronger heave energy.

Porosity: Porosity in rocks tends to reduce the efficiency of blasting operations. The lengths of strain-wave-induced cracks in a highly porous rock were determined and found to be only about 25% of those in a non-porous rock of identical mineralogy. This implies that highly porous rocks are fragmented mainly by heave energy. Hence, post-detonated gases have to be kept trapped at high pressure until they have performed their task. This can be achieved by bottom priming and by having adequate stemming to prevent premature venting of gases.

Internal Friction: Internal friction is a relative measure of a rock's ability to attenuate strain waves by the conversion of some of the mechanical energy into heat. It increases with a high degree of porosity, permeability, and jointing of the rock mass. Generally, internal friction values for igneous or metamorphic rocks are lower than for sedimentary rocks, which require high energy explosives for satisfactory blasting. However, if the rock pores are filled with water, the internal friction factor reduces considerably, giving easier passage of the strain wave and improved fragmentation.

Water Content: Water saturation considerably increases the velocity of propagation of strain waves, owing to the filling of pores with water, which is a good medium for elastic wave transmission. However, fluids in a porous rock reduce both the compressive and tensile strengths, owing to the lower friction characteristic between grain surfaces. If water is present in discontinuities adjoining a block of rock which is being blasted, strain waves may have a greater ability to weaken that rock mass by means of water being jetted considerable distances through interconnected fissures which has a wedging action that influences on overbreak and hence slope instability. It is therefore advisable in open-pit mining to dewater the rock slopes so as to ensure that minimum maintenance effort is left for the exposed rock mass.

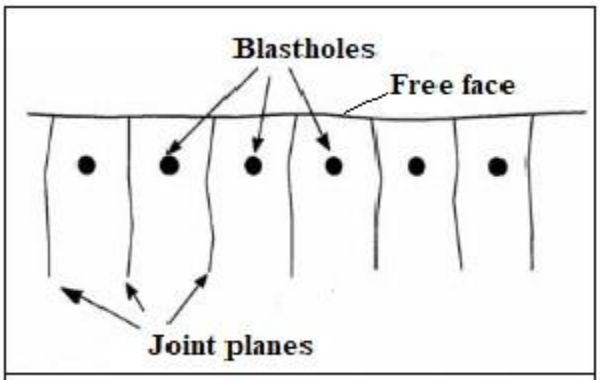


Fig. 20 :Blasthole positioning Vs Joint planes

In Situ Static Stress: High in situ static stresses often exist well within the rock body and blasting results can be affected by these stresses particularly in radial cracks in which blasthole tends to curve off into the direction of the static stress field. There is also a strong possibility for closing of micro cracks by the static stress in the rock mass when confining pressure is above 100-300 MPa. Again, when a stress field exists in a direction normal to pre-existing radial cracks around a blasthole, it can be sufficiently strong to prevent extension of the cracks.

Moreover, it may induce the formation of new cracks in the direction of the stress field.

Structure: Bedding planes and joints in a rock mass tend to dominate the nature of the blastinduced fracture pattern. Maximum fragmentation is generally achieved where the principal joint planes are parallel to the free face. Where the angle between joint planes and the face is within a region between 30° and 60°, the blastholes may produce an irregular new face, owing to the formation of wide cracks behind the blastholes. When the joint planes are at right angles

to the free face, then each block requires at least one blasthole in order to obtain satisfactory fragmentation as illustrated in figure 20. If there is a high density of joint planes normal to the face, it is worthwhile to consider adopting smaller diameter blastholes at closer spacing.

Bedding Orientation: The orientation of the major beddings can have a significant effect on blasting results. There are three cases to be considered:

Shooting in the dip direction of the strata,

Shooting against the dip direction of the strata

Shooting along the strike of the strata

Shooting in parallel direction to the dip (Fig.21(a)) leads to a tendency to get more back break, less toe problems, a smoother pit floor and a greater movement of blasted material away from the face and therefore a lower muckpile profile. In this case, less sub-drilling may be required owing to the fact that the explosive energy may follow the strata downward, eliminating toe problems. Furthermore, the drillholes can be inclined to the direction of dip thereby reducing backbreak although that will tend to 'cast' (throw) and spread the muckpile. A slight addition of delay time in the back row may provide relief to the back of the shot resulting in a more stable highwall.

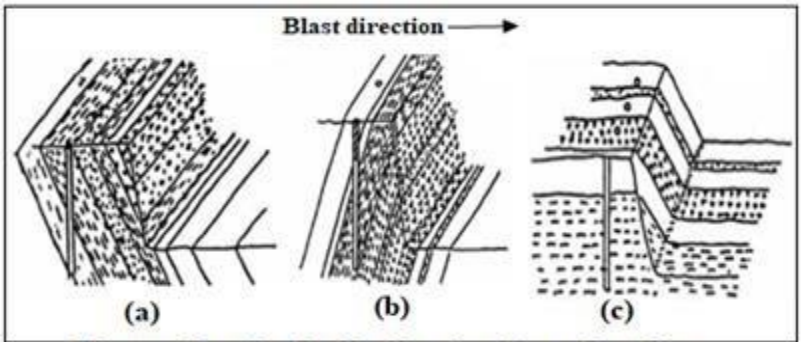


Fig. 21: Shooting in dip direction(a), against dip direction(b) and along the strike(c)

Shooting against the direction of dip (Fig.21(b)) leads to; - Less backbreak since the strata is dipping into the wall.

A rougher floor condition.

Muckpile may become higher with less movement of blasted material from the face. In this situation, the rock material produced tends to move upward, parallel to the plane of the joints. As a result of explosive energies migrating into the strata, a rock unit may cause back break. This situation may result in the creation of an unstable highwall. Also the muckpile would tend to be poorly displaced (creating more work during excavation). To eliminate toe problems, the blaster may consider using angled drill holes or high energy explosives in the toe area and/or additional subdrilling. Pre-splitting could also be used and become a highwall stabilization option.

Finally, shooting that is done along the strike (Fig.21(c)) leads to a highly saw-toothed profile due to different rock types intersecting the floor being blasted and an irregular back break. These are some of the worst conditions for those involved in drilling and blasting. To overcome them, the working face should be reoriented to a more favorable direction.

(b) Support of underground mines

Underground excavations are safer when supported by engineered steel structures. The support that is provided to transport tunnels can also apply to mine tunnels that lead to actual working areas such as stopes. The support becomes necessary due to the disturbance that arises from use of blasting method of excavations in which explosives are used. Main purpose for providing support is usually to strengthen the exposed rock mass by linking it to interior of the rock mass thereby preventing rock fall as well as seepage of ground water into the mine. Support measures can be done by use of rock bolting and or shotcreting.

Rock bolting: A rock bolt is a long anchor bolt, for stabilizing rock excavations. The bolting done transfers loads from unstable exterior, to the confined and much stronger interior of a rock mass. Rock bolts were first used in mining works starting in the 1890s, with systematic use documented at the St Joseph Lead Mine in the US in the 1920s. Rock bolts are almost always installed in a pattern as shown in the figure 22A. Design for the bolting depends on the rock quality designation and the type of excavation to be used. Rock bolting processes consists of anchoring the bolt in a hole in a predetermined pattern based on rock structure and applying tension to the bolt to place the rock under compression parallel to the bolt. The bolting aims at clamping together ('knitting') several roof beds to form a composite beam with strength considerably greater than the sum of the individual beds acting separately. Bolting system improves the competence of disturbed rock masses by preventing joint movements thereby forcing the rock to support itself. The system binds together a discontinued, fractured, laminated and jointed rock mass. In addition, rock bolting has a marked effect on the stiffness of the rock by reinforcing rock mass through friction and suspension effects. Because of this, the technique of rock bolting is approved for mines and tunnels in all types of rock. Rock bolts are used both as an initial support and as a final rock support. They are used at the tunnel face as an initial support to ensure safe working condition for workers (Nilsen and Palmström, 2000). Rock bolts can be installed individually to fix individual loose blocks at the excavation face (called spot bolting) and afterwards with systematic bolting. Systematic bolting is a pre-planned pattern of bolts that is based on geological conditions. As with anchor bolts, there are many types of proprietary rock bolt designs such as mechanical, epoxy means of establishing the set needed or fiberglass bolts etc. They also can be used to support wire mesh as an additional function. To measure relative performance of different anchor systems in rock mass, pull out test can be performed on different anchor systems targeting different mechanical anchors, different lengths and different bond materials which are then grouted. Ultimate capacity as the maximum load sustained by the anchor system is determined including working capacity as the load on the anchor system at which significantly increasing displacement begins. In this pull out test different embedment lengths and variation in cement-water mixing ratios of grout used are also determined. The data obtained after analysis is then used to choose anchor types and select the correct bolt length, spacing and size of the bolts to be used for support works at hand.

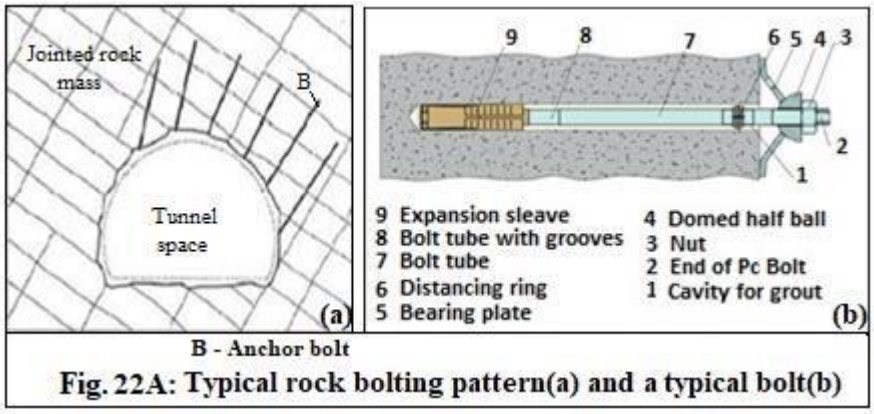


Fig. 22A: Typical rock bolting pattern(a) and a typical bolt(b)

Shotcreting: Shotcreting is a construction technique in which concrete or mortar that is conveyed through a hose is pneumatically projected at high velocity onto a surface. Shotcrete undergoes placement and compaction at the same time due to the force with which it is projected from the nozzle. It can be impacted onto any type or shape of surface, including vertical or overhead areas. The term "Shotcrete' is usually an all-inclusive term that can be used for both wetmix and dry-mix versions. Shotcrete, then known as gunite, was invented in the early 1900s

by American (Carl Akeley) when making, plaster models of animals. He used the method of blowing dry material out of a hose with compressed air, injecting water at the nozzle as it was released. This was later used to patch weak parts in old buildings. In 1911 Carl Akeley was granted a patent for his invention named as "cement gun" as implied by the equipment used, and "gunite", the material that was produced. This method was improved and named as dry mix method since it involved placing the dry ingredients into a hopper and then conveying the ingredients pneumatically through a hose to the nozzle. A skilled nozzleman controls water that is added to the dry mix at the nozzle (Fig.23 (A)). The water and the dry mixture become completely mixed as the mixture hits the receiving surface. The water content can be adjusted instantaneously for more effective placement in overhead and vertical applications without using accelerators.

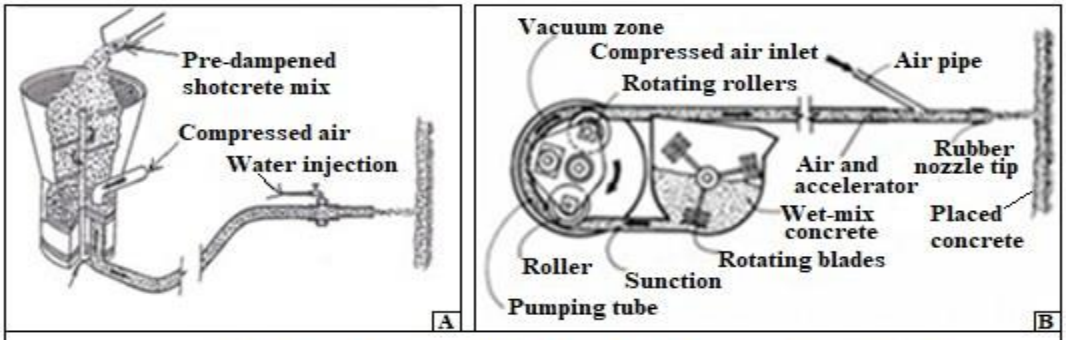


Fig.23: Dry-Mix techque(A) and Wet-Mix Technique (B)

In the 1960s, an alternative method, wet-mix method for gunning was devised with the development of a rotary gun which had an open hopper that was fed continuously. In this method, readily wet-mixed concrete is pumped to the nozzle zone. Compressed air is introduced at the nozzle to impel the mixture onto the receiving surface (23(B)). Greatest advantage of wet-mix process is that larger volumes can be placed in less time. Furthermore, the wet-gun procedure generally produces less rebound compared to the dry-mix procedure and the nozzleman does not have to be highly skilled. The sprayed concrete can be reinforced by using conventional steel rods, steel mesh, and or fibres. Fibber reinforcement of steel or synthetic material is also used for stabilization in

applications such as slope stabilization or

tunneling. Likewise, chain link mesh, although very strong and flexible, could be used but is not ideal for shotcrete application because it is difficult for the shotcrete to bypass the mesh up to the

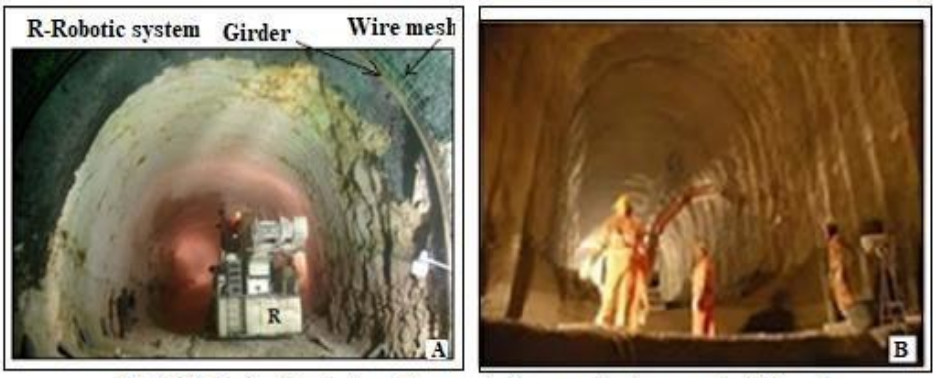


Fig.24: Robotic shotrecting , girders and wire mesh (A) and Primary support of shotcrete with lattice girders(B)

rock surface at the back. However, welded wire mesh which is firmly attached provides excellent reinforcement when used for shotcrete works. Typical shortening with other reinforcement provisions are as shown in figure 24.

References

ALEANJO, L.R. et al,2007, 'Slope geometry design as a means for controlling rock falls in quarries', Int. Journ. Rock Mechanics and Mining Sciences, Vol. 45, pp1252-1272. Ariane, R. P., Côrtes, C. A., Moreira, D. I. K., Veloso, L. B. V., and Flavio. (2016). Anauate Bergonzoni Geoelectrical prospecting for a copper-sulfide mineralization in the Camaquã sedimentary basin, Southern Geofísica Internacional Brazil 55-3: 165-174. org, G., 1994. The Geita gold deposits, NW-Tanzania. Geology, ore petrology, geochemistry and timing of events. Geologisches JahrbuchD, 100: 545–595.

Bulanova G.P. (1995) The formation of diamond Journal of Geochemical Exploration Volume 53, Issues 1–3, March 1995, Pages 1-23, Elsevier Publ.

Horkel A., Pohl, W, Niedermayr, G, Okelo, RE, Wachira, JK, Nauta, WJ. (1979) Geology of the Taita Hills- Degree sheet 60SE (Sheet 189/4). Geological Survey of Kenya Report 102.

Kabete, J.M., Groves, D.I., McNaughton, N.J.,and Mruma, A.H., 2012. A new tectonic and temporal framework for the Tanzanian Shield: implications for gold metallogeny and undiscovered endowment. Ore Geology Reviews, 48: 88-124.

atheson, G.D. and G. Reeves,2010, 'The identification, appraisal and assessment of hazards on quarry rock faces in terms of the UK Quarries Regulations', Paper submitted to Quar. Journ. Eng. Geology, Geol. Soc., London.

Milson J., Erikssen A., 2011, Field Geophysics. John Wiley and Sons, Chichester, 297pp

Phillips, G.N, Groves, D.I, and Kerrich, R., 1996. Factors in the formation of the giant Kalgoorlie gold deposit. Ore Geology Reviews, 10: 295–317.

Rop, B.K. and Namwiba, W.H. (2018): Fundamentals of Applied Geology: Competency and Evaluation Approach 697p. Verlag/Publisher: LAP LAMBERT Academic Publishing ISBN 978-613-9-57896-2.

Rop, B.K. (2014). UNDP Consultancy on "Economic and Job Creation Potential on Artisanal and Small-Scale Miners for Artisanal and Small-Scale Miners in Taita Taveta County".

Simonet, Cedric & Okundi, S & Masai, P. (2002). General setting of coloured gemstone deposits in the Mozambique Belt of Kenya: Preliminary considerations. Suwa K., Suzuki, K, Miyakawa, K, Agata, T. (1979) Vanadium and vanadium grossulars from the Mozambique metamorphic rocks, Mgama Ridge, Kenya. 4th Preliminary Report of African Studies, Nagoya Univ., 87-96.

Walsh, J and Du Bois, C.G.B (1970). Minerals of Kenya. Geol. Surv of Keny. Mines and Geological dept., Bull no.11. Nairobi.

Landslide Disaster Preparedness and Mitigation Measures: A Case of Kapkese Village, Kokwet Location, Kipkelion West Constituency, Kipkelion District, Kenya

Bernard K. ROP and Seroni ANYONA

Mining, Materials & Petroleum Engineering Department,

JKUAT,

P.O. Box 62000 – 00200, Nairobi, Kenya.

Emails: ropben@jkuat.ac.ke , sanyona@jkuat.ac.ke

Abstract:

The Kapkese landslide disaster has recurred (December 2015) from the heavy El Nino rainstorms sweeping Kenya. The village is located in Kokwet Location, Kipkelion West Constituency, Kipkelion District, Kenya. This has again caused harmful geo-environmental hazards to the villagers who have migrated to safer grounds, far from their original homesteads. In May 2003, a mother and her three little daughters were killed when their hut was buried in a similar landslide. The existing landslide vulnerability occurrence ratings have been identified and documented using participatory approaches. The adoptive indigenous methods, which helped mitigation against the negative impacts, were useful while determining the slope steepness using Abney level and other inherent factors that triggered the landslide. The geological set up, settlement and climatic factors relating to landslides, revealed that the affected homesteads are on a steep slope of approximately 80%. The underlying Tertiary volcanic rocks (basalts and nephenilites) on the steep escarpment where the landslide occurred, consists of loose debris and unconsolidated thick black cotton soils. The slope has scattered vegetation cover due to extensive farming of mainly maize and coffee plantations. The landslide disaster is a precursor to loss of lives, injuries and damage to property. Natural resources, including water points, suffered siltation. Mitigation measures such as geo-hazard mapping and zoning, construction of support structures, encouraging agro-forestry on vulnerable steep hill slopes and hazard-prone areas resulting from poor land use practices, have been recommended.

Keywords: *Landslide, land use, slope, mitigation measures, volcanic rocks, geo-hazard*

1. Introduction

The Kokwet escarpment areas (where

Kapkese Landslide occurred in December

2015) located in Chilchila Division, Kipkelion District, Kipkelion West Constituency, are predominantly occupied by the *Kipsigis* tribe. It borders Tindiret Forest Reserves. The area is sparsely populated with the inhabitants mainly living on the steeper inclined sloppy areas on the top of the ridges or on the lower gentler slopes near the rivers, leaving the steeper middle slopes for cultivation. The population of Chilchila Division was 8,717 according to 1999 census. Its projected population for 2008 was 10,197 (Government of Kenya, 1999).

Farming activities are practiced mainly for economic subsistence. Some tomatoes, bananas, sugarcane and potatoes are grown in small scale. Maize and coffee are cultivated for major family income generation. Large indigenous forest trees at the forest edge have been cleared leaving shrubs and a few patches of thin forests on stony, steeply sloping land (Fig.1, Plates 1-7).

The study area is hilly with the parallel ridges that run in a N-S direction. The steep areas of the ridges dip both toward the east and west. It is at Kapchorua ridge, Kapkese village (Kokwet location) that four persons perished in May 2003 after a landslide buried them in their house. Last year (December, 2015), villagers migrated to safer grounds when heavy rains commenced, thus no casualties were reported as the MP (Hon Jackson Rop) had sensitized the people on the impacts of these geo-hazard prone areas to their lives.

The literacy level in the area is moderate.

The mapped area (Ahmed and Almond, 1983) covered a total area of 15 sq. km (5km long and 3km wide). The geology of the study area, where the mass movement occurred, is mainly composed of the Tertiary analcite and nephelinite volcanic rocks, which have weathered into black clay cotton soils (Binge, 1962). The slope has scattered vegetation cover due to intensive farming of maize and coffee plantations.

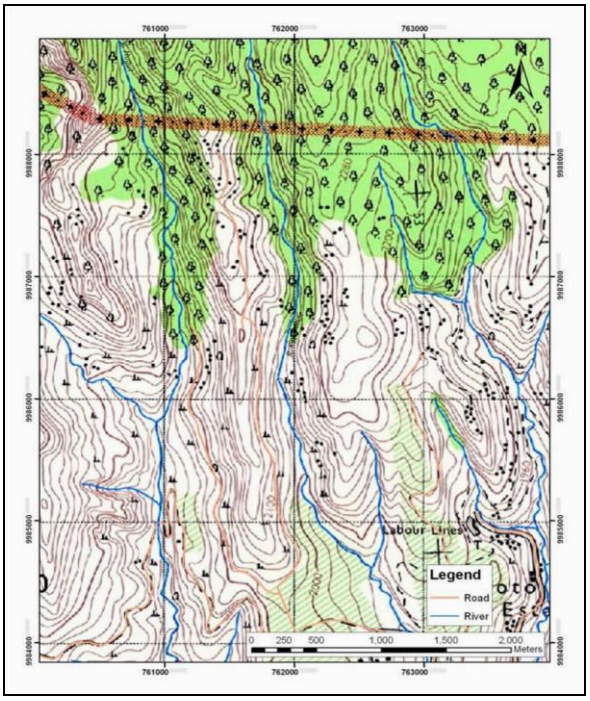


Fig. 1: Map showing the study area affected by landslides

The area was initially under indigenous forest until 1978 when it was sub-divided for settlement purposes. This led to clearance of vegetation to pave way for cultivation and settlement.

2. Materials and Methods

2.1 Definition: A *landslide* or *landslip* is the sliding of a large mass of rock material, soil, etc. (Figs.3, 4), down the side of a mountain or cliff (Allaby and Allaby, 1990; Cunningham and Siago,2001). This takes place on a definite plane, which may be a structural plane, e.g. bedding, joints, schistosity, etc. Sometimes, because of torrential rains, the pyroclastic material resting on the mountain slopes becomes saturated with water and moves as a *mud flow* or *lahar* (Allaby and Allaby, 1990).

Landslide, also called mass wasting (*mass movement*), is a general term for the transfer of earth material downhill slopes as in the case of the present site (Kapkese village, Kipkelion District). Mass movement includes four main categories: *flow*, *slide*, *fall* (rock fall) and *creep* (Cunningham and Siago, 2001).

Of these, *creep* is the most important if least spectacular. It is the result of gravity acting on material that has lost cohesion typically as a

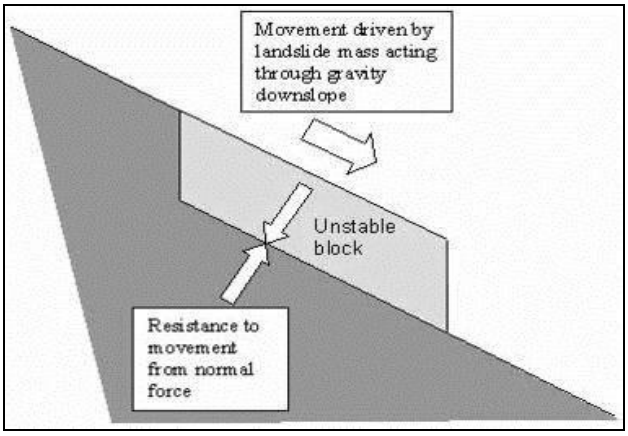


Fig. 2: Diagram illustrating the resistance to, and causes of, movement in a slope system consisting of an unstable block

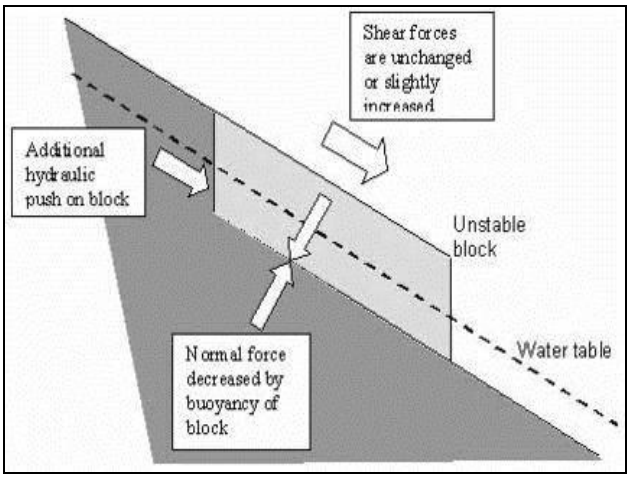


Fig. 3: Diagram illustrating the resistance to, and causes of, movement in a slope system

consisting of an unstable block result of an increase in water content. An avalanche is a rapid and often destructive flow of rock or snow. A slide (or landslide) is a comparatively rapid displacement of Earth material over one or more failure surfaces, which may be curved, or planar (Wikipedia Encyclopedia, 2007)·

2.2 Causes of mass movement Weathered material can move downhill slopes under the influence of gravity, with or without the assistance of running water like the Kapkese's area case (Figs. 2, 3). This movement under the influence of gravity is called mass movement. Gravity exerts a constant pull on all Earth material (stress).

Weathered material on slope would immediately slide down to the river (valley) were it not for the fact that it possesses certain strength (Figs. 3, 4), which is due to a number of material properties (Allaby and Allaby,1990):

All particles have rough surfaces, which result in friction between touching particles.

The shape of the particles may cause them to interlock like the pieces of a jigsaw puzzle.

The clay particles of weathered material attract each other by electric forces, which produce cohesion between particles.

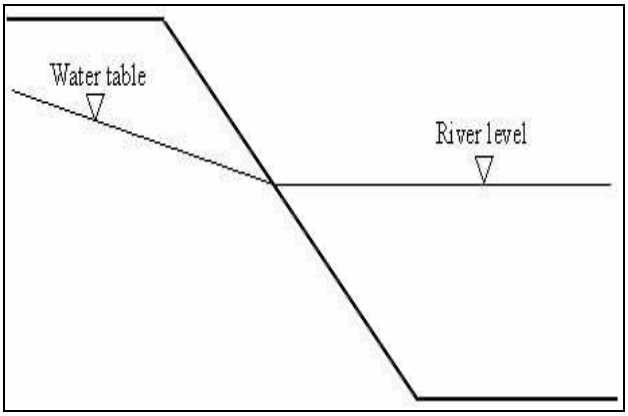


Fig. 4:: Groundwater conditions when the river level is stable.

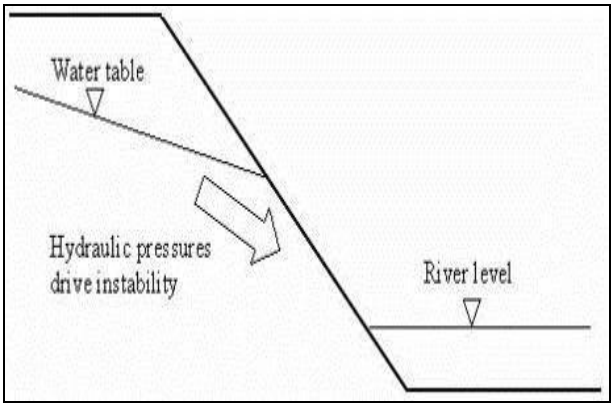


Fig. 5: Groundwater conditions on the falling limb of the hydrograph. If the fall in river levels is sufficiently rapid then the high water levels in the slope can provide a hydraulic push that destabilises the slope, sometimes triggering bank collapse (Siddhartha K.

(1999).

Thus mass movement occurs when the stresses acting on the material, exceeds the strength of the material. Alternatively, the strength of the material may be decreased suddenly by a rise in water content, which forces the particles apart. This can be expressed as a factor of safety, Fs.

Fs=Strength of shear resistance of material (1) Magnitude of stress

Thus, when Fs is less than 1.0 the slope will fail. This is brought about by the application of increased stress due to changes in conditions external to the slope, which increases the denominator, or by the internal processes that weaken the slope material thereby decreasing the numerator. In most cases, failure will result from a combination of both processes, an increase in shearing forces and a decrease in resistance to shear (Allaby and Allaby, 1990; Ahmed and Almond, 1983; Lugens and Tarbuck. 1982)[1].

In simple terms, mass movement can be related to a set of the following five conditions:

When the soil and the mantle rock are loose or poorly consolidated and deeply weathered.

The angle of repose (depends largely on the shape of the fragments which control the angle at which the fragments interlock while falling) of the regolith and the degree of inclination of the strata (Figs. 2, 3).

Presence of thin beds which increase the tendency of movement because there are more bedding planes along which slipping can occur.

Moisture content of the soil – movement is greater in very wet weather, particularly after long dry spells (Figs. 4, 5).

Conspicuous absence of vegetation covers without which the soil stability is reduced.

2.3 Slope measurement

Since the settlement of the locals in the area, the forest cover has been continuously been cleared to pave way for settlement and cultivation. The wood products have also been a source of building materials (Plate 1). The high demand of wood products from outside the area also contributed to the depletion of the vegetation. This led to bare steep slopes, susceptible to landslides and soil erosion (Ahmed and Almond, 1983; Kipseba et al., 2008; Ndola, 2005).



Plate 1: Kapchorua area showing overcultivated areas in steep slopes with the forest area at the background of the first photo.

The slope data in the study were obtained by direct measurements using Abney level (equation 1).



Plate 2: Very steep Kapkese slope where landslide occurred in December 2015

3. Results and Discussion

3.1 Landslides

An old, active landslide was observed between

GPS positions 0761185, 9987004 and 0761184, 9987104. This landslide has a width of 106m and a length of 100m. The average slope in the affected area is 30^0 towards the west. Water flows from an erosional gully from the ridge and disappears at the crest of the landslide resulting in a waterlogged area. This water saturates the soil and causes a slow slumping movement near the scarp of the landslide and consequently a slow creep at the toe of the landslide. This area is at the moment being utilized as grazing area.

Between GPS positions 0761064, 9987740 and 0761075, 9988058, the area is highly prone to landslides. Eight old episodes of landslides were observed in this 200m span, including the fatal 2003 landslide at GPS position 0761096, 9987800. The fatal landslide measured 50m long and 15m wide. Debris of these landslides is mainly black cotton soil laden with rock boulders.



Plate 2: Kapkese's Landslide site with gushing waters on slopes ranging from 60^0 to 80^0, in a general westward direction (Area MP with inhabitants inspecting the disaster-prone area).

3.2 Debris flows

Plate 4: Photograph of Kapkese steep slope (behind Dr. Rop background) and a river valley (December 2015).

3.3 Rock Falls

Rock falls are common on all the slopes below the ridges in the area. They are however more common on the steeper slopes that are under cultivation, especially during or after heavy rains.

This situation is clearly observed on the western slopes of Kapchorua ridge. The boulders are of various sizes which rarely exceeds 2m in diameter. The slope of the ridges on the inhabited area has an inclination angle of up to 60^0.

Debris flows are common in the area. They are normally triggered on the upper slopes of the ridges, flowing through erosional valleys and end up in the rivers. The most serious debris flow happened in 1998 from GPS point 761466, 9987198 and flowed into Mugut River at 0761066, 9987060. Another smaller debris flow occurred in 2005 from GPS point 0761160, 9987830, flowing into Mugut River at GPS point 0761042, 9987650.

There are other numerous, smaller debris flows on other parts of the ridges. Plates 2 &4.





Plate 3: A rock that rolled from the top of the ridge in September 2008

The study established the following in relation to the past landslides/mass movement incidents

Source1:
Village elders recalled that there have been three incidents prior to this, in 1998, 2003 and 2005, which occurred during the day and there were no fatalities.

Currently, the affected area is approx. 106m x 100m.

3.2 Landscape and geomorphological analysis – Kokwet escarpment at Kapkese village

Landscape - Very steep slope of more than 80^0. The slope (Ahmed and Almond, 1983; Cunningham and Siago, 2001) increases towards the top of the escarpment (measuring approximately 80m ground distance) - (Fig. 6).

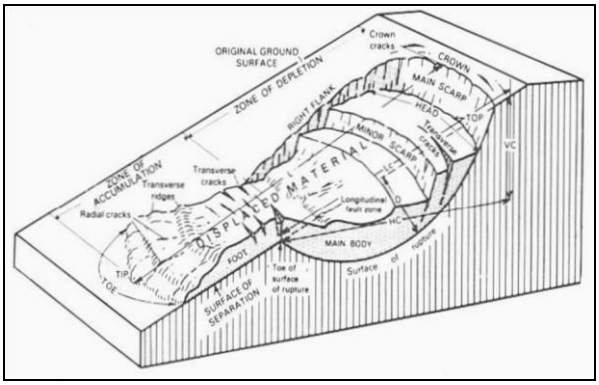


Fig. 6: Nomenclature employed in describing landslides. (Varnes, 1978, in Schuster and Krizek, eds.Landslides - Analysis and Control)

Several cracks filled with water observed a day before the disaster.

Cracks developed after the heavy rains in April – May 2003.

Geology and Geomorphology (Fig. 6): The analcite basanite and tephrites overlie the nephelinites. This formation is composed of soft rocks which are easily weathered into black cotton soil. This explains why the area has a thick soil cover of high fertility requiring no fertilizer.

Deep weathering (chemical) has occurred.

Soaked regolith slumped down the slope at very high speed.

Soft rock debris, with sticky soils.

Heavy sludge-like materials rolled to the faults cape toe.

Hydrology - Several streams originating from the foot of the forested escarpment. The general drainage of the study area is towards the south. The two main rivers draining the area are Murgut River to the west and Kipsinende River to the east of the study area. Kapkese stream is tributary of Murgut River that drains from the North West. The slopes have some permanent springs which serve as sources of domestic water supply.

Water filled the crack prior to the disaster.

Geomorphology (Fig. 6): The area has its lowest elevation as 1760m near Kokwet market to the south. The highest elevation of 2440m is at the northern part of the area in the forest. The entire area consists of N-S trending ridges that continuously rise northwards.

Escarpment baseline composed of dunes due to soil creek (slow movement of materials); an evidence of potential slope failure.

Rock boulder/debris found at the escarpment baseline, evidence of the past rock falls.

Several deep valleys, with stream flows at the escarpment baseline, indication of sub surface drainage.

The Kapkese landslide was probably triggered by removal of trees and other slope vegetations, which subsequently weakened the anchorage holding the overburdens (soils and rocks) on the major Kokwet Escarpment slope or fault zone area (Figs. 6, 8). Thus the weight of the loose soil and rock materials could have increased to the extent that the vertical slope (about 85°) became unstable hence failure, resulting in the mass movement.

Rainfall (Fig. 7)

The area receives high rainfall for most of the year. The temperature is generally cool with an average annual temperature of about 20°C and high humidity.

The area receives its highest rainfall in March to June and the lowest in the months of December and January. It has two rainy seasons, long rains between March and June and the short rains between August and October.

Rainfall data for the last six years are is shown in the figure below:

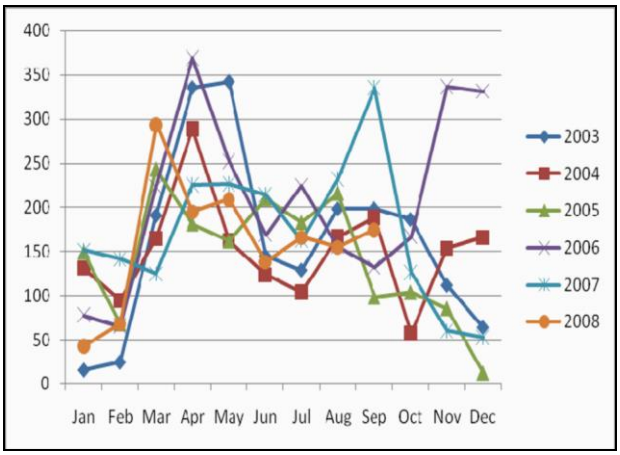


Fig. 7: Graphs of rainfall for the last six years

The highest annual rainfall received in the last six years was in 2006 when 2504mm was received. The lowest rainfall in the same duration was in 2005 with 1711.1mm. In 2003 between April and May, a total of 678mm was recorded (335.6mm in April and 342.4mm in May). This was when massive landslides occurred in the area and killed four family members.

Between November and December 2006, 668.5mm of rainfall was recorded (336.8mm and 331.7mm respectively). Several landslides also occurred in the area.

One of the most likely factors that led to the mud flow is inappropriate land use.

The slope in question consists of three categories of slope namely (Fig. 8); 80% along the Kokwet escarpment with an east/west aspect with a slope length of 100-200m 20-35% below the above slope for about 50m 20% at the bottom.

The steepest slope was deforested and cultivated in some places and some and some with dwellings. These are the structures that were destroyed together with human life on the disaster struck.

The cultivated field slopes were planted with maize.

The secondary slope of 30-40% was planted mainly with sugar cane.

This is the area with very deep soil material it appears over the years, soil masses have been washed to this area.

The lower slopes (20-30%) carries most of the residential and farming (maize, millet, bananas) activities.

The greatest risk of mud flow is >80% slope. But again, it is only that slope which had been deforested, and cultivated for maize (annual) crop. Where there were human settlements.

The soils are consolidated and appear to hold water hence where there was too much rain; the soil became saturated with water and followed along the slope thereby causing the disaster.

3.3 Geo-environmental Impacts

3.3.1 Impacts (Effects) All landslides degrade the land in which they occur, rendering the land uneconomical and dangerous to live in. The landslide scars are usually bare and infertile whereas the landslide debris is loose, relatively flat and fertile. The locals settle on these fertile and flat areas regardless of their instability (Kipseba et al., 2008; Ndola, 2005).

The immediate impacts of the landslides in this area are loss of life, crops, trees, pasture and rich soil. Long term impacts include loss of soil fertility and continued erosion (leading to food shortages), trauma from fear of another occurrence or loss of land.

3.3.2 Causative Factors (Analysis) There are two main categories of factors that influence the occurrence of a landslide. These are inherent factors and triggering factors. Inherent factors create a conducive environment for the occurrence of a landslide and include geology, slopes, vegetation cover and type of drainage.

Triggering factors: trigger the movement and include rainfall, earthquakes and tremors (vibrations), blasting, machinery, thunder and human activity. The landslides in this area were a result of most of these factors as described below.

I Inherent Factors

Slope gradient It is a very important factor due to influence of gravity. In the area, the slope inclination is generally high along the hill slopes. Some parts are almost vertical (Plates 5, 6).

Geological criteria This includes the type of overburden such as soils and their mechanism and the physical and chemical properties of the underlying rocks.



Plate 5: A homestead constructed on old landslide debris, an unstable ground.

The soils in the study area are black cotton soils with high fertility and support crop cultivation. The area has a thick soil cover.

Structural criteria This refers to the nature of fractures and joints on the underlying rocks or bed rocks. The rock formation in the area is soft and easily weathered.

Hydrologic criteria or Moisture content

This accounts for the amount of underground water content or nearness of the water table in the area. Under normal circumstances high potential areas receive high rainfall whose percolating water is trapped between the overburden and the impermeable rocks. This water lubricates the interface between the two surfaces triggering mudflows or debris flow. This area receives over 1700mm of rainfall annually and therefore the soils are always wet. Permanent water springs are common in the area.

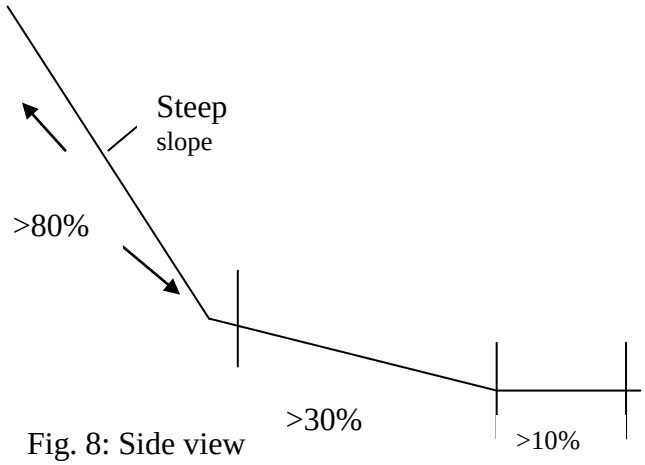


Fig. 8: Side view cross section
(Not drawn to scale)

Vegetation

Vegetation on steep slopes helps in holding the soils together. The roots system increases the shear strength of the soils hence enhancing cohesion. Vegetation also reduces the surface run off of water during rainy seasons.

On the negative side, mechanical forces resulting from wind blowing vegetation cause instability to the soils. Nonetheless, in general terms, vegetation cover promotes stability of the ground.

In this area, the locals cultivate the steep slopes and are continuously removing the vegetation cover on the upper parts of the slopes (Plates 6, 7).



Plate 6: Steep slopes that have been cleared for cultivation. Note the poor soil

conservation measures II Triggering Factors a) Rainfall Rainfall increases the water content in the ground. This results in the conditions described in (1, d) above.

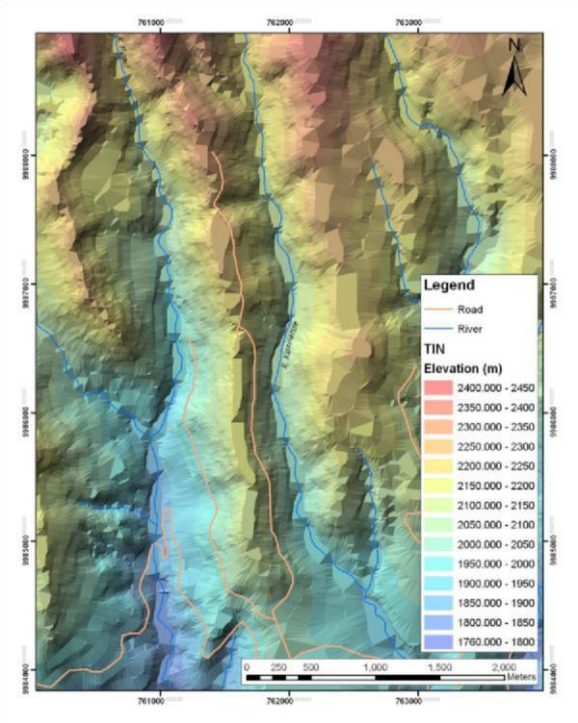
b) Human activities Like natural factors, man's activities such as clearing of vegetation, farming, building, quarrying and blasting, construction and other engineering works trigger landslides. The human activities that have contributed to landslides in the area are as follows:

Clearance of vegetation. This started when the locals first settled in the area. This was done to give way to settlement and cultivation. Cultivation was observed to have been done on a larger part of the slopes. Soil conservation structures are totally lacking in the area.

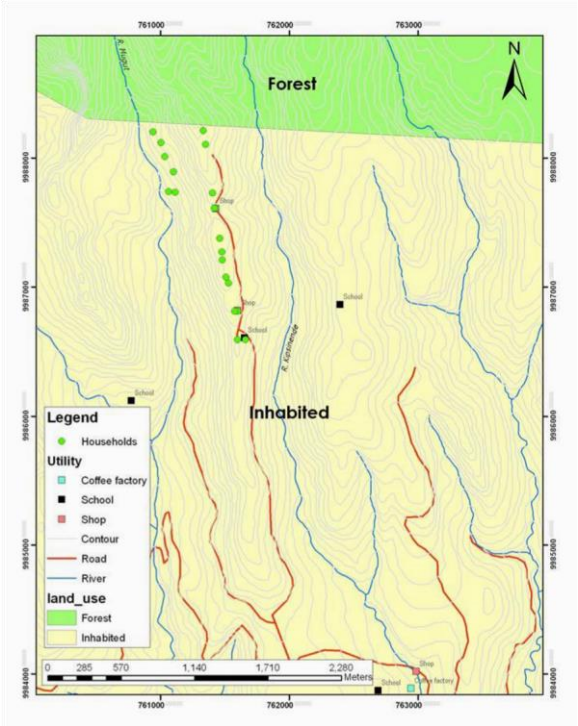


Plate 7: Cultivation and settlement on the steep slopes

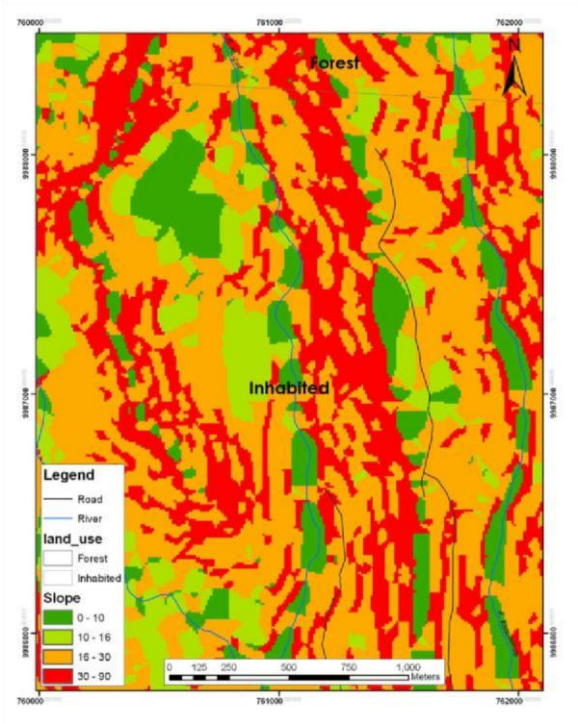
3.3.3 Risk Analysis The data which was collected from the field together with the basic (topographic) data was used to categorize the landslide risk in the study area (Maps 1,2,3,4,5). The analysis of the landslide risk took into consideration four parameters (factors) namely slope, population, proximity of old landslides and land use. The results of the slope analysis are illustrated in the maps below. Areas with a slope of between 0^0 and 16^0 were categorized as "Relatively Safe", 16^0 to 32^0 as "Moderate Risk" to landslides, and above 32^0 as "High Risk". The risk associated with smaller slope is because the slopes have been generally cleared for cultivation. This is mainly due to expansion for more fertile land where artificial fertilizers are not required by the crops.



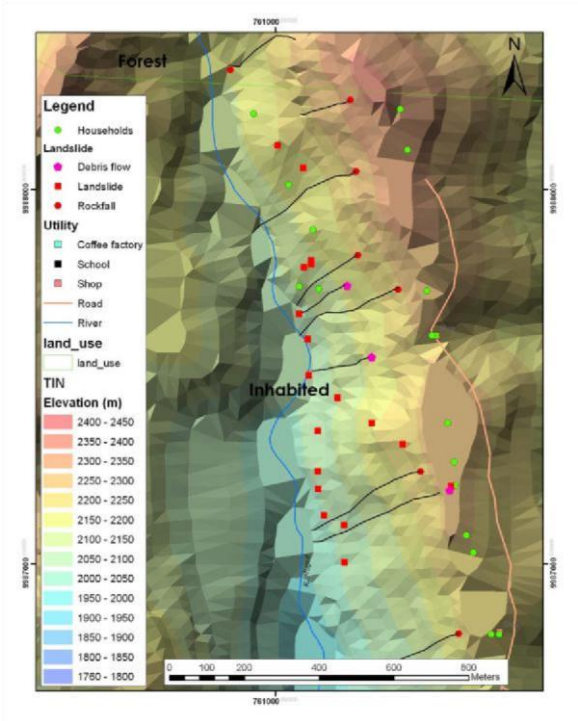
Map 1: 3D map of the area



Map 2: Land use/ Land cover of the area. Note that the households have been highlighted for the area most affected by landslides. Other areas are more populated

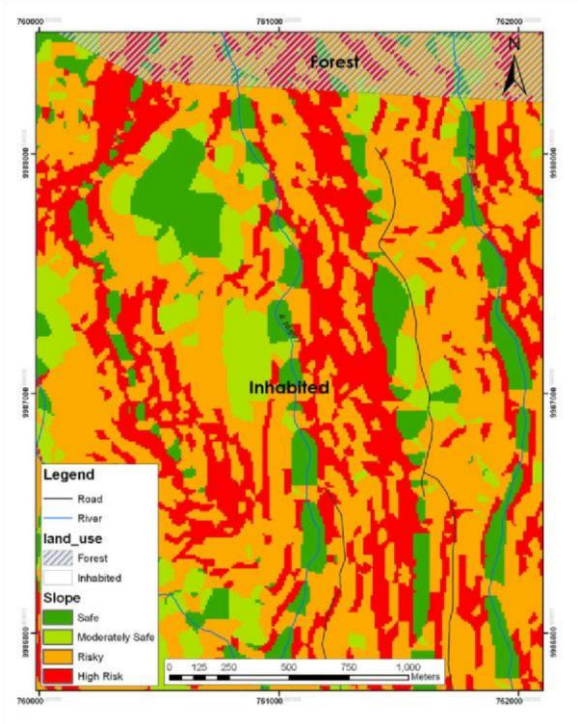


Map 3: Slope map of the area



Map 4: Location of landslides on the map. Debris flow and rock fall paths are shown by

the black lines



Map 5: Landslide Risk map of the area

3.3.4 Land Use – Agriculture & Livestock The land use in the area includes:

Cultivation of subsistence crops e.g. maize, beans, millet, vegetables, sugar cane and fruits

Cultivation of coffee as a main cash crop

Settlement

Exotic trees on the slopes of the hills

Livestock and pasture

The top soil on the newly cultivated areas of the slopes is fertile, whereas the eroded areas and those that have been affected by landslides are rocky and not fertile. However, areas covered by old landslide debris are very fertile. It also forms a relatively flat ground on which locals build their homesteads. The landcover on the slopes has been depleted for cultivation, leaving it very susceptible to soil erosion and landslides.

Approx. 0.7 acres of maize, vegetables and some tree stems, a few years old, were destroyed by the mud and debris/rock falls. Cows, goats, sheep and cats were not affected.

3.3.5 Buildings One house with common household property in one homestead was buried together with four persons by landslide.

3.3.6 Water Resources The stream natural water at the lower end of the rivers in the affected area suffered siltation.

3.4 Mitigation Measures The mitigation measures are proposed as follows:

Planting of deep rooted trees on steep slopes.

Discouraging cultivation on steep slopes

Discouraging settlement on steep slopes

Stop vegetation clearing

Putting up of soil conservation structures

Constructing support structures on vulnerable areas

Encouraging agro-forestry in the area

The hill slopes should be zoned and the steep areas should be vacated

Residents of the area to be moved to less steep areas

Plant trees on the steep slopes

Introduce bee keeping in order to motivate residents to participate in an income generating activity

Educational seminars on public awareness about land use and zonation.

4. Conclusion and Recommendation

The disaster was as a result of regolith slump facilitated by steep slope and infiltrating water in to the deep weathering regolith (Figs. 1 - 8).

Landslides are natural phenomena whose causative factors have substantial human contribution.

In order to avoid such Geo-environmental hazards in future, there is need to map and identify (Patwardhan, 1999):

The slopes in the study area which are susceptible to landslides; and much effort is needed from all stakeholders in conserving the slopes

The main triggering factors of the landslides are over saturation of water in the soil due to heavy downpour, depletion of vegetation on the steep slopes and other human activity • The western slopes of Kapchorua ridge is very unstable and not fit for human settlement

From the observations made, it is therefore recommended that:

i. There should be no settlement on the steep slopes in the area, ii. There should be no cultivation on the steep slopes, iii. Reforestation of the entire western slopes of Kapchorua ridge is necessary in order to restore slope stability, iv. The residents living on steep slopes should be relocated to safer ground,

v. Soil conservation structures should be constructed in the area, and vi. Sensitization of the local communities should be done through

seminars and workshops

Acknowledgements

This paper is published with the permission of the Commissioner of Mines and Geology (2009 - 2010). The fieldwork, data analyses and interpretation formed part of the geological field survey, which we believe, will contribute in advising the local community on safe farming methods, soil conservation measures and slope stabilization. Special thanks go to Mr. Kipseba for his expertise in data analysis and map- production. We are also grateful to the Provincial Administration, the District Statistics Officer, District Officer and Chief (Fort-ternan) and the Meteorological Officer - Kericho District, for their logistical support and provision of the population, rainfall, climatic, and other basic data in the District.

References

Ahmed F. and Almond D. C. (1983): Field mapping for geological students. George Allen & Unwin, pp.72.

Allaby A. and Allaby M. (1990): Edition: Concise Dictionary of Earth Sciences. Oxford University Press, pp.404.

Binge F .W. (1962): Geology of The Kericho Area, Report No. 50.

Cunningham W. P. and Siago B. W. (2001): Environmental Science, A global concern (6th Edition). McGrawHill, pp.646.

Government of Kenya (1999): Kenya Population Census,.

Kipseba E., Ogora M., Kotut J., Kurgat H., Borura G. and Maina G. (2008):

Landslide Prone Areas Along

Part of the Nandi Escarpment (unpublished internal report).

Lugens F. K. and Tarbuck E. J. (1982):

Essentials of Geology (3rd Edition). Merrill Publishing Co., pp.378.

Ndola T. (2005): Geohazard Inventory Mapping and Monitoring In The Rift Valley Province (unpublished internal report).

Patwardhan A. M. (1999): The Dynamic Earth System. Prentice-Hall of India, pp.404.

Siddhartha K. (1999): The Earths Dynamic Surface. Kisalaya Publications. Pvt. Ltd., pp.492.

Wikipedia Encyclopedia (2007): Wikipedia Organization Website: http://www.wilkipedia.org

Limestone Production Optimization by Fragmentation Control – Case Study of Bissel Quarry

Emmanuel Kiamba[a], Richard Muthui Kasomo[ab], Bernard K.Rop[c] , Jackson Mwangngi Mwendwa[d]

a) Taita Taveta University, School of Mining and Engineering, Department of Mining and Mineral Processing Engineering, P.O Box 635-80300-voi-Kenya.

b) School of Resources and Environmental Engineering, Wuhan University of Technology, Wuhan, Hubei 430070, China.

c) Mining, Materials and Petroleum Engineering Department, Jomo Kenyatta University of Agriculture and Technology, Nairobi 62000-00200, Kenya.

d) Machakos University, School of applied Geology and Mining, 136-90100 Machakos, Kenya.

ABSTRACT

Limestone Production Optimization by Fragmentation Control – Case Study of Bissel Quarry

Blasting is one of the most economical production excavation method in hard rock mines. Few studies about blasting fragmentation exist due to lack of reliable fragmentation data. Many researchers have attempted to predict blasting fragmentation using the Kuz-rams model, an empirical fragmentation model suggested by Cunningham. This investigation is to relate the blasting parameters such as the drill hole diameter, the burden, spacing, charge length and explosive weight to the fragmentation size distribution in order to obtain controlled fragmentation blasting.

This investigation is to relate the blasting parameters such as the drill hole diameter, the burden, spacing, charge length and explosive weight to the fragmentation size distribution in order to obtain controlled fragmentation blasting. The investigation further studied the final profile of the excavated wall and adopted a presplitting blasting techniques to produce a smooth stable wall which reduced dilution of the limestone muck piles. Blasting data from the Bissel quarry was analyzed. It was observed that 16.25% of the blasted material used to be retained on the mesh hence accounted as boulders. The best blasting parameters for the quarry were defined and by application of researchers empirical models and the developed blasting design model, the amount of material retained on the mesh were reduced from 16.25% to 0.65%.

This was a clear indication that application of these parameters can be used to solve the issue of large boulders currently experienced at the Bissel Quarry leading to required size reduction and avoiding secondary blasting which is costly in blasting.

Keywords: Blasting, Kuz-rams model, blasting parameters, Presplitting

INTRODUCTION

Rock fragmentation design models plays a key role in the evaluation of efficiency and productivity of quarry blasting. Regular assessment of rock fragmentation is needed to control it. If rock fragmentation is not controlled, it can increase production cost and delay the quarrying process due to unnecessary secondary blasting or crushing. Therefore, blasting design should take into account the findings of rock fragmentation assessment to cut down the mining cost and shorten the work time. Drilling and blasting cost in open pit mines represent 15-20% of the total mining cost. Apart from the direct costs, blasting efficiency also influences down the line mining costs.

Firing pattern that provides a pathway for the detonation wave of initiation for the explosive charged in the holes. Several models have been developed for the prediction of fragment size distributions from specific blast designs. Kuz-Ram and adapted the Rosin–Rammler model were chosen for these research work due to the following reasons: Kuz-Ram is the most commonly used models in industrial applications, The data required as input for these models are easier to gather, The adopted Rosin–Rammler model was used to predict the fraction of materials retained on the screen

OBJECTIVE

The objective of this research was to define the main blasting parameters values in order to obtain Optimal fragmentation after blasting, improving limestone productivity and improving the stability of the excavated walls at the quarry.

3. OVERVIEW

The Kuznetsov Equation

The amount of breakage that occurs with a known amount of explosive energy can be estimated using the Kuznets's equation. The original question, developed by kuznetsov (1978), was modified by Cunningham (1987) for ANFO base explosive.

$$X_m = AK^{-0.8}Q_E^{0.167}\left(115/S_{ANFO}\right)^{0.633} \quad \text{..... (1)}$$

Where X_m is the mean fragmentation size (cm). A the rock factor (or blastability index) , K the powder factor or specific charge (kg of explosive/m^3 of rock), Q_E the mass of explosive being used (kg), S_{ANFO} the relative weight strength of the explosive relative to ANFO

The blastability index is calculated from an equation originally developed by Lilly (1986). It is used to modify the average fragmentation base on the rock type and blast direction.

$$A=0.06(RMD + JF+ RDI+ HF) \quad \text{..... (2)}$$

Where A is the blastability index

RMD the rock mass description, JF the joint factor, RDI the rock density index, HF the hardness factor

These factors are calculated from geological data such as; in-situ, block size, jointing spacing, joint orientation, and rock specific gravity, young's modulus unconfined compressive strength etc.

Powder factor or specific charge is the mass of the explosive being used (kg) to break a cubic meter volume of rock. $K=Q_E/ V_O$ …….. (3)

Where Q_E is the mass of explosive being used (kg),V_O the rock volume (m^3) broken per blast hole

V_O = burden (B)* spacing (S) * bench height (H)

The Rosin & Rammler Equation

The size distribution of the material is calculated from the Rosin & Rammler question especially in mineral processing are (Rosin& Rammler 1933)

$$y = 100\left(1 - e^{-(x/x_c)^n}\right) \quad \text{…….. (4)}$$

Where Y is the percentage of the material less than the size X (%) X diameter of fragment (cm)

X_C the characteristic size (cm) n the Rosin & Rammler exponent e the base of natural logarithm

since the kuznetsov formula gives the screen size X_m for which 50% of the material would pass, the characteristic size is calculated from the average size for use in the Rosin & Rammler equation by substituting $X=X_m$ and Y = 0.5 into Equation 4 one find that

$$X_C = \left(\frac{X_m}{0.693^{\frac{1}{n}}}\right) \quad \text{……. (5)}$$

Average particle size of the material obtained from a blasting operation is not enough information explaining the efficiency of the operation. Uniform particle size distribution is an important parameter that has to be considered.

The adapted Rosin–Rammler equation

$$R_m = \exp\left[-0693 - \left(\frac{x}{x_m}\right)^n\right] \quad \text{…… (6)}$$

Where R_m=mass fraction retained on screen opening – boulders, X =screen opening; n=uniformity index, usually between 0.7 and 2.The uniformity coefficient is calculated by Cunningham (1987), established the applicable uniformity taking into consideration the impact of such factors as: blast geometry, hole diameter, burden, spacing, hole lengths and drilling accuracy. The exponent n for the Rosin % Rammler equation is estimated as follows

$$n = \left(2.2 - 14\frac{B}{D}\right)\left[\frac{1+\frac{S}{B}}{2}\right]\left(1-\frac{W}{B}\right)\left(\frac{L}{H}\right) \quad \text{..... (7)}$$

Where B is the blasting burden (m) S, the blast hole spacing (m) W, the standard deviation of drilling accuracy (m) D, the blast hole diameter (mm) L, the total charge length (m) H, the bench height (m).

4. DATA COLLECTION

Data for the research work were obtained from the Bissel quarry of the East African Portland Cement Company Limited (EAPCC). They were acquired through field measurements and extraction from the geological files and documents from the mine. The data include the geometric blast design and explosive data of the lasts studied and rock parameters of the pits where the study was conducted.

Table 4.1: Rock and Explosive Parameters at Bissel Quarry

Parameter	Value
Bulk density (tonnes/m3)	2.51
Volume of blasted rock per drill hole (m3)	165
Nature of Blasted face	Highly rugged
Average quantity per hole (kg/hole)	57
Powder factor (kg/m3)	0.3 varies
Loading density (kg/m)	9.5
Average charge length (m)	7.0
Stemming (m)	4.0
Base charge height (m)	1.0
Column charge height (m)	6.0
(S)Relative weight strength of explosives (ANFO)	100
Fly rock factor	1 for normal blasting

Table 4.3: Geometric Blast Parameters

Parameter	Value

Spacing (m)	3.0
Bench height (m)	10.0
Burden (m)	3.0
Average hole depth (m)	11.0
Hole diameter (mm)	150.0
Average final stemming height (m)	4.0
Drilling deviation(m)	0.015
Average sub drill length (m)	1.0
Blasting pattern	rectangular

5. Results and DISCUSSION

Rock fragmentation prediction using collected data

After the data were gathered, the geometric, explosive and rock parameters were used for the prediction of the fragmentation output for each of the blasts considered. The prediction was done using the Kuz-Ram and adapted the Rosin–Rammler model using excel Calculator model.

Volume of boulder produced per hole =volume of rock blasted per hole x % of boulders produced

165x0.1625=26.81m^3, Tonnage of large boulders= volume of total boulders x bulk density

26.81x2.51=57.65 tonnes per hole

Total tonnage of boulders per round of blast=Tonnage of large boulders x number of holes

57.65x20=1152.94tonnes per round.

The results of the model calculator are shown in fig 5.1, 5.2 with the parameters in red representing the calculated values while the rest are the values entered to the calculator to generate the desired parameters based from Kuz ram and Rosin Rammler empirical models.

Design parameters calculations

Burden (B) a) Using Scott and cocker, 1996 formula, $B = 19.7 \times d^{0.79}$ $= 19.7\times 0.150^{0.79}$ = 4.4m

Where; d = diameter of blast hole in meters

Also according to Wesley L. Bender burden should be 24 to 36 times of the explosive diameter. Hence, B = (24+36) x 0.150/2 = 4.3m: approximately 4m.

From the above calculations, the influence of the blasthole diameter on determining the burden size can be noted. From research, it has been noted that the increase in the blasthole diameter will result to increase in the burden size. This can translate to an increase in blasting related problems like fly rocks, vibration and fragmentation hence the need to analyze the blast well for effective production.

Spacing (E)

From the mathematical model used to calculate burden, we have obtained a burden of 3m

According to Wesley L. Bender, Spacing **= (1.0 to 2.0)** times the burden,

Therefore 1.0x 4m =4m

Stemming (h_0)

According to Wesley L. Bender, h_0 = 0.3×Bench height = 0.3×12 (sub drill included) =3.6m

Sub drilling (u)

Konya and Walter, 1990 defined sub drill as, u=0.3×burden =0.3×4 =1.2 m

Explosive charge length (l)

l = Blast hole length +sub drill– stemming length (Konya and Walter, 1990).

= 10m – 3.3m+1.2m = 7.9mapproximate 8 m

Q_E the mass of explosive being used (kg)

$$Q_E = \text{volume x density}$$

$$QE = \pi r^2 h \; x \; 840kg/m^3$$

$$= \pi\left(\frac{150}{1000x2}\right)^2 \text{x8m x 840kg/m}^3$$

$$= 118.8kg$$

Prediction of blast fragments using defined blast design parameters

By using the developed excel model to predict the mean fragment, the uniformity index and fraction of material retained as boulders. From the parameters calculated using other researchers' empirical formulas it was observed that their application in prediction of the mean fragment yielded a mean of 28.35cm with a lower percentage material retained of 0.649%. This is a great improvement compared to the parameters already in use at the quarry.

Figure 5.1: shows blast hole parameters currently in use at Bissel quarry. It can be seen that the mean fragment produced from the quarry blast were 45.15 cm, the percentage of material retained on the crusher were 16.25%. This percentage is equivalent to 1,152.94 tonnes per round of 20 blast holes. The crusher gape of the quarry is 80cm. It means that 16.25% of the blasted limestone were larger in size than the crusher gape. This is an indication of the presence of large boulders observed currently at the quarry.

Figure 5.2 show the blast hole parameters prediction defined for use at Bissel quarry. From the parameters calculated using other researchers' empirical formulas it was observed that their application in prediction of the mean fragment and material retained yielded a mean of 28.35cm with a lower percentage material retained of 0.649%. This is a great improvement compared to the current parameters in use at the quarry. This implies that the ore will be highly fragmented with good top size which is less size than the crushers gape and hence an insignificant boulder would be produced per blast.

In order to achieve the best possible profile for the final excavated wall presplitting technique this research recommended its use in Limestone mines. This involves the drilling of closely spaced holes at the planned excavation perimeter which are lightly loaded with explosive in order to generate an appropriate borehole pressure

6. CONCLUSION

Kuz Ram and Rosin Rammler being empirical models, which infers finer fragmentation from higher energy input, it is more about guidance rather than accuracy. The results obtained remain a starting point to give an overview of what is expected of an adjustment to a preexisting blast design.

It can therefore act as a datum for evaluating different designs, investigating the effect of changing certain variables and predicting the size distribution to be produced by the design.

Furthermore, the simplicity of the model and the relative ease of gathering the data required to serve as feed to the model remains a major advantage of the model and putting it on the forefront of fragmentation prediction models. A general overview of results from various designs can also be examined using this simple model. The most important function of Kuz–Ram is to guide the blasting engineer in thinking through the effect of various parameters when attempting to improve blasting effects.

By using the developed excel model calculator which adopted both Kuz ram and Rosin Rammler models, the larger boulders being produced at the Limestone quarry can be

significantly reduced. The model calculator is effective and the values can be adjusted to suit the desired bench height requirement of even other Limestone quarries.

Presplitting was suggested in order to obtain a better profile after each blast. The advantage of this method over others is that it can employ the same diameter hole used for production drilling.

REFERENCES

Anon. (2012), "Blasthole Drilling in Open Pit Mining", Atlas Copco Drilling Handbook (3rd Edition), www.atlascopco.com/blastholedrill., 300 pp. Accessed: August 18, 2015.

Anon. (2014), "Ajopa Mineral Resource Update – Feb., 2014", Mineral Inventory Report for AngloGold Ashanti, Continental Africa: Geology, 48 pp.

Anon. (2015a), "AngloGold Ashanti Iduapriem Mine – Mining Department", Unpublished Induction PowerPoint Slides, Tarkwa, Ghana, 49 pp.

Ash, L. R. (1968),The Design of Blasting Round, Pfleilder, E. P., ed., AIME, New York,pp. 387

Cunningham, C. V. B. (2005), "The Kuz-Ram Fragmentation Model – 20 Years on", Proceedings of the Brighton Conference 2005: European Federation of Explosives Engineers, Halmberg, R. et al (ed.), Brighton, Sussex, England, pp. 201 – 210.

Esen, S and Bilgin, H. A. (2006), "Effect of Explosive on Fragmentation", http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.131.3650&rep=rep1&type=pdf, 12 pp. Accessed: August 20, 2015.

Esen, S. (2013), "Fragmentation Modelling and the Effects of ROM Fragmentation on Comminution Circuits", Proceedings of the 23rd International Mining Congress and Exhibition of Turkey, Antalya, Turkey, pp. 251 – 260.

Johnson, C. E. (2014), "Fragmentation Analysis in the Dynamic Stress Wave Collision Regions in Bench Blasting", Unpublished PhD Thesis Report, University of Kentucky, U.S.A, 158 pp.

Johnson, N., De Klerk, Q., Yeo, W. and Roux, A. (2012), "Technical Report and Mineral Resource and Reserve Update for the Nzema Gold Mine, Ghana, West Africa", Report Prepared for Endeavour Mining Corporation, Cayman Islands, 205 pp.

APPEDIX

Figure 5.1: Blast Hole Parameters Currently in Use at Bissel

1	**BISSIL LOW CARBONATE LIMESTONE BLAST DESIGN**	
2		
3		
4		
5	**A** the rock factor (or blastability index)	9
6	**V** volume of blasted rock, m cubic	165
7	**K** Powder factor	0.72
8	**Qe** Mass of explosive charge per hole, per kg	118.8
9	**E** Relative weight strength of explosive (ANFO = 100)	100
10	**U** sub drill	1.2
11	**B** Burden(m)	4
12	**D** Hole Diameter (mm)	150
13	**W** Standard deviation (m)	0.15
14	**S** Spacing	4
15	**Lc** Column Charge Length	7.2
16	**Lb** Bottom Charge Length (m)	1
17	**L** Total Charge Length (m)	8.2
18	**H** Bench Height (m)	10
19	**Xm** Mean fragmentation size (cm)	28.3544
20	**X** Crusher gape(cm)	80
21	**N** Uniformity index	1.91234
22	**Xo** Characteristic size	34.3483
23	**Rx** The fraction of rock retained on the screen	0.00649
24	**Øx** Distrion function	0.99351
25	**ho** Stemming(m)	3

Figure 5.2: Blast Hole Parameters Prediction for Use at Bissel Quarry.

VALIDATION OF GIS BASED APPROACH OF OPTIMALLY LOCATING

Exploration Targets During Gold Exploration in Kakamega, Western Kenya.

Abstract

When a new borehole is drilled during mineral exploration, it needs to be located in the field at a location that will hit a mineral target yet not interfere with the exploration budget. Due to the heterogeneity in field properties, there may be places where drill holes need to be located close from each other or further apart. Drilling is also time-dependent in that the entire exploration program is legally and technically time bound. To complicate the issue further, the placement of the borehole must also consider the decision as to direction of inclination. [79]

The choice of the drill holes locations, spacings, orientations and patterns during gold exploration is based on the knowledge of the continuity, strike and dip of the subsurface mineralization. Geological, geochemical and geophysical nature of the surface environment obtained through respective exploration methods as reflected in anomalies in a particular locality individually do not sufficiently define the subsurface nature of mineralization which is the basis for the drilling decisions. [80]

An exploration model that outlines the criteria for making drilling decisions has been the key deficiency in gold exploration in western Kenya. An attempt to overcome this problem was proposed and defined by Mutua et al. (2018) where data from preliminary surface exploration methods was used in a GIS based optimization approach for exploration drilling.

This study therefore seeks to validate the criteria defined by Mutua et al. (2018) where he postulated that the nature of surface environment in relation to the subsurface for Lirhanda corridor gold prospect can be used in generating a predictive model giving recognition to the geological aspect in defining mineralized blocks. His approach involved a check on the available geochemical, geophysical and geological data related to gold mineralization and correlating them to the subsurface environment to generate a consistent link. This therefore set a reliable base for the model validation which can then be performed to the defined 'geologic' blocks to optimize drill hole locations and hence a validated optimum model for making drilling decisions and a guide in further gold exploration within Lirhanda corridor and other similar occurrences. The research validates the reliability of remote sensing, geophysical, geochemical and geological data in identification of gold mineralization.

Key words: Validation, Drilling, Targets, Model, Exploration, Optimizati

Introduction

The objective of any gold exploration company is to operate at the minimum costs possible. While almost all mineral exploration involves drilling to precisely establish the mineral resource located, drilling generally represents the largest single cost associated with mineral exploration and the delineation of an ore deposit once it has been discovered. Decisions on

[79] Güyagüler Baris, 'Optimization of Well Placement and Assessment of Uncertainty'.

[80] Dindi and Maneno, 'Geological and Geophysical Characteristics of Massive Sulphide Deposits: A Case Study of the Lirhanda Massive Sulphide Deposit of Western Kenya'.

where to drill, how to drill and when to start and stop drilling are critical and are influenced by the level of certainty or uncertainty of the sought mineral. Due to the expensive nature of the exploration drilling; clear, certain projections and rapid reporting are needed for accurate drill hole locations to achieve timely decisions before and during the drilling exercise, there is also need for a projected model at a more local scale [81]. This is to ensure that surface to near surface information can be correlated to the subsurface gold occurrence to make these critical drilling decisions.

Presently, distinctive exploration models have been documented for many types of deposits, and different elements show characteristic patterns of enhancement or depletion with proximity to mineralization [82]. Nevertheless, although many typical deposits display similar regional-scale controls and commonly occur in the same camps, they differ in styles of mineralization, metal association, interpreted crustal levels of emplacement and relative age. The Western region of Kenya has revealed gold potential since 1953 [83] and has been a target for exploration. However, not much could be shown from these long-time efforts until recently in 2015 when Acacia mining identified considerable and possibility of more deposits in the area. Primarily because there is no developed robust exploration model for gold in this area, it has been difficult to locate the deposits. Furthermore, most of the original old gold mines were abandoned as dangerous holes covered with vegetation. The exploration company has therefore called for more research to be done to help in further exploration of this very high gold potential area.

It was therefore necessary to use the available exploration data to establish the relationship between surface and the subsurface of Lirhanda area. This will assist in the understanding of the occurrence of the gold deposit hence the development of an optimum model for effectively locating such deposits with ease and optimizing drill location. Such model having been proposed and done, is hereby validated by use of GIS based procedures to identify the conformity of the validation area to that of the previously defined criteria.

Methodology

Data-based approach involves the build-up of a voluminous database containing various geoscientific data [84]). The database used often in this approach contains remotely sensed data, geophysical, geological and geochemical exploration data. A meaningful geostatistical interpolation and integration techniques on exploration data with careful attention to geological controls on mineralization provide more reliable block by block mineral prospects. Understanding the geological character of a mineral deposit as thoroughly as possible is an essential base on which to build an estimate of mineral inventory [85]

The methodology initially used to define the criteria for optimal drill holes involved an integrated approach in treatment of exploration data to come up with a conclusive evidence of the underlying mineralization as shown in figure 1.1

[81] Holliday and Cooke, 'Advances in Geological Models and Exploration Methods for Copper ± Gold Porphyry Deposits'.

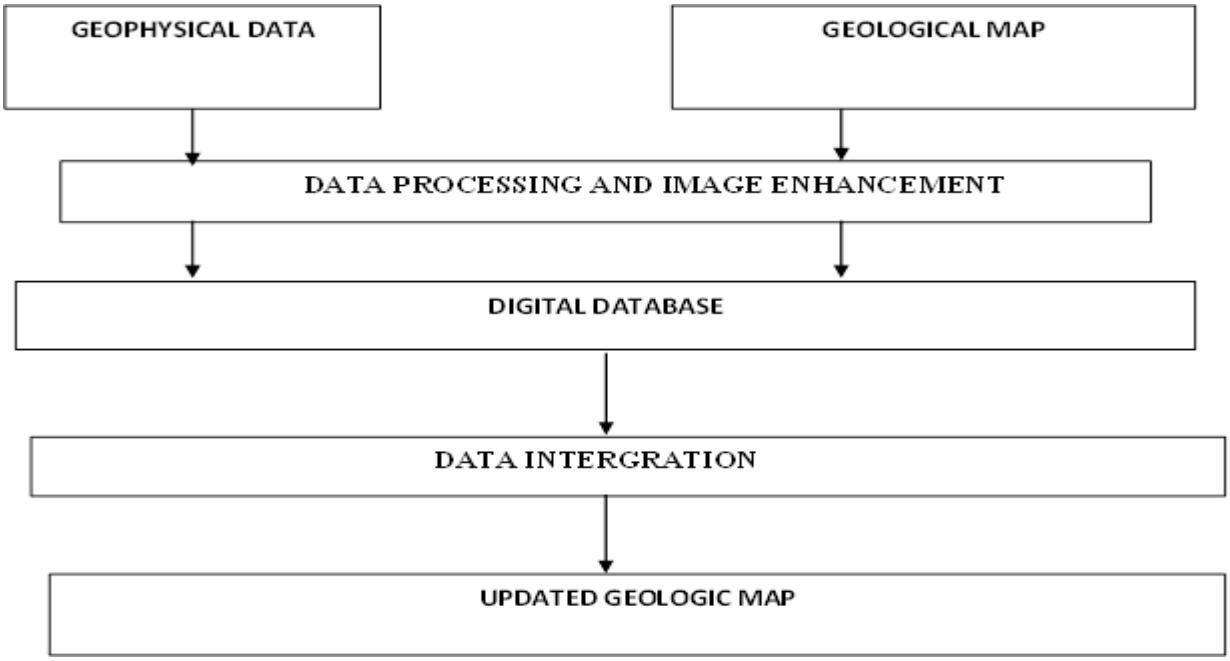
[82] McClenaghan, 'Indicator Mineral Methods in Mineral Exploration'.

[83] Tosdal, 'Paper Number : 3938 Geology of the Archean Busia-Kakamega Greenstone Belt , Western Kenya'.

[84] (Harris et al., 2001)

[85] Soltani and Hezarkhani, 'Proposed Algorithm for Optimization of Directional Additional Exploratory Drill Holes and Computer Coding'.

Step 1.



Step 2.

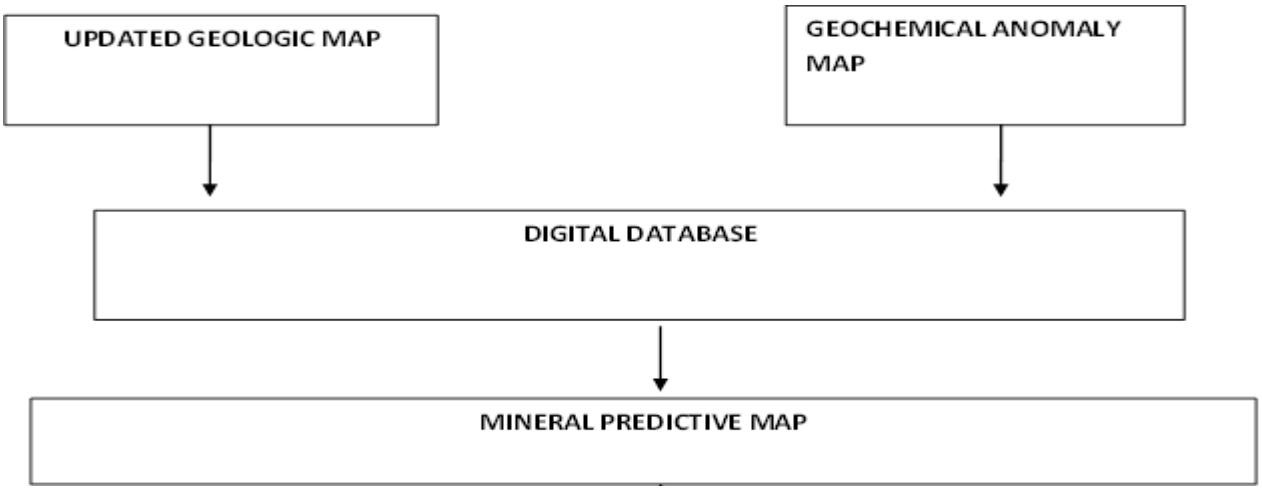


Figure1.1: Methodology chart for validation process

The result of step one and two which have been published in another work are displayed in figure 1.2 and are used in this case to portray the criteria modelled by the author, hereby being validated.

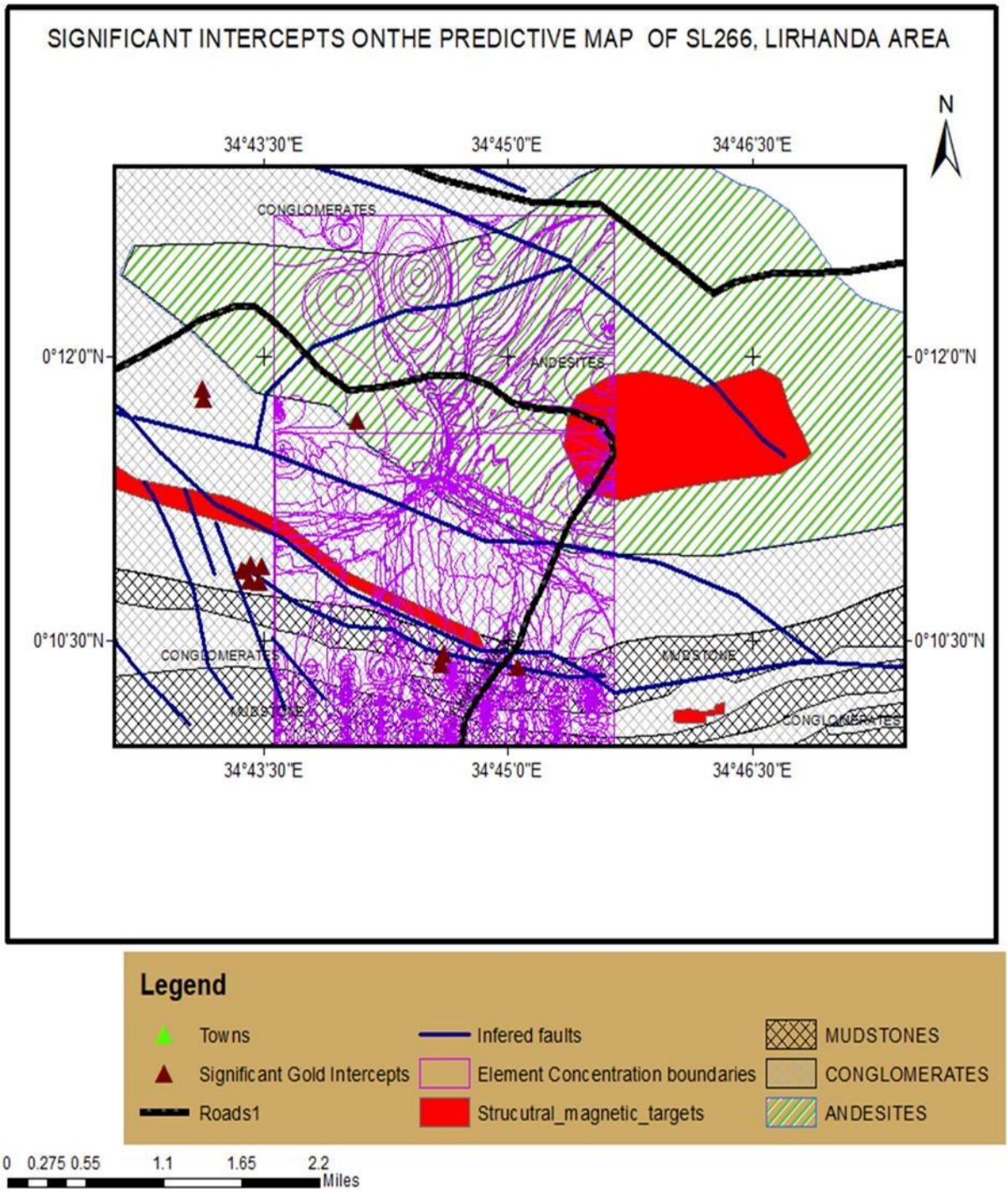


Figure 1.2: Spatial correlation of all datasets in relation to geology and structures hereby Gold predictive map of the study area showing element enrichment superimposed on the updated geological map.(after Mutua, 2018)

Figure 1.2 defines the optimum drilling locations during gold exploration in this area as those within the proximity to interpreted magnetic targets as well as within mudstones, conglomerates and andesite lithologies and along the interpreted magnetic targets and fault

lines. The purpose of this validation procedure is therefore to confirm the defined criteria. Step 3

Model Validation

To test the consistency of the criteria defined by Mutua et al. (2018), drilling and/or sampling at preselected locations from the predictive map to test the success of the model were necessary. A location of known geological and geophysical data was selected and tested for compliance to gold mineralization. The SL266 geochemical soil samples by AEK used in the generation of this projected model were collected from within mudstones, conglomerates and andesites as well as from within the proximity of interpreted structural controls and magnetic targets. For consistency therefore, samples points were preselected from the map from locations with similar geology and structural features as those of SL266 BY AEK (figure 1.2) which were in support of gold mineralization. The coordinates for these sample locations were calculated from the GIS software. Results are displayed for a region sharing geology with SL266. Fifteen Samples were collected at different depths from shafts proximal to these preselected sampling points within Isulu and Bushiangala areas. They were then tested for Fe, Sb, Cd, Hg, Bi, Ag, Mo, As, W, Pb, Cu, Zn and Sn using AAS method at the Ministry of Mining laboratories. Spatial distribution of samples shows the underlying geology from which these samples were selected. NB. Negative values show no detected elements.

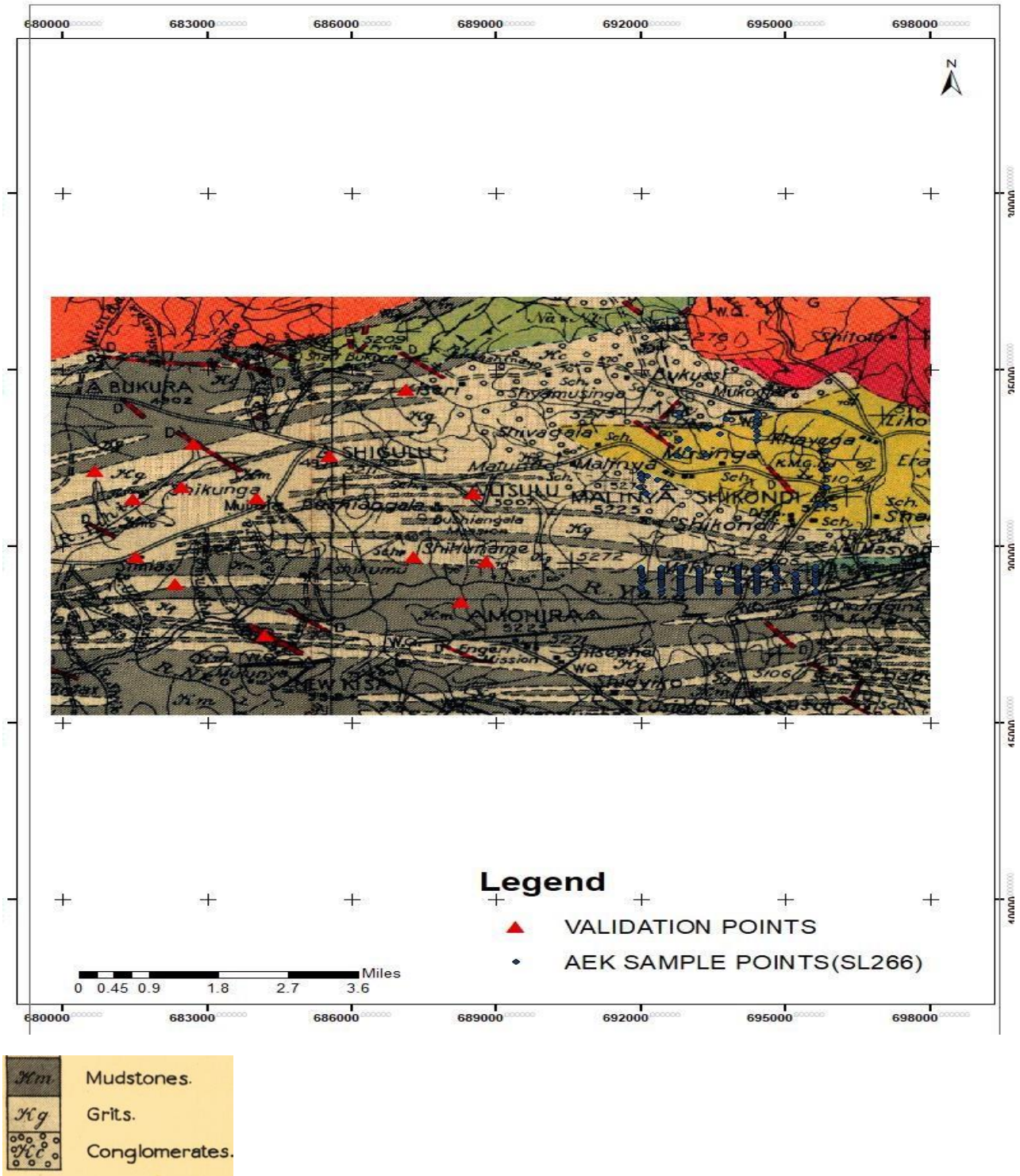
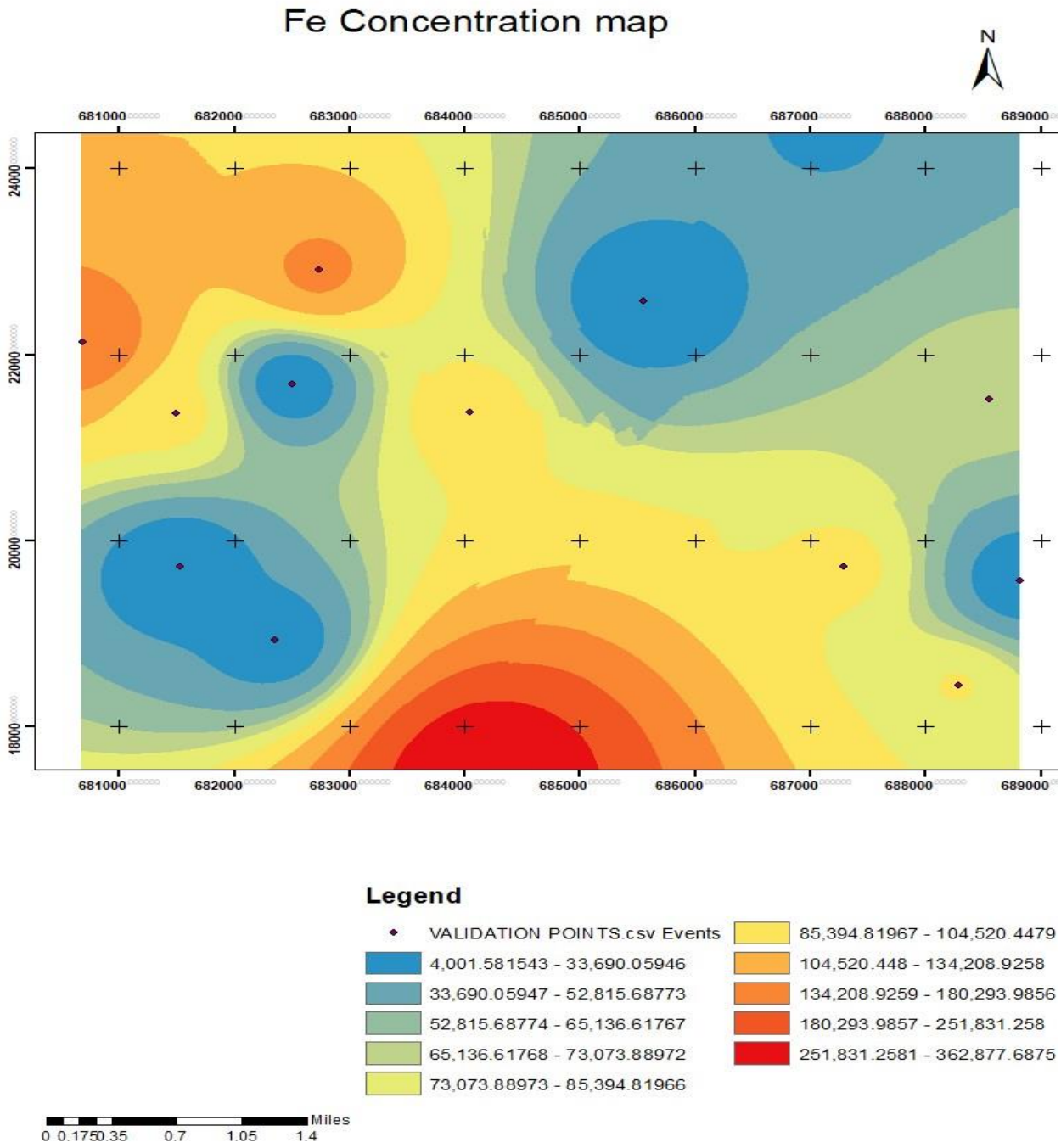


Figure1.3: Spatial distribution of validation points vs. AEK sampling points with respect to the geology (Extracted from Huddlestone, 1953)

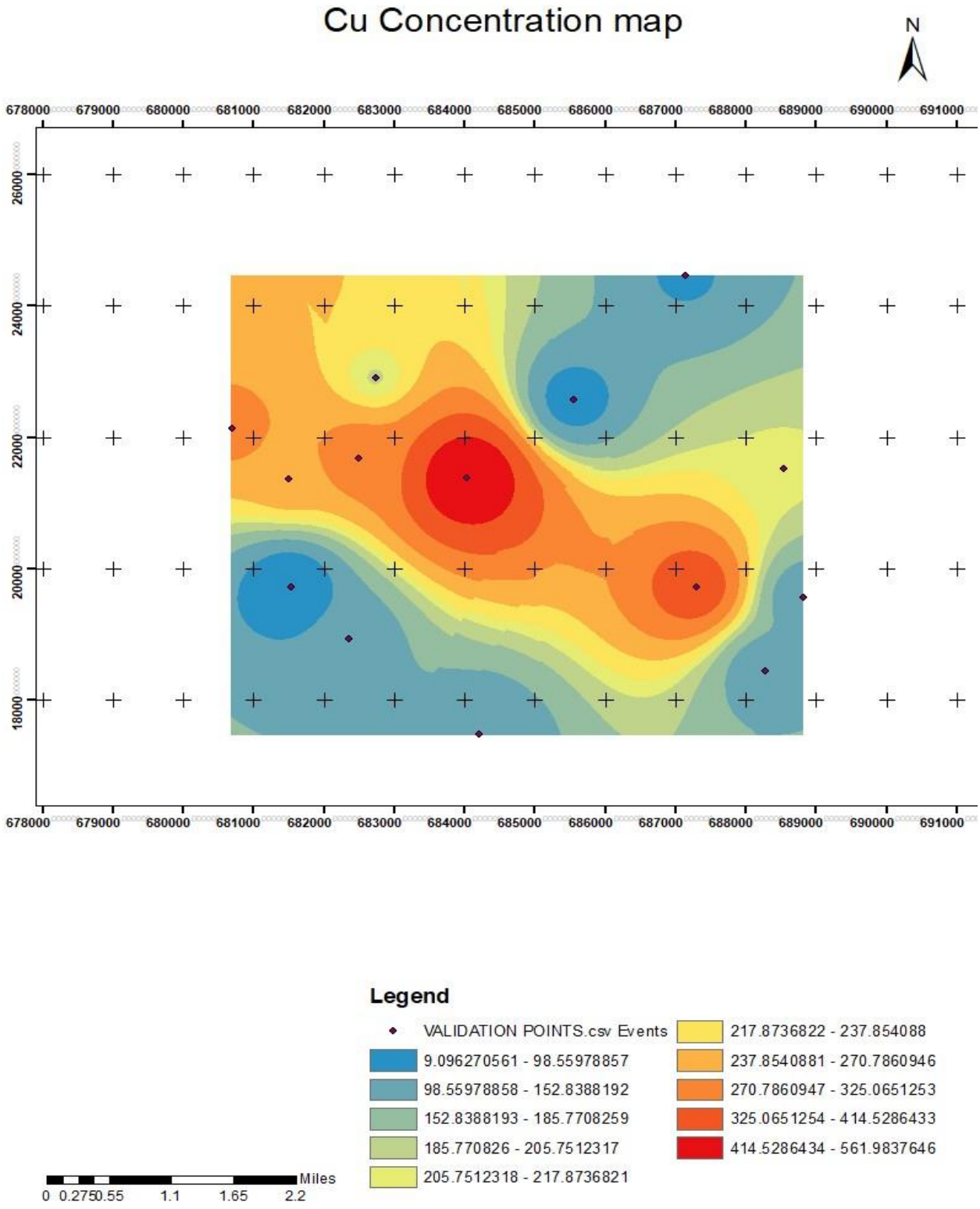
Table 1: AAS results from study area (ppm)

Sample code	x	Y	Fe	Sb	Cd	Hg	Bi	Ag	Mo	As	W	Pb	Cu	Zn	Sn	Au
A	688278	18445.27	86120	-1	-1	-1	-1	-1	-1	18	-1	-1	115.06	201.8	-1	7.99
B	688814.5	19568.46	14684	-1	-1	-1	-1	-1	-1	-1	-1	-1	117.3	98	-1	6.73
C	687288.9	19719.33	90732	-1	-1	-1	-1	-1	20	-1	-1	54.08	386	100.4	-1	8.06
D	688546.2	21513.08	69325	-1	-1	-1	-1	-1	-1	11.04	-1	-1	210	76.04	-1	13.55
E	685545.5	22569.22	8360	-1	-1	-1	-1	-1	58	27.08	-1	-1	58	78.98	-1	38.58
F	687138.1	24446.79	30580	-1	-1	-1	-1	-1	-1	21.06	-1	-1	89.01	82.34	-1	10.35
G	682343.5	18931.42	15380	-1	-1	-1	-1	-1	10.5	20.04	-1	-1	116.4	198.9	-1	8.08
H	681522.1	19719.33	3980	-1	-1	-1	-1	-1	22	-1	-1	-1	9.03	9.08	-1	8.22
I	681488.6	21362.21	91560	-1	-1	-1	-1	-1	34	9.04	-1	-1	260	189	-1	5.87
J	680683.9	22133.35	172890	-1	-1	-1	-1	-1	-1	1160	38.02	-1	290.04	486.07	420	7.22
J2	682494.4	21680.72	10205	-1	-1	-1	-1	-1	26.89	-1	1489	-1	301.04	756	-1	19.41
K	684036.7	21378.97	98600	-1	-1	-1	-1	-1	938	26.48	12.01	0.8	562	499	-1	27.35
L	682729.1	22904.5	144840	-1	-1	-1	-1	-1	-1	1320	26.78	119.24	204	401	-1	11.28
M	684204.3	17472.95	362884	-1	-1	-1	-1	-1	131	496	9.04	242	101	620	-1	6.52

Performing geostatistical interpolation of the above data yielded the following integral maps.
IDW Validation Maps

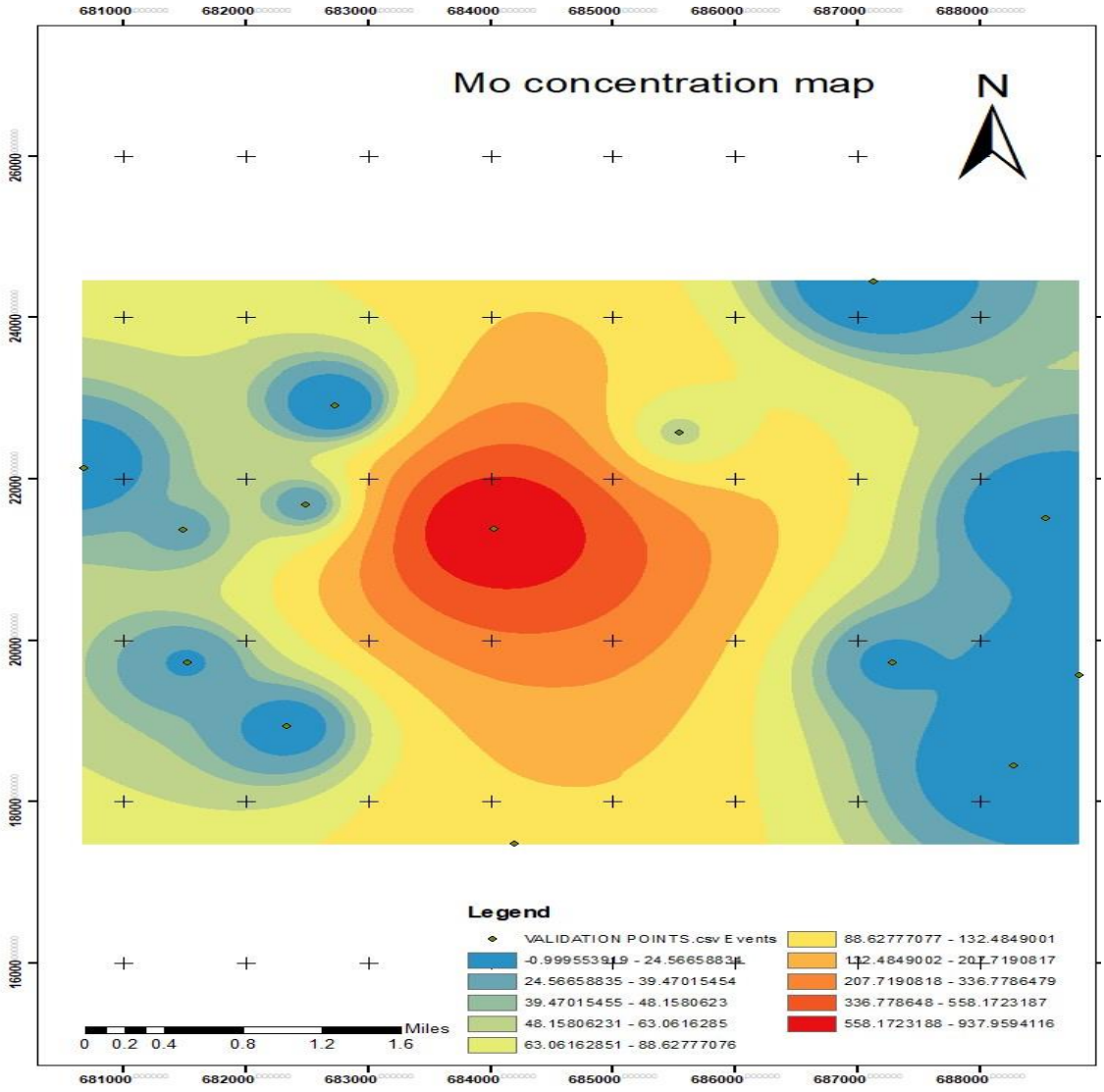


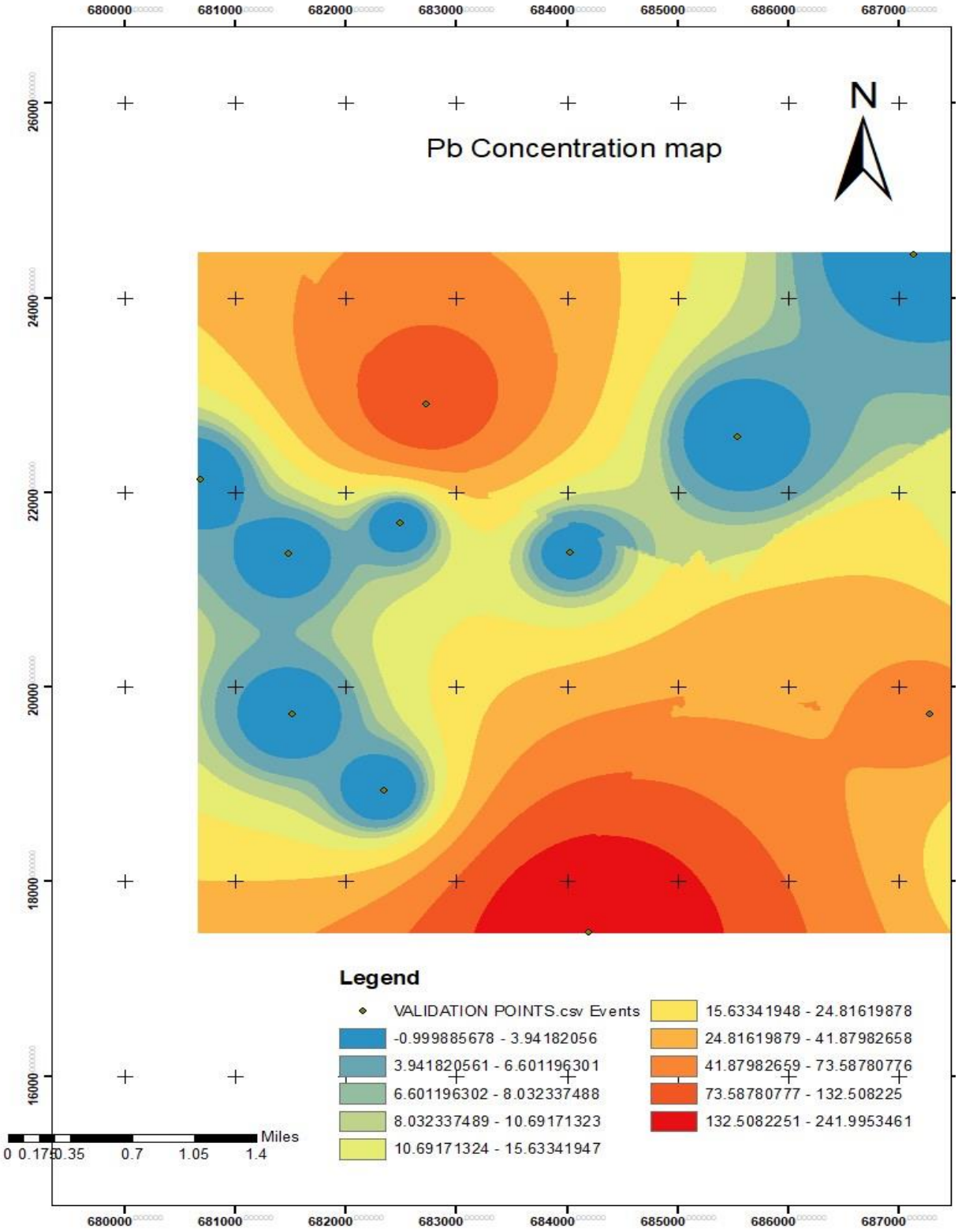
a)


Cu Concentration map
N
678000
679000
680000
681000
682000
683000
684000
685000
686000
687000
688000
689000
690000
691000
26000
24000
22000
20000
18000
Legend
VALIDATION POINTS.csv Events
9.096270561 - 98.55978857
98.55978858 - 152.8388192
152.8388193 - 185.7708259
185.770826 - 205.7512317
205.7512318 - 217.8736821
217.8736822 - 237.854088
237.8540881 - 270.7860946
270.7860947 - 325.0651253
325.0651254 - 414.5286433
414.5286434 - 561.9837646
Miles
0 0.275 0.55 1.1 1.65 2.2

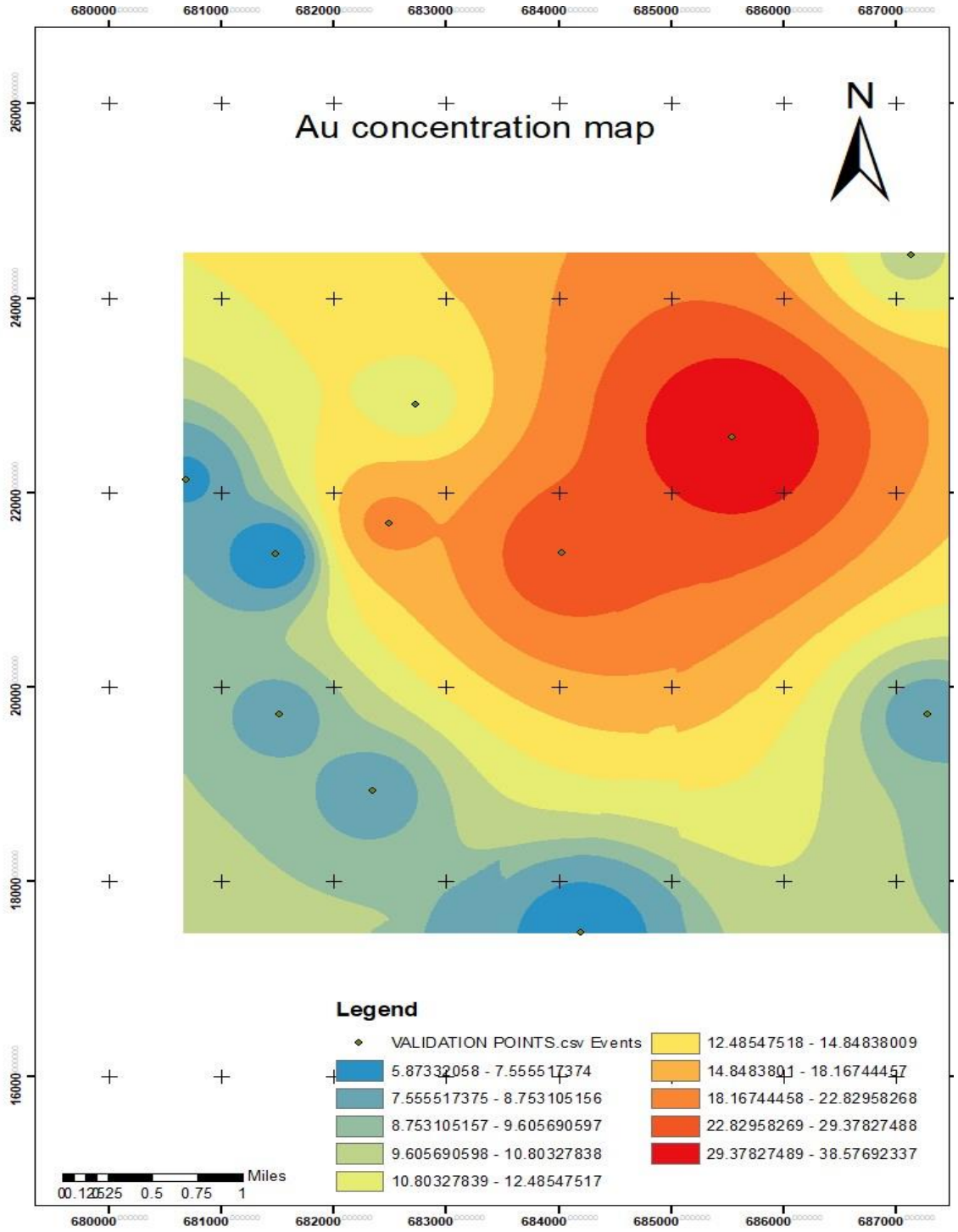
b)

c)


Mo concentration map
N
681000
682000
683000
684000
685000
686000
687000
688000
26000
24000
22000
20000
18000
16000
Legend
VALIDATION POINTS.csv Events
-0.99955391 - 24.56658834
24.56658835 - 39.47015454
39.47015455 - 48.1580623
48.15806231 - 63.0616285
63.06162851 - 88.62777076
88.62777077 - 132.4849001
132.4849002 - 207.7190817
207.7190818 - 336.7786479
336.778648 - 558.1723187
558.1723188 - 937.9594116
Miles
0 0.2 0.4 0.8 1.2 1.6


Pb Concentration map
N
680000
681000
682000
683000
684000
685000
686000
687000
26000
24000
22000
20000
18000
16000
Legend
VALIDATION POINTS.csv Events
-0.999885678 - 3.94182056
3.941820561 - 6.601196301
6.601196302 - 8.032337488
8.032337489 - 10.69171323
10.69171324 - 15.63341947
15.63341948 - 24.81619878
24.81619879 - 41.87982658
41.87982659 - 73.58780776
73.58780777 - 132.508225
132.5082251 - 241.9953461
Miles
0 0.175 0.35 0.7 1.05 1.4

d)



e)

Figure 1.4: Spatial correlation of a) Fe, (b) Cu, (c)Mo, (d) Pb and (e)Au within validation area.

Cu, Ag, Mo, Pb and Au were observed to be significantly concentrated over the validation area suggesting the possibility of sulphide mineralization within the area. Figure 1.4 is a summary of the above concentration maps displayed at 70% transparency over the geology of the area to ascertain the selection criteria used to select drill locations. It is evident from the map that

those locations showing enrichment lie within the Mudstone, andesite and conglomerate lithologies as well as well as along the inferred fault lines. The element concentrations also show a trend suggesting the trend of possible mineralization. A close look into the synoptic map reveals a dense concentration of element classes which also is an agreement to the defined criteria.

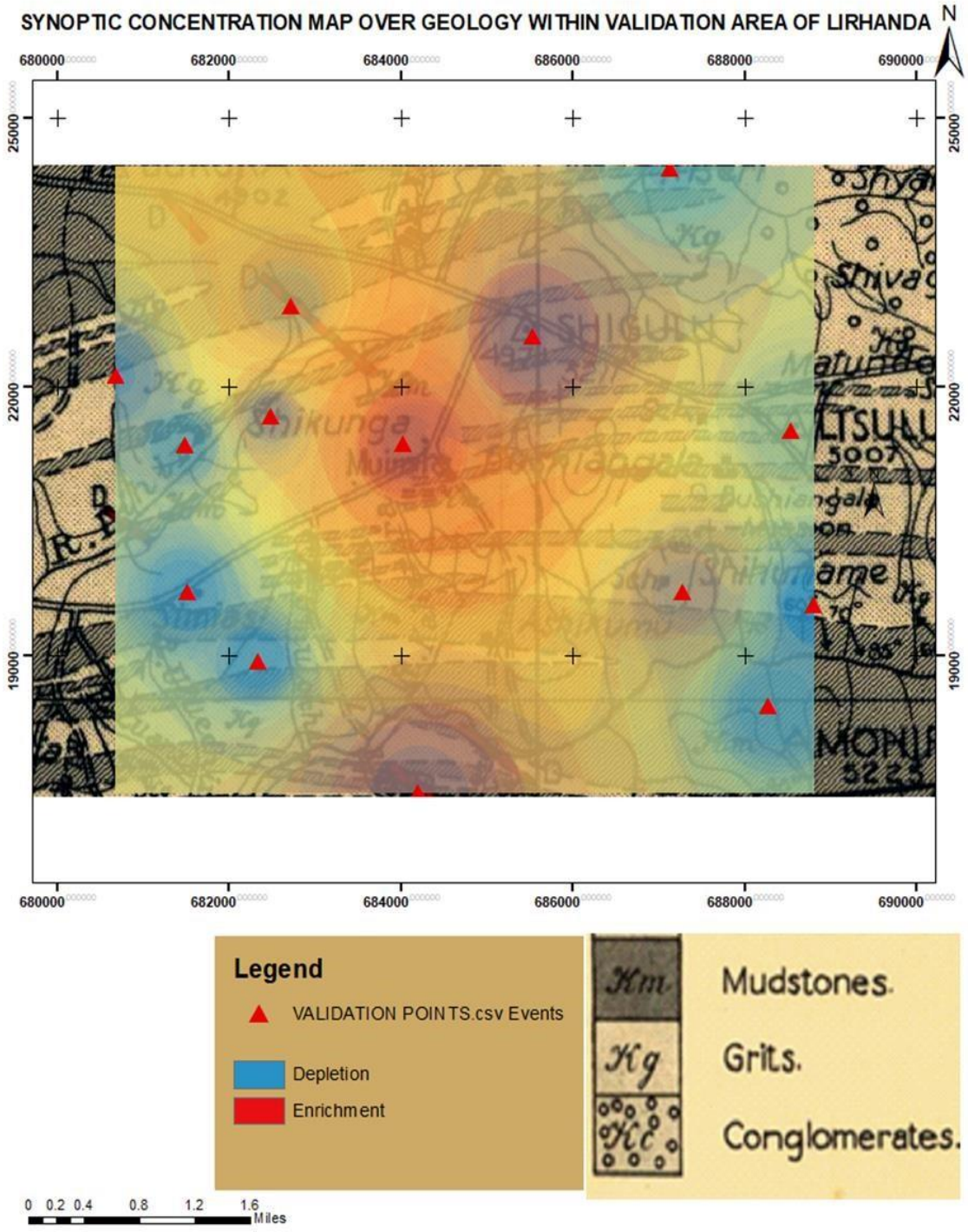


Figure 1.5: Synoptic element concentration map within Validation area of Lirhanda corridor

Visual inspection of the concentration maps in figure 1.4, clearly shows that the base metals except for the silver are spatially correlated with enrichments trending North-south and NW SE diagonal of the sampled area. This is the area characterised by the interpreted intrusions in the same direction of enrichment and also by the mudstones, conglomerates and andesite lithologies. This relates well to the defined criteria as in (figure 1.2).

Conclusions

To have exploration drilling done at a minimum cost possible within Lirhanda gold exploration project by AEK, a research to optimise drilling locations using the available surface exploration data was invited, conducted and hereby validated. A GIS based interpolation technique for the geochemical data and spatially relating it to the geological and geophysical data was employed. Surface Niton XRF data was primarily used to generate concentration maps for different pathfinder elements within the special licence area SL266 of the Lirhanda gold project. A digital geochemical database was created from these maps using the GIS software and then superimposed on digital features created from the geophysical and geological data sets. Preselected points and areas which showed more positive spatial correlation of all the three data sets and which were defined to be optimum as drill locations in this project area were successfully validated and the following conclusions were made;

Base metal and low grade gold intercepts were encountered at the preselected points, that is "optimal drill locations". There were pyrite intercepts but low gold intercepts encountered as revealed by the results from existing shafts which fall within the preselected "optimum locations".

Existing shafts proximal to the preselected drill locations which were used for sample collection revealed mineralized quartz veins indicative of gold mineralization.

The associated geology and geophysical interpreted targets as well as structural features of those areas which indicated possible mineralization showed similarity to those of the preselected drill location.

The defined criteria is a very appropriate replacement of the trial and error methods by the artisanal miners in Kakamega who have previously used the landmarks left during the pre-colonial era to locate their shafts which most often ended up a disappointment.

Preliminary exploration data can be utilised appropriately to understand the subsurface and optimize drilling locations hence reducing the exploration expenditure.

The more prospective locations for drilling were confirmed to be those reflecting a coincidence in supporting geology, fault lines and within the proximity to interpreted magnetic targets. These locations are within mudstones, conglomerates and andesite lithologies as well as along the interpreted magnetic targets and fault lines and are therefore hereby referred to as the optimum signatures for gold mineralization in Lirhanda corridor.

Together with previous research done on the same area, this work can be used to indirectly reduce unnecessary drill holes and determine when to stop or continue drilling. The selected drilling points can be used to determine whether there is a sulphide mineralization which could be gold. Decision to stop drilling exercise can be made on the basis of the type of sulphide mineralization encountered.

Recommendations

Based on the findings of this study during the validation exercise, the following recommendations were made;

To optimize the drilling exercise in the same area the company in charge has to priotize on the preselected areas defined by this research work to help them know when to proceed or stop exploration drilling.

Further Model validation by drilling on the more prospective areas to determine compliance to the sulphide mineralization which would in turn help determines gold mineralization.

Adapt the defined criteria to help artisanal miners to locate their shafts with an improved certainty. Artisanal miners from Kakamega area have for a long time used traditional methods to locate their shafts.

Further validation to be done by visual inspection of superimposed gold intercepts on data maps from SL277 and SL265 special license areas to confirm the defined criteria for drill hole location.

On behalf of all authors, the corresponding author states that there is no conflict of interest.

References

Asadi, H. H. and Hale, M. (2001) 'A predictive GIS model for mapping potential gold and base metal mineralization in Takab area, Iran', Computers and Geosciences, 27(8), pp. 901–912. doi: 10.1016/S0098-3004(00)00130-8.

Brown, L. and Vearncombe, J. (2014) 'Critical analysis of successful gold exploration methods', Applied Earth Science, 123(1), pp. 18–24. doi:

10.1179/1743275814Y.0000000050.

E.Mathu (2000) 'Petrology and tectonic evolution of the Archean and Neoproterozoic rocks of the Kakamega_Kapsabet area, Western Kenya; Unpublished Phd Thesis, University of Nairobi; Pp 335

Gershon, M., Hall, S. and Auen, L. E. (1988) 'Application of a new approach for drillholes location optimization', in lmernational Journal afSurfau Mining, pp. 27–31.

Harris, J. R., L. Wilkinson, and M. Bernier. 2001. 'Analysis of Geochemical Data for Mineral Exploration Using a GIS — A Case Study from the Swayze Greenstone Belt,

Northern Ontario, Canada'. Geological Society, London, Special Publications 185

(1): 165–200. https://doi.org/10.1144/GSL.SP.2001.185.01.08.

Holliday, J R, and D R Cooke. 2007. 'Advances in Geological Models and Exploration

Methods for Copper ± Gold Porphyry Deposits'. Proceedings of Exploration 07: Fifth Decennial International Conference on Mineral Exploration, 791–809.

Ibrahim, A. M. and Bennett, B. (2014) 'Point-based model for predicting mineral deposit using GIS and machine learning', Proceedings of the 2014 First International Conference on Systems Informatics, Modelling and Simulation, SIMS, 14, pp. 83–

88. doi: 10.1109/SIMS.2014.22.

McClenaghan, Margaret Beth. 2011. 'Indicator Mineral Methods in Mineral Exploration'. 25th International Applied Geochemistry Symposium, no. 22-26 août 2011, Rovaniemi, Finland, B92-4: 72. https://doi.org/10.1144/1467-7873/03-066.

Mitchell, N., Lung, T., & Schaab, G. (2006, May). Tracing significant losses and limited gains in forest cover for the Kakamega-Nandi complex in western Kenya across 90

years by use of satellite imagery, aerial photography and maps. In Proceedings of the

ISPRS (TC7) Mid-Term Symposium "Remote Sensing: From Pixels to Processes (pp. 8-11).

Mohammadi, S. S., Hezarkhani, A. and Erhan Tercan, A. (2012) 'Optimally locating additional drill holes in three dimensions using grade and simulated annealing', Journal of the Geological Society of India, 80(5), pp. 700–706. doi: 10.1007/s12594012-0195-8.

Ogola, J. S. (1987) 'Mineralization in the Migori greenstone belt, Macalder, Western Kenya', Geological Journal, 22(2 S), pp. 25–44. doi: 10.1002/gj.3350220605.

Rop, B.K. and Namwiba, W.H. (2018). Fundamentals of Applied Geology: Competency and Evaluation Approach. LAP LAMBERT Academic Publishing, Germany ISBN-13:

978-613-9-57896-2.

Soltani, Saeed, and Ardeshir Hezarkhani. 2013. 'Proposed Algorithm for Optimization of

Directional Additional Exploratory Drill Holes and Computer Coding'. Arabian Journal of Geosciences 6 (2): 455–62. https://doi.org/10.1007/s12517-011-0323-6.

Tosdal, R. (2000) 'Paper Number : 3938 Geology of the Archean Busia-Kakamega Greenstone Belt , Western Kenya', pp. 3–5.

Verly, G., Postolski, T. and Parker, H. (2014) 'Assessing Uncertainty with Drill Hole Spacing Studies – Applications to Mineral Resources', 1(1), pp. 24–26.

Evidence
Action

DISPENSERS FOR SAFE WATER



Optimizing Access to Safe Water Through Chlorinated Dispensers in Rural Kenya, Uganda and Malawi

Philip Komo Kahuho[1], Phirista Nakato Nassali[1], James Maina[1], Paul Byatta[1]Evidence Action[1]

Contact:

Evidence Action

P.O.Box 35731-00100

Daykio Plaza | Ngong Lane (Off Ngong Road) | Nairobi Kenya

Tel: +254 (0) 716 079 521 | email: info@evidenceaction.org

Web:www.evidenceaction.org

Abstract

The use of unsafe water has been the primary cause of diarrhea, the main child- Mortality contributor causing 1 in every 10-child deaths (WHO, 2009), yet 58% of diarrhea cases can be averted through safe-drinking water, sanitation and hygiene (WHO, 2014). Use of chlorine treatment reduces diarrhea risk by 40% for regular users. Evidence Action is implementing a community-based "Dispensers for Safe Water (DSW)" program aiming at improving community access to safe drinking water by installing chlorine dispensers at communal water points in rural areas. The installed free chlorine dispensers currently provide 4.7 million people across Kenya, Uganda, and Malawi with access to quality household safe drinking water. This study utilized a cross-sectional design with multi-stage stratified sampling techniques to assess chlorine adoption among communities in Kenya, Uganda, and Malawi. The sample consisted of 73,513 households and 8,319 water points across three countries. Two-stage sampling technique was used to select water points and households to be visited; stratified sampling method where Uganda, Malawi, and Kenya were treated as strata and used a simple random sampling method to select 1.5% water points within each stratum. The simple random sampling method was used to select eight households per water point that were visited every two months to assess; dispenser hardware functionality, community Chlorine adoption rates and availability of chlorine. Results indicated that; female respondents from Uganda and Malawi were respectively 4.3% and 3.7% more likely to chlorinate their water. Educated households were 18% more likely to use chlorinated water than the uneducated. Households with children under 5 years were more likely to chlorinate their water in Kenya and Uganda, unlike in Malawi ($p=0.001$). Furthermore, community knowledge about the chlorine dispensers and other water treatments methods contributed significantly ($p<0.001$) to a household using chlorine across the three countries. In Kenya, households that attended Village Community Sensitization forums were 3.2% more likely to treat their water, while in Uganda and Malawi, households who attended Community Education Meetings were 2.5% and 7.0% respectively more likely to chlorinate their water, unlike in Kenya. Community members who heard from promoters (within 30 days) were 32% in Kenya and 89% in Malawi more likely to chlorinate their water. Rural community adoption of chlorine safe water treatment is associated with gender, education level, community dispenser knowledge, social clubs attendance and access to

promoters. Future programs need to prioritize increasing Community's knowledge and skills of chlorine water treatment mechanism through strengthening community Promoter model, extending water treatment education to children ensuring adequate Chlorine supply chain and leveraging on call centers/ text message as communication channels.

Keywords: Dispenser, Chlorine, Mortality, Promoters, Treatment, Logi

Background of the study

Although access to safe drinking water, sanitation, and good hygiene are fundamental to health, survival, growth, and development; over 1.1 billion people globally do not have access to safe water sources. It is estimated that 3.4 million people annually die globally as a result of water-related diseases hence a leading cause of morbidity and mortality. Waterborne diseases are characterized by diarrhea which involves excessive stooling, often resulting in dehydration and possibly death. Diarrheal disease accounts for about 4.1% of the total daily global disease burden and causes about 1.8 million deaths every year. According (WHO, 2014).

Worldwide, about 780 million people lack access to improved water sources; 66% of the affected live in rural areas where the cost of delivering safe water is high (WHO/UNICEF, 2012). Often, rural inhabitants are underserved with water projects and therefore resort to using water from doubtful sources. Most of community water catchment sites are not usually fenced making them prone to animal and human contamination (Bodzewan, 2014). Even protected wells and communal standpipes fail to deliver safe drinking water in areas with poor sanitation due to feacal infusion contamination. Additionally, rural communities lack trained personnel to carry out health education on the dangers of water-borne diseases.

Water treatment plays an important role in improving the livelihoods of community members by reducing waterborne diseases and mortality rates especially among children under 5 years. A report by WHO (2014) indicated that 58% of the diarrhea cases can be averted through safe-drinking water, sanitation, and hygiene. A number of water treatment methods have been promoted amongst rural households including sedimentation, filtration, disinfection and boiling with different success levels. Historically, water disinfection for the inactivation of waterborne pathogens using chlorine was a preserve for big water supply projects which are usually biased to urban centers. Studies have shown that water treatment using chlorine reduces diarrhea risk by 40% for regular users (Arnold & Colford, 2007). Chlorine residuals prevent water from recontamination up to 72 hours which otherwise would have led to microbial infiltration.

Over time, studies by Evidence Action have proved that water chlorination can be a relatively simple and cost-effective process capable of enabling rural communities to access safe drinking water. The Dispensers for Safe Water (DSW) program provides free chlorine at the water point with an aim of reducing diarrhea rate in children. The program ensures improved access to safe drinking water to community members by installing chlorine dispensers at communal water points in rural areas. Currently, installed chlorine dispensers provide 4.7 million people across Kenya, Uganda, and Malawi with access to safe drinking water. Communities with access to a chlorine dispenser are able to improve the microbiologic quality of their household drinking water by dosing with dilute sodium hypochlorite (chlorine) (treatment at the point of use). The program utilizes a model that incorporates community-based promoters responsible for maintaining the dispersers as well as community sensitization for increased adoption.

Different studies provide evidence for the Dispenser for Safe Water approach in treating water at the point of use. Cochrane Review (2013) evaluated water interventions at point-of-use as well as more traditional water source improvements and concluded that such interventions are more effective in reducing episodes of diarrhea than interventions at the source. According to Arnold and Colford (2007), the point of use of chlorine drinking water treatment reduces the risk of childhood diarrhea by 40% among users. Additionally, a review by the International Initiative for Impact Evaluation (2012) using meta-analysis established that point-of-use water quality interventions are highly effective than water supply or source treatment in reducing diarrhea.

Although point-of-use water quality interventions are highly effective than water supply or source treatment in reducing diarrhea, such is only attainable if high adoption rates are maintained. Although chlorine dispenser has a much higher adoption rate compared to other treatment options,[86] Evidence Actions' DSW program data indicates varying adoption[87] rates averaging at 36% for Kenya, 57% in Uganda and 76% in Malawi as indicated in figure 1. Despite the underlying benefits of eliminating microbial pathogens through water chlorination, continuous provision of chlorine and maintenance of dispensers, experiential program data shows varying success levels over time and across countries. This paper aims at informing the program implementing team on country-specific factors that influence community uptake of chlorine. Additionally, the paper contributes to the existing body of literature on the effectiveness of various water treatment methods.

Study Objectives

This study aimed at assessing the use of chlorine dispensers for water treatment among rural communities in Kenya, Malawi, and Uganda. Specifically, the study intended to achieve the following objectives;

To assess the adoption rate of chlorine dispensers for water treatment among the rural communities in the target areas of in Kenya, Uganda, and Malawi

To identify the factors influencing the adoption of chlorine for water treatment among rural communities in Kenya Uganda and Malawi.

Methodology

Study design and sampling

The study adopted a repeated cross-sectional design and a stratified sampling technique. The study uses program monitoring data collected bi-monthly between January 2013 and February 2017. Each country; Kenya, Uganda, and Malawi formed a stratum. During every monitoring period, simple random sampling was used to select 1.5% of all water points fitted

[86] Arnold, B. F.; Colford, J. M., Treating water with chlorine at point-of-use to improve water quality and reduce child diarrhoea in developing countries: A systematic review and meta-analysis. *The American Journal of Tropical Medicine and Hygiene 76,* (2), 354-364

[87] Adoption is the proportion of households whose drinking water tested positive for chlorine

with a chlorine dispenser from each stratum. From each water point sampled, a promoter[88] survey was conducted as well as a spot check was conducted to assess dispenser hardware functionality and water point use. Eight households collecting water from each sampled water point were randomly selected to assess chlorine adoption. Overall 8,319 water points and promoters as well as 73,513 households were interviewed across and Kenya, Uganda and Malawi during the monitoring period.

Table 1: Sample Description

	Kenya	Uganda	Malawi
Time period	Apr 2013 – Jan 2017	Aug 2013 – Jan 2017	Jun 2014 – Jan 2017
No. of Households interviewed	49,202	16,768	7,543
No. of water points visited	5,713	1,798	808

Note: Some of the water points were visited more than once in the different year of evaluation

Study variables

The dependent variable in the econometric model was chlorine adoption depicted by presence or absence of total chlorine residual (TCR) in sampled water. Powder DPD (N, N-diethylparaphrnylenediamine) reagent causes the water turn pink color upon reacting with chlorine. The variable was coded as 0 when a household tested negative (absence) for chlorine residual and 1 for household testing positive (presence) for chlorine residual. Other variables to be included in the model were selected based on a detailed literature review and bivariate association analysis of the explanatory variables with dependent variable using a chi-square test[89]. Independent variables were drawn from household characteristics, water treatment options, promoter engagement with community members, promoter characteristics and chlorine dispenser hardware status. The variables were a mixture of continuous and categorical variables[90]. Dummy variables[91] were created for categorical variables with more than 2 levels.

Household characteristics included the gender and education level of the household member who is responsible for collecting household water and household size. A household wealth index[92] was also calculated as a proxy of the household economic status. Education level was coded 1 if the member had at least attained primary education while literacy of the household head was coded as 1 if the member was able to read a newspaper and 0 for not able to read. Primary sources of information on water treatment included promoter, community health worker, radio, neighbors/relatives, school, church and village elder. Since this was a nominal variables with more than two categories we set up dummy variables with promoter as the reference. Households with children responsible for water collection were assumed less

[88] A promoter is volunteer responsible for filling chlorine in the dispenser and sensitizing the community to chlorinate their drinking water

[89] Chi-square test is used to determine relationship between two categorical variables e.g. adoption (Positive or negative) and gender.

[90] Continuous variable is a variable with infinite number of possible values e.g. age in years. Categorical variable is a variable with finite number of categories/distinct groups e.g. gender

[91] Dummy variable takes the value of 0 or 1

[92] Household wealth index was constructed using principal component analysis as suggested by: Seema.V & Lilani K (2006). Constructing socio-economic status indices: how to use principal component analysis. *Health Policy and Planning,* 21: 459-468

likely to have treated their water with chlorine. Knowledge about dispenser and the benefit of consuming safe water is also important in understanding community dispenser use.

Knowledge was generated as a score including several variables like use of water points with an installed chlorine dispenser; whether households treated water or not; whether households knew the benefits of drinking chlorinated water; action taken by the household when a dispenser is found empty; households knowledge on the chlorine dosage required to treat 20litre jerican of water; household knowledge of the correct wait time before using chlorinated water after chlorinating the water and household knowledge on correct steps when using chlorine dispenser to assess community knowledge of the dispenser.

Community members who interact with promoters more frequently are more likely to adopt chlorine. Household participation in village community sensitization community education meeting meetings were assumed to likely adopt chlorine. The gender, education level and use of chlorine dispenser by the promoter were also considered key determinants of community chlorine adoption. Having functional chlorine dispensers would increase the likelihood of chlorination by the community. In addition to functionality, the program's chlorine supply chain should be efficient ensuring that dispensers have a sufficient supply of chlorine the monitoring team checks if there is chlorine in the dispenser tank during unannounced visits to the dispenser.

Model specification and analysis

Principal Component Analysis (PCA) were used to compute the household wealth index and data reduction method to determine the weighted linear combination of variables. Key variables used for calculation of wealth index included ownership of a mobile phone, radio, livestock (sheep/goat and cattle) and materials making the house walls, roof and floor. Bivariate analysis of independent variables and total chlorine adoption rates was done through comparing means for continuous variables and cross-tabulation of categorical variables to check variables distribution. A multiple logistic regression model was used to identify factors influencing chlorine adoption.

$$\log it(p) = Ln(\frac{p}{1-p}) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + ... + \beta_k x_k$$

where $(x_1, x_2, \ldots, x_k)$ are the independent variables, and $(\beta_0, \beta_1, \ldots, \beta_k)$ are regression coefficients of independent variables. p is the proportion testing positive for chlorine residual and $1-p$ is the proportion testing negative for chlorine residual. Marginal effects were calculated to quantify the contribution of one independent variable to adoption when controlling for other variables in the model and statistical significance of 10% was used. Variables collinearity and confounding variables were explored before fitting the model using the Pearson correlation for continuous variables and tetrachoric correlation for binary variables. Highly correlated variables (p>=0.8) were omitted in the model while those with a small count were either left out of the model or interacted with other variables.

Logistic regression predicted probability formula and Excel Solver were used to achieve the second objective of optimization adoption. All coefficients of independent variables were used in the formula. Required levels of variables which were statistically significant and can be

controlled by the program team were then determined. Levels of independent variables were determined simultaneously. The predicted probability formula is as follows;

$$\Pr(y=1)=\frac{\exp(\beta_0+\beta_i x_i)}{1+\exp(\beta_0+\beta_i x_i)}$$

where $Pr\ Pr\ (y=1)$ is the chlorine adoption probabilities predicted by the fitted model. $(x_1, x_2, \ldots., x_k)$ are the levels of independent variables; mean values of independent variables in the study data were used. $(\beta_0, \beta_1, \ldots., \beta_k)$ are the regression coefficient of independent variable obtained from the regression model. Excel Solver: Constraints of identified variables used were greater than or equal to zero and less than or equal to one; $0 \leq x_1 \leq 1$. The minimum chlorine adoption rates used were adoption targets for 2017; 55% in Kenya, 65% in Uganda and 70% in Malawi. This will give the minimum levels of input needed that will result in 2017 target adoption rates.

Study Results

Background Characteristics

Study results show that majority of respondents were male and over 72% had attained at least primary education across all the three countries, while only 44% of households in Uganda could read. Uganda had the highest household size (5.8) while Malawi (4.7) registered the lowest. Assessment of time taken to fetch water revealed that households in Malawi had the highest proximity to the water source. On average, it took a household member about eight minutes to fetch water in Malawi compared to 18 minutes in Uganda. There more Children under five years in Uganda (1.0 Children) and more Children in Uganda (17%) fetched water from the water source.

Dispenser for Safe Water Project uses rural based promoters to sensitize community to chlorinate their water. In terms of Promoters, in Kenya and Malawi, promoters were mostly women compared to Uganda. At least 9 in 10 promoters across countries had attained at least primary education. More promoters in Malawi treated their water with Chlorine than any other country. In terms of hardware of the dispensers, less dispensers in Malawi had hardware problems (1%) and this is because the program had just started and most dispensers had just been installed.

Table 3: Distribution of Study Background Characteristics by country countries

Characteristic		Kenya	Uganda	Malawi
Household can read		74%	44%	83%
Gender of respondent_1= male		91%	84%	95%
Respondent attained primary school		86%	72%	82%
Children mainly collecting water		8%	17%	5%
Dispenser with hardware problems		20%	19%	1%
Time taken to draw water		15	18	8
Source of information about chlorination	CHW	7%	6%	79%
	Radio	11%	26%	7%
	Neighbor/Relative	22%	34%	2%
	Promoter	50%	34%	12%
Participation in sensitization forums		32%	35%	68%
Household size		5.1	5.8	4.7
Average No. of children <5 yrs		0.7	1.0	0.7
Engaged a promoter in the last 30 days		28%	46%	59%
Proportion of female promoter		72%	46%	79%
Proportion of promoter with at least primary education		95%	85%	92%
Proportion of promoters treating water		61%	75%	82%

Source: Evidence Action, 2018

Trend analysis of adoption rate of chlorine dispensers for water treatment

The study thought to establish the adoption rates over the years across countries. For the purpose of this study, adoption is measured as the proportion of households whose drinking water tests positive for chlorine. The figure 1 shows that Evidence Actions' DSW data from 2015 to 2017 indicates varying adoption rates in Kenya, Malawi, and Uganda. There have been fluctuating chlorine adoption rates averaging at 36% for Kenya, 57% in Uganda and 76% in Malawi. In Malawi the program has experienced government and chlorine is obtained through health centres unlike other countries. Adoption was also influenced by dispenser emptiness, promoter interaction with households and hardware issues.

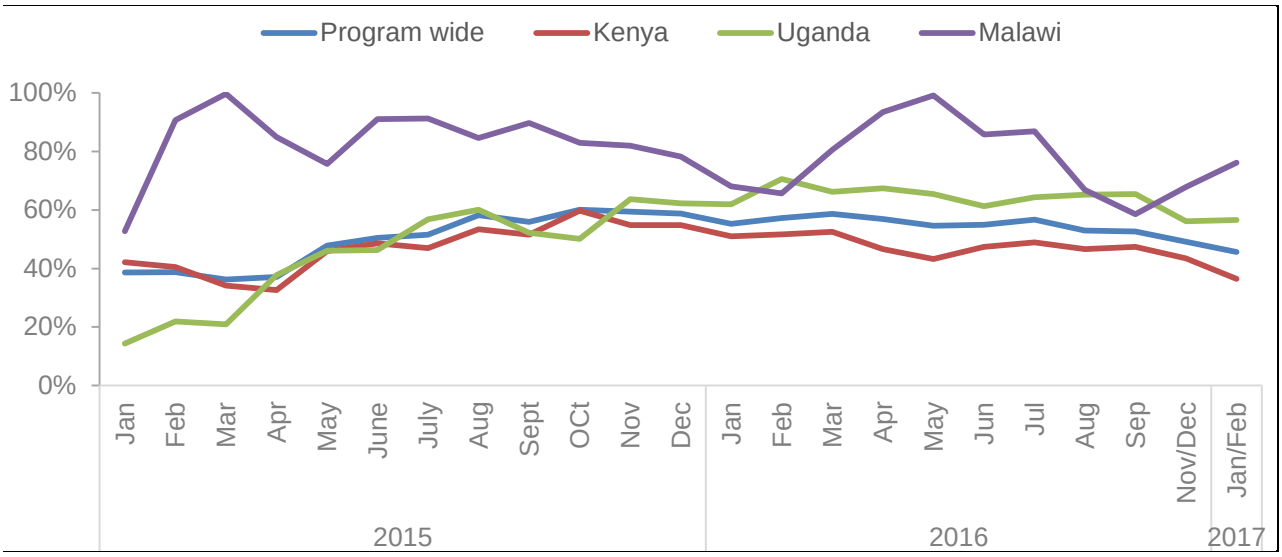


Figure 1: Chlorine adoption trend from January 2015 to February 2017

Source: Dispenser for Safe Water Program progress data, Evidence Action, 2017

Factors affecting chlorine adoption

The multiple logistic regression analysis show the model is a best fit and explains adoption (Kenya: chi-square =6309, df=27, p<.001, Uganda: chi square=1933, df=25, p<.001 and Malawi: chi square=2125, df=23, p<.001). This indicates that the independent variables tested as part of the study significantly explained variation in chlorine adoption rates in the sampled communities. The model accurately predicts chlorine adoption probabilities in all three counties. In Kenya, it predicts community chlorine adoption at 49% which is close to the actual chlorine adoption rate of 46%. In Uganda predicted adoption was 59% and in Malawi 81%. Both were close to their actual adoption rates of 55% and 80% respectively. Overall, the accuracy of the model was 71% in Kenya, 73% in Uganda and 87% in Malawi. This indicates a good model given that it is above the required cut-off of 50%. Table 2 shows logistic regression marginal effects and their significance level for each of the independent variables.

Household characteristics

The study indicated that gender of the household member collecting the water or the most knowledgeable person on water treatment is a significant influencer of chlorine adoption in Uganda (p<0.01) and Malawi (p=0.004). Specifically, female respondents were 4.3% and 3.7% more likely to chlorinate their water in Uganda and Malawi respectively compared to their male counterparts. This is perhaps due to the fact that women's primary responsibility is childcare.

Literacy level of the household head was significant in predicting adoption rates in Uganda and Malawi at 10% significance level. The findings of this study suggested an 18% likelihood of a household treating its water for drinking in Uganda if the person responsible of collecting water attains at least primary education. Although household size was not significant, the study findings established that household with children under 5 years were more likely to chlorinate their water in Kenya and Uganda and less likely to chlorinate in Malawi. In

Malawi, adoption seemed to decrease with increasing number of children aged below 5 years in a household, each additional child cause adoption to reduce to by 2% (p=0.001)

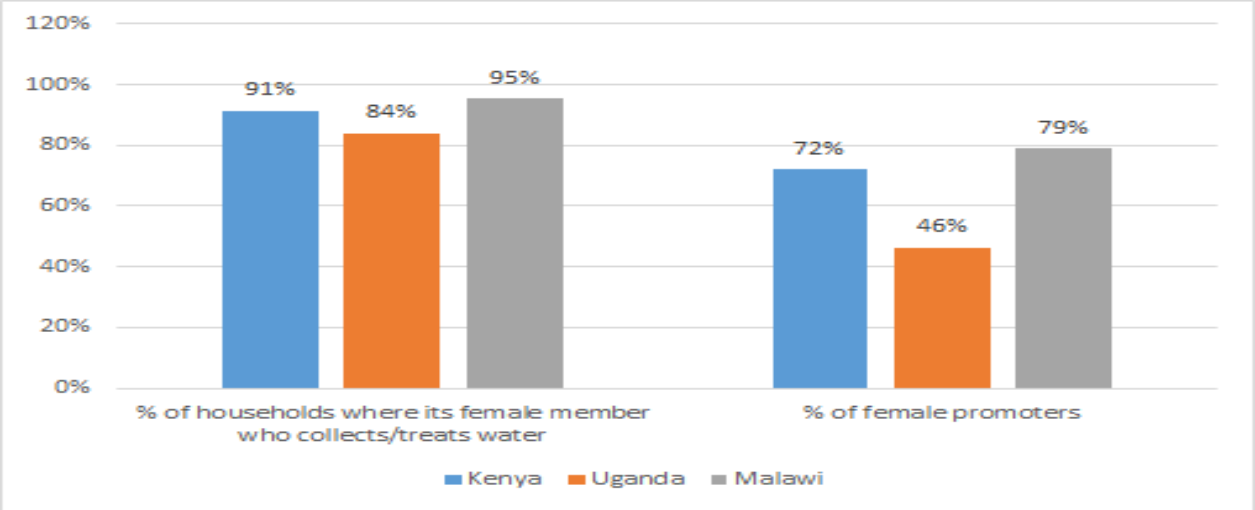


Figure 2: Proportion of households with female members collecting/treating water and gender of community dispenser promoters

Source: Dispenser for Safe Water Program progress data, Evidence Action, 2018

Water treatment

The most commonly mentioned sources of information on water treatment by household members were dispenser promoters, community health workers (CHW), radio, neighbors/relatives, schools, church and village elders. The Dispenser for Safe Water program uses promoters as their main point of contact, to encourage the community to use the dispenser. The analysis compared the effectiveness of other sources of information to the effectiveness of using promoter to deliver water treatment message to community promoter effective as far as community chlorine adoption is concerned.

Results indicate that households in Kenya and Malawi that mentioned other sources of information different from dispenser promoters as their main source of information were less likely to treat their water with chlorine as compared to those that relied on the dispenser promoter for information on water treatment. This implies that community members are more likely to chlorinate their water if they received the information from promoters compared to other sources. For instance, 46% of households in Kenya and 80% of households in Malawi who mentioned CHW as their primary source of water treatment information were less likely to chlorinate their water as compared to 50% of households in Kenya and 84% of households in Malawi that accessed their information from dispenser promoters. The figure 3 further shows how knowledge dispenser use affected adoption.

In Uganda, the results were slightly different where households that got water treatment information from, Radio, neighbors, and relatives were more likely to use the chlorine dispenser as compared to those that accessed their information from a dispenser promoter. The Dispenser for Safe Water program has used the radio in the past in Uganda to encourage communities to use the dispenser and this is a likely factor in the differing results between Uganda and the other countries.

Community knowledge about the chlorine dispenser (including correct dosage per 20 liters, correct duration waited before drinking water, correct procedure of operating the dispenser) and other water treatments methods contributed significantly ($p<0.001$) to a household using chlorine across the three countries. While holding other variables constant, a unit increase in community member's knowledge on chlorine dispenser increased the likelihood of households using chlorine by 10%.

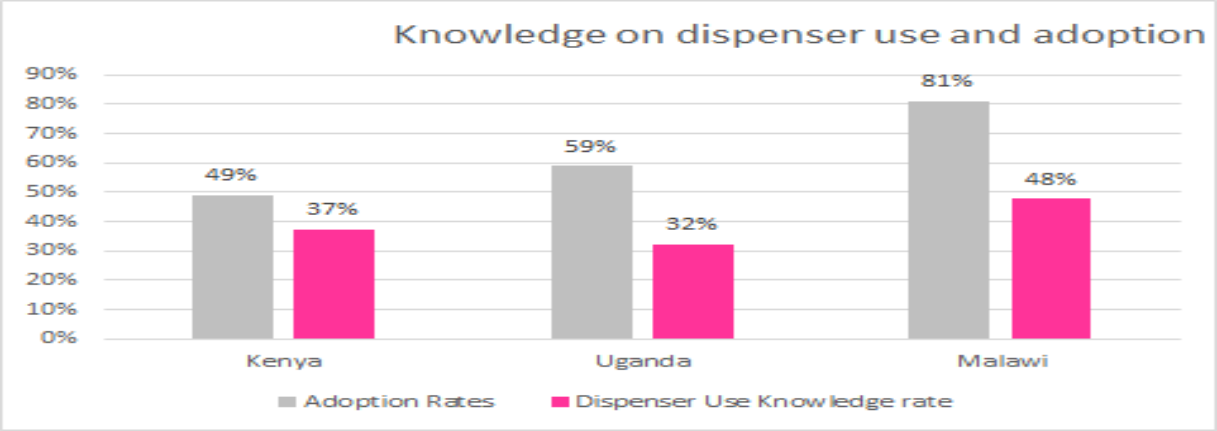


Figure 3: Adoption and Knowledge on dispensers use in Kenya, Uganda and Malawi

Source: Dispenser for Safe Water Program progress data, Evidence Action, 2018

Age of the person collecting drinking water was also statistically significant in predicting chlorination. In Kenya and Uganda, households were 4.7% and 2.9% less likely to chlorinate their water whenever the water was fetched by a person younger than 18 years of age. This negative effect was direr in Malawi where whenever a person below 18 years fetched the water, the household was 9.6% less likely to treat the water with chlorine in the dispenser.

Community sensitization

Results from this analysis show that community attendance of village community sensitization (VCS) and community education meetings (CEM) contributed significantly to chlorine adoption across all countries. Overall, VCS meeting was more effective in Kenya while CEM was more effective in Uganda and Malawi. In Kenya, households that attended VCS were 3.2% more likely to treat their water compared to those who did not attend. On the other hand, households who attended CEM meetings were 2.5% and 7.0% more likely to chlorinate their water in Uganda and Malawi compared to those who did not attend. The results were different in Kenya where community members who attended CEM were 3% less likely to chlorinate their water compared to those who did not attend. Good mobilization of the community to attend these meetings is, therefore, one of the ways that can be explored to increase the use of dispenser by the community. In addition, it would be good for teams in the different countries to share how they conduct specific meetings to improve on the effectiveness of the meeting in getting the community to use the dispenser. Kenya team can share how they conduct VCS while Uganda and Malawi teams can share how they plan and conduct CEM.

Promoter's engagement with community members

Households members were asked to state how often they had seen the promoter and how often the promoter had spoken to them about the dispenser. This is used to measure how accessible the promoter is, as well as his engagement with the community with respect to the chlorine dispenser. Promoter interaction (either daily, weekly or monthly) with community members significantly ($p<0.01$) increased chlorine adoption in Kenya and Malawi. Community members who said that promoters had spoken to them within a period of 30 days were 32% in Kenya and 89% in Malawi more likely to chlorinate their water compared to those who had not heard from the promoter in the past 30 days. This is consistent with previous analyses that showed that community members who frequently interact with their promoter are more likely to chlorinate their water. Notably, promoter engagement with the community had the highest level of effect on community adoption among all influencers.

Chlorine dispenser status

The chlorine dispenser is installed in a strategic position near the water point for ease of access by the community members and to act as a physical reminder for households to treat their water. The placement of the dispenser near the water source is also strategic as it allows the community to continue with their water collection routine without changing in order to accommodate the dispenser technology. The study revealed that having chlorine present in the tank at all times contributed significantly and positively to chlorine usage by community members ($p<0.01$). In Malawi, households using dispensers with presence of chlorine during unannounced spot check visit were 47% more likely to chlorinate their water, while households were 23% in Kenya and 14% in Uganda more likely to treat their water in water sources where the dispenser had chlorine compared to those whose dispenser did not have chlorine. This indicates the need of the promoter refilling the dispenser as soon as community exhausts the chlorine in dispenser tank.

Dispenser promoter characteristics

This analysis also sought to establish whether the promoter's gender, education level, and chlorine adoption affect community members' chlorine adoption. Though water points with female promoter were likely to post lower adoption rates, the gender effect was only statistically significant ($p=0.034$) in Kenya with a small reduction margin of 1.3%. Promoters with at least some education (at least primary education) contributed positively to use of chlorine dispenser by community members in Malawi with a marginal effect of 4%. It is therefore important to select promoters with at least some primary education to allow them to communicate effectively with community members.

The study also found a positive relationship between the promoter use of the dispenser and community adoption rates ($p<0.01$). The contribution was positive and ranges from 11% to 17%. Specifically, households whose promoters were using chlorine in Uganda were 17% more likely to use chlorine to treat water compared to those whose promoters were not using chlorine.

Discussion of Findings, Conclusion, and Recommendations

This section details the discussion of findings from the study while relating it to the findings from other available literature. It also includes the conclusion and practical recommendations

intended to inform evidence-based decision making among program implementing teams, key decision makers and interested development partners.

Table 2: Logistic regression results for each independent variables across countries

Indicators	Chlorine Adoption		
	Kenya	Uganda	Malawi
Gender of community member (base=male)	-0.0133	0.0433***	0.0367**
Education level of community member	0.0044	0.1767***	-0.0417
Household head able to read newspaper	0.0127*	-0.0072	-0.0213*
Number of people per household	-0.0017	-0.0018	0.0013
Number of children under 5 per household	0.0033	0.0059	-0.0205***
Source of information on water treatment (base=promoter)			
CHW	-0.0391***	0.0047	-0.0366***
Radio	-0.0252***	0.0583***	-0.0596***
My neighbors and relatives	-0.0138*	0.0755***	-0.0421
Schools in my area	-0.0367***		
Church	0.0035		
Village elder or local government	-0.122***	-0.0113	
Who collected water in the glass (child < 18 years)	-0.0472***	-0.0293**	-0.0957***
Community knowledge about chlorine dispenser	0.1003***	0.0974***	0.1029***
Attend village community sensitization	0.3219***	-0.0223*	-0.019
Attend community education meeting	-0.3041***	0.0249*	0.0702***
Promoter engages the community in 30 days	0.3168***	-0.1538***	0.8896***
Chlorine in the tank at the time of spot check	0.23***	0.1363***	0.4746***
Dispenser had problems at the time of spot check	-0.0083	0.0711**	
Gender of the promoter(base=Male)	-0.0132**	-0.0083	0.0069
Education level of the promoter	-0.0007	-0.0149	0.0399***
Promoter chlorine adoption	0.1206***	0.1749***	0.1147***
Prob > chi2	0.000	0.000	0.000
Classification accuracy	71%	73%	87%
Number of observations	26,664	7,760	6,463

Note: The values are average marginal effects (reflects the change in the probability of y=1 given a unit change in x variables for continuous and the discrete change from the base level for actor levels.

*Asterisk indicates significance: ***p<0.01, ** p<0.05, * p<0.1.*

Discussion of findings

The disparity in significance of various variables on chlorine adoption across the three countries could be due to differences in political, social, and economics aspects as well as program alignment to national WASH policies. The study indicated that the gender of the household member collecting water significantly impacted on chlorine adoption while household size did not have any impact on water chlorination among households. It is notable that higher proportions of females are engaged in water collection. This, therefore, implies that focus should be extended to sensitizing females in households on water chlorination to improve adoption.

In terms of literacy, the ability to read a newspaper of the household head lowered the likelihood of chlorine adoption. The findings in Uganda and Malawi are in agreement with

those of (Joshi & Amadi, 2013 & Ram *et al*, 2007) who indicated that there is no association between literacy and adoption of WASH practices. However, households with more number of children under 5 years are less likely to chlorinate their water in Malawi. It is likely that communities in Malawi have accepted the notion that consumption of chlorinated water is harmful to human health especially among children (Botlagunta *et al*, 2015).

The findings revealed that the households commonly received information on water treatment using chlorine dispensers from promoters, community health workers (CHW), radio and neighbors/relatives with schools, church and village elders being the least effective in encouraging chlorine use. The Dispenser for Safe Water program uses promoters as their main point of contact to encourage the community to use the dispenser and this has notably been proved to be a factor in improving adoption rates. Radio communication approach has also been used by the DSW program to encourage communities to use the dispensers. However, the use of radio as opposed to promoters is only effective for Uganda and not for Kenya and Malawi. Studies have established that promotion through word of mouth is perceived to be more credible than advertising in marketing literature including radio (Godes and Mayzlin, 2004; Hung and Li, 2007).

Results from this analysis showed that community participation in village community sensitization (VCS) and community education meetings (CEM) contributed significantly to chlorine adoption. Effective mobilization of the community to attend these meetings is, therefore, one of the ways that can be explored to increase the use of dispenser by the community. Increasing awareness through community meeting can be used to encourage more use of the dispensers with a more cost-effective means being reliance on promoters. Additionally, sharing on effective ways to conduct the VCS and CEMs across these countries may offer a learning experience on what can be done to improve on their effectiveness in promoting dispenser use among community members. Evidence shows that communal approaches that involve sensitization messages being passed to all community members are a more effective way of encouraging households to treat drinking water (Ahuja *et al*,2010).

Chlorine dispensers are usually installed in a strategic position near water points to ease access for community members and to act as a physical reminder for households to treat their water. Placement of the dispenser near the water source is also strategic as it allows the community to continue with their water collection routine without changing in order to accommodate the dispenser technology. Notwithstanding the conflicting findings, Uganda results indicate that the presence of chlorine in the tank at all times significantly contributes to chlorine use by community members. This underscores the need for the promoter to keep refilling the dispenser as soon as community exhausts the chlorine in dispenser tank. Given the possible significant impact of reduced hardware issues impacting on adoption as shown by results from Uganda, adoption rates among community members can be improved by ensuring proper dispenser functionality.

This analysis also sought to establish whether the promoter's gender, education level, and chlorine adoption affect community members' chlorine adoption. Though water points with female promoter were likely to post lower adoption rates, the gender effect was only statistically significant in Kenya with a small reduction margin. In Malawi, promoters with at least primary education contributed positively to use of chlorine dispenser by community members. Hence, it is better to select an educated promoter, at least with primary education. Additionally, the ability of promoters to use dispensers themselves is also a significant factor in enhancing chlorine adoption. Promoters' adoption was indicated to have a significant and positive effect of community adoption. It is therefore important to sensitize and motivate

promoter to chlorinate their water. Further, frequent promoter-community interactions remain essential towards improving adoption rates among community members. The study has shown that interactions at whichever frequency within a month generally impacts chlorine adoption. Notably, promoter engagement with the community had the highest level of effect on community adoption among all influencers. This emphasizes the essence of having promoters within the community to continuously remind and engage community members in water treatment using chlorine dispensers.

The major factors that statistically influenced adoption included that the program team may direct efforts and working strategies to achieve the targeted adoptions rates included; promoter interaction with community members; the presence of chlorine in the tank; promoter adoption rates and; Community knowledge on chlorine dispensers based on the detailed 2017 targets for chlorine adoption in Kenya (55%), Uganda (65%). Since the average chlorine adoption in Malawi is above the targeted average adoption, the current programs need to aim at maintaining or increasing the numbers of promoter interaction, the presence of chlorine in tank and promoter adoption.

Conclusion

As per the program's theory of change, consistent functional dispensers (non-empty rates, reduced hardware issues, minimal time to resolve an issue), knowledgeable community service assistants (CSAs), field officers (FOs) and promoters, regular and informed interactions between target population as well as promoter regarding safe water facilitated high chlorine adoption. Results from this analysis validated the findings from the randomized control trial that informed the program theory of change. Program efforts therefore need to re-direct strategies to the identified factors to increase their adoption, while taking into account the noted recommendations.

Recommendations

Sensitization strategies should target more females and households with children below 5 years since they are likely to be more receptive to water treatment information. There is need to extend water treatment education to children

Promoters are the most effective model for enhancing community sensitization and increasing adoption. Strategies that use Radio are most effective when backed up with direct community sensitization which is most effective in behavior change through the use of a promoter.

There is need to setup experience sharing platforms across countries to share their best practices and lessons which can be replicated elsewhere to influence adoption.

The program in Uganda and Kenya needs to re-direct working strategies specifically on; increasing promoter interaction with community members; consistent dispenser tank refilling with chlorine; and further sensitize communities on chlorine dispensers

Community members' knowledge and skills on chlorine as a water treatment method should therefore be increased through sensitization and trainings.

Program teams need to identify ways of encouraging the promoter to share messages and keep the dispenser full

There is need to conduct regular feedback meetings with promoters on the results from their various communities regarding adoption to further increase their community engagement.

The program may leverage on call centers to use text reminder to promoter to speak to community

There is need to encourage promoter to speak more to community service assistants (CSAs) whenever they run out of chlorine, and encourage promoters to treat their water since they act as change agents in the communities.

Share data with community service assistants (CSAs)regarding dispenser functionality and how it affects adoption, community dispensers found empty and non-functional and the time taken to resolve issues in order to influence adoption

Reference

Arnold, B., & J. Colford (2007). Treating water with chlorine at point-of-use to improve water quality and reduce child diarrhea in developing countries: A systematic review and meta-analysis. *American Journal of Tropical Medicine and Hygiene. 76(2):* 354-364Botlagunta, M., JS, B. & Mathi, P., (2015). Water Chlorination and Its Relevance to human health. *Asian J Pharm Clin Res*, *8*(1): 20-24. Bisogni, A. (1986). Social Foundations of thought and action: A social cognitive theory.Bodzewan E.F (2014). Prevalence of water-borne diseases within households in Bamendankwe Municipality Haviland, W. A., Prins, H. E., Walrath, D., & McBride, B. (2012). The essence of anthropology. Cengage Learning.

Kremer, M., Miguel, E., Mullainathan, S., Null, C., & Zwane, A. P. (2011). Social engineering: Evidence from a suite of take-up experiments in Kenya. Unpublished Manuscript, Harvard University, Cambridge, MA.

Mukunga, F. M. (2012). Influence of community participation on the performance of Kiserian dam water project, Kajiado county Kenya. Unpublished MA Thesis UoN.

Mulievi, M. (2018). Influence of Women Groups on Socio-Economic Empowerment on Households in Malava Constituency, Kakamega County, Kenya (Doctoral dissertation, Moi University).Murphy, H. M., McBean, E. A., & Farahbakhsh, K. (2009). Appropriate technology–A comprehensive approach for water and sanitation in the developing world. *Technology in Society, 31(2)*:158-167.Nawaz, K. (2008). Community participation and water management in Balochistan, Pakistan.Pahl- Wostl, C., & Hare, M. (2004). Processes of social learning in integrated resources management. *Journal of Community & Applied Social Psychology, 14(3):* 193-206.Pruss-Ustun A, Bos R, Gore F, Bartram J. (2008). Safer water, better health: Costs, benefits, and sustainability of interventions to protect and promote health. World Health Organization, Geneva, Switzerland.

Qureshi, N., & Shaikh, B. T. (2006). Myths, fallacies, and misconceptions: applying social marketing for promoting appropriate health-seeking behavior in Pakistan. *Anthropology & Medicine, 13(2):* 131-139.

Twebaze, J. B. (2010). Community mobilization in rural water supply and sanitation programs: how effective is it? "A case of Wakiso District-Uganda" (Doctoral dissertation, Makerere University).

UNICEF. (2010). Water, Sanitation, and Hygiene Annual Report 2008. Geneva: WHO

UNICEF/WHO (2012). Progress on Drinking water and sanitation: 2012

WHO/UNICEF (2000). Global Water supply and sanitation assessment report. Geneva and New York: WHO and UNICEF.

World Health Organization (2014). Guidelines for drinking-water quality, 4th edition, 2014.

World Health Organization (2005). World Health Report. Geneva: WHO. Available

Mapping Geographical Features: Case Study of Bungoma County

By Chepkania Levi Situma

Background to Geographic Information System

It is not very easy to give an exact definition of GIS as it means different things to different authors due to its multi-disciplinary origin and multi-application fields. GIS is an acronym for Geographic/Geographical Information Systems/Science. A number of Authors, authorities and/or societies have defined GIS in a number of ways. One of the authors is Aronoff, S. (1989), who defines Geographic Information systems as computer-based systems used to store and manipulate geographic information. A GIS is designed for collection, storage, and analysis of objects and phenomena where geographic location or geo-referencing is an important characteristic and critical to the analysis or exploration. Geographic Information System is manual or computer-based set of procedures used to store and manipulate geographically referenced data.

A GIS is a computer-based system that provides the following four sets of capabilities to handle geo-referenced data: Input; Data management (data storage, and retrieval); Manipulation and Analysis, and; Output (Aronoff, S. 1989). GIS is a powerful set of tools for collecting, storing, retrieving at will, transforming, and displaying spatial data from the real world for a particular set of purposes (Burrough, P.A. 1986). GIS is a database management system technology that integrates spatial data with large sets of related information (ESRI, GIS Arc/Info, 1989). GIS has characteristics including mapping, storage, and manipulation of dynamic comprehensive database; merge data for different analyses and new information; provide quantitative, qualitative, and spatial descriptions of planning decisions; a variety of digital formats can be read, and; final data can be transformed to other databases (ERDAS Inc, 2015). GIS is among others also a tool for accessing, integrating and distributing large sets of spatially referenced data in large number of applications (ESRI, 2008).

Work on GIS began in late 1950s, but first GIS software came only in late 1970s from the lab of the ESRI. Canada was the pioneer in the development of GIS as a result of innovations dating back to early 1960s. Much of the credit for the early development of GIS goes to Roger Tomilson. Evolution of GIS has transformed and revolutionized the ways in which planners, engineers, managers among others conduct the database management and analysis.

Statement of the Study Problem

The earth's limited resources are usually under constant pressure due to limited supply and unlimited demand. This has resulted in multiple problems requiring multiple approaches to solutions. Solving such problems requires multi-disciplinary, multi-agencies, and multi-sector approaches in order to understand the problems, i.e. an integrated approach and information are the key to solution. With GIS one can be able to map different areas and be able to identify which areas are prone to flooding, soil erosion, deposition of eroded materials, which areas are safe for establishment of infrastructure including settlement and recreation. The study used GIS, an integrated approach to map physical and human features in Bungoma

County. The output product of GIS processes was an integrated map document, database, for the development of the County.

Study Objective

The main objective of the study was to map the physical and human features in Bungoma County.

Significance of the Study problem

In the recent past GIS has gained a tremendous trend in mapping environmental and human features across the face of the earth. The model of mapping features in the study area has not been fully utilized because it is an expensive venture but it is worth it. Despite the bottleneck with embracing the technology, the researcher put in efforts and was able to buy relevant data and subsequently mapped the physical and human features found in Bungoma County. The final output document, map document, formed the database that can be used by the County government of Bungoma, environmental experts, policy analysts and farmers for the wellbeing of the people of Bungoma County. Farmers can easily identify areas that are suitable for farming. Therefore, the study was relevant.

Literature

Several studies have been conducted in the area of mapping natural and human features. Chepkania, L.S. (2018) did a study on assessment of soil erosion factors in parts of Bungoma County drained by River Kibisi. In his study Chepkania found out that terracing is the best practice for soil conservation and soil management for Bungoma County. A similar study on soil loss equation has been done by Reshma, P. and Uday, K. (2012) in Upper South Korea Basin. The study is relevant to the current study and gives foundations to build upon especially in mapping potential areas for farming.

Kemunto, E.A. (2013) did a study on the Role of geo-information in enhancing tourism in National Parks case study of Amboseli National Park demonstrates the importance of Geo-information. A topographic map and other data from Kenya Wildlife Service were used in the study to create a geo-database and a digital map of the Park using GIS software. Features were digitized on the scanned map and other data in form of shape files added as overlays. An attribute table was created to link the spatial data with their characteristics in order to provide more information for analysis. From the findings of the study, it was concluded that with coordinated and long-term spatial data collection techniques, the capabilities and application of Geo-information in tourism will grow significantly and this will greatly increase the revenue from tourism as well as improve the tourism status in the country. The study is relevant to the study of mapping natural/environmental and human features in Bungoma County so that resources including land and scenic are distributed and utilized equally across the entire County.

Ndumbi H.M. (2016) did a study on Mapping flood vulnerability using GIS, in Nairobi Central Business District (CBD). The study's main objective was to map flood vulnerability in the Nairobi CBD. To achieve this objective, four flood vulnerability factors namely elevation, land cover, soil and drainage were studied and mapped. They were then combined through a model to reveal the flood susceptibility. An additional flood vulnerability factor of rainfall was studied and analyzed separately to add onto the interpretation of the model. The final product was a Flood Vulnerability Map that was produced indicating the different degrees of flood

vulnerability at different locations in the CBD. The map document shows the degree of flood vulnerability at different locations in the Nairobi CBD at a scale of 1 to 5 starting from very low vulnerability to very high vulnerability. The study is relevant to the current study because they all deal with mapping features both natural and man-made in coming up with a map document to assist in planning and utilizing the resources for the wellbeing of man.

Bwisa, M.M. (2016) did a study on Mapping tourist attractions, a case study of Bungoma County. GIS had been used in the project because of its capabilities of collecting, storing, manipulating, analyzing, presenting and disseminating geographical information. The project aimed at locating the exact positions of the attractions on the ground, map and expose them to attract more tourists as well as assist planners, the private sector and the County government to improve its sector well.

A geo-database of the tourist destinations and facilities including health facilities, security centers, shopping malls and hotels was created using data obtained from various sources including Kenya Wildlife Service, Google Earth, Bungoma County open data website, tourist websites and actual data collection from the ground.

Tourist attractions in each of the five sub-counties of Bungoma were mapped individually using QGIS software before the final map featuring the entire county was produced. Maps featuring tourist facilities in the region were also created. These maps provide necessary information needed for the wellbeing and enjoyment of tourists visiting Bungoma County. The study is relevant and gives more light to the study currently.

The evolution of slope instability studies (Alexander, E.D. 2008) is charted from its descriptive, field-based origins to recent higher levels of understanding. There has been a shift from static to dynamic modeling of slope processes using digital simulation and computer graphics, and automated cartography, GIS and remote sensing which have enabled regional studies at last to predominate over site-based ones. The study proved difficult to reorient landslide studies to tackle slope instability problems with greater sensitivity to the stakeholders' needs. Worth noting, are the social, administrative, political, cultural and perceptual aspects of landslides that have been neglected. There are signs of a new interest in these important aspects relevant to current study.

The County Government of Makueni is among the few counties in Kenya that have complied with Section 107 of the County Government Acts, 2012, that requires Counties to prepare a 10-year Geographic Information System based spatial plan. It provides a vision and common direction for policies and programs that guides long term development plans. Bungoma County should follow suit and the current study is relevant and provides the needed information for spatial planning and utilization of resources in the County (Mutua, F. and Mwaniki, D. 2017).

The high rate of urbanization being witnessed in most of the counties is impacting negatively on other complementary land uses. Consequently, there is need to use spatial planning as a means of integrating adaptation and mitigation to climate change and disaster risk reduction in all the 47 Counties of Kenya. By mapping out the counties, it becomes easier to manage land allocation and enhance various social amenities such as schools, hospitals, markets and public recreational areas (Mutua, F. and Mwaniki, D. 2017).

Study area

Bungoma County is home to an estimated 1.7 million people and sits on an area of 2,069 km² (Figure 1). Bungoma is third populous County after Nairobi and Kakamega. It borders three Counties i.e. Kakamega on the South, Trans Nzoia on the North and Busia on the West. It also enjoys a vast shared international border with Uganda. Bungoma County has 9 constituencies and 45 County Assembly wards. The 9 constituencies, Sub-Counties, include Kanduyi, Bumula, Webuye East, Webuye West, Kabuchai, Sirisia, Tongaren, Kimilili and Mt. Elgon (CGB, 2018).

The Wards in Bumula are Bumula, Khasoko, Kabula, Kimaeti, Siboti, South Bukusu, West Bukusu. In Kanduyi Bukembe-East, Bukembe-West, Khalaba, Musikoma, Sang'alo East, Sang'alo West, Township and Tuuti-Marakaru. Kabuchai has four wards including Bwake-Luuya, Kabuchai-Chwele, Mukuyuni and West Nalondo. In Webuye East we have Maraka, Mihuu and Ndivisi wards. In Webuye West, we have Bokoli, Miendo, Matulo, Sitikho and Misikhu. Sirisia has three wards including Kulisiru/Malakisi, Lwandanyi and Namwela. The huge Tongaren has six wards including Ndalu, Naitiri-Kabuyefwe, Milima, Soi Sambu-Mitua, Tongaren and Mbakalo. Kimilili has four wards including Kamukuywa, Kibingei, Kimilili and Maeni (CGB, 2018, Chepkania, L.S. 2018).

Bungoma County has immense sub-tribes and cultures including the Bukusu, Teso, Sabaot, Tachoni, Batura, Kabras, Banyala, Bongomek and Banubi. The fusion of the different cultures and traditions has boosted County's potential as a destination for cultural tourism. With the diverse cultures, Bungoma has remained peaceful County in the region even in the heat of politics – a fact that has seen many other communities pitch homes and businesses in the County lifting its profile as an investment hub.

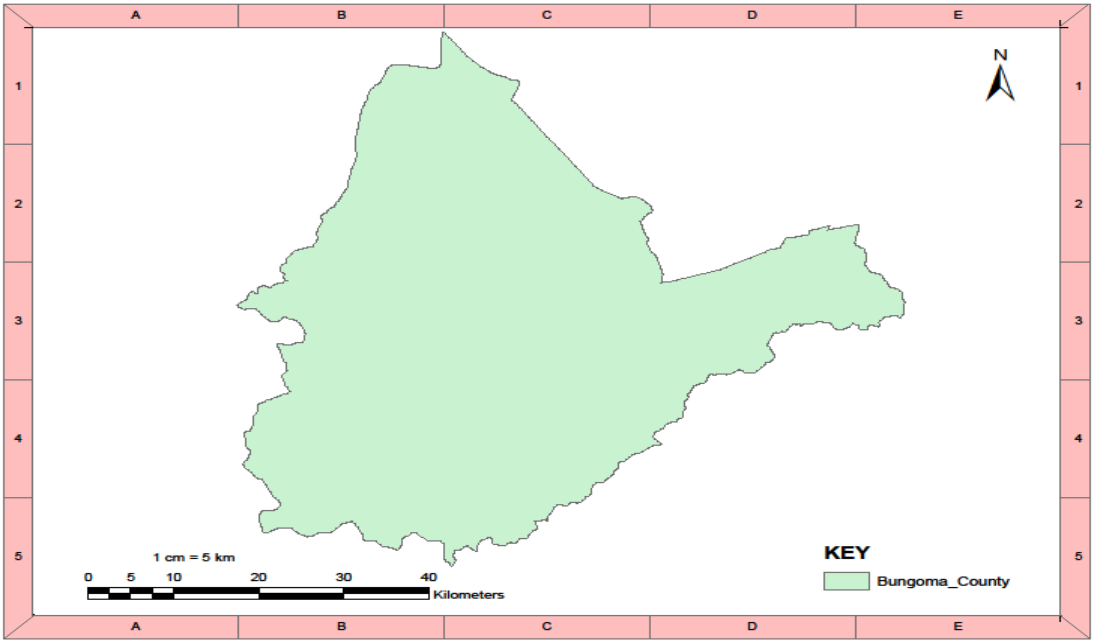
Bungoma County is strategically located and is the gateway to Uganda into Eastern and Central Africa countries including Rwanda, Burundi and Southern Sudan. The County enjoys two shared border points with Uganda through Lwakhakha and Chepkube. Malaba in Busia is 43km from the County's Central Business District. Its vantage position in the region makes it suitable for trade with Uganda and countries on the Northern Corridor. Bungoma County is served with extensive network of roads, two airstrips, Bungoma and Webuye, and a rail system on which a cargo train ply. The infrastructures enhance mobility of people and movement of goods from one place to another (CGB, 2018).

Bungoma County's economic strength is rooted in agriculture encompassing production of sugarcane, tobacco, coffee, onions, vegetables, sunflower, maize and dairy cattle. Tongaren and Naitiri are the region's breadbasket in maize production. Bungoma records heavy rainfall throughout the year and is home to several high rivers, which are used for small-scale irrigation. Fertile lands, rivers with falls that can generate electricity, tourist sites and hard-working people give Bungoma the potential to stand as a commercially high potential investment County. There are economic activities including trade, booming hotel industry and a vibrant retail, supermarkets, sector (CGB, 2018, Chepkania, L.S. 2018).

In Bungoma, historical sites, scenic hills, rivers and waterfalls, make it a destination for tourists. Chetambe Fort, the Golan Heights of Bungoma, Bukusu and Tachoni watched the advancing colonialists, is a tourist attraction site. The fort, built behind a protective 12-foot defensive ditch by Chetambe Ifile. Nabuyole falls on the River Nzoia, also attract tourists.

Mt. Elgon forms a ring around the County to the north and part of the east. Apart from sightseeing, it forms part of the Kenya-Uganda border with caves that open in Kenya onto Uganda. There is another beautiful waterfall on River Kuywa at Teremi, one with great potential for a hydro-electricity power plant. Awaiting the tourists eyes are three trees of historical significance, planted by founding President Jomo Kenyatta, Uganda's first President Milton Obote and Elijah Masinde, a revered Bukusu leader of Dini Ya Msambwa. Twenty kilometres south, another two landmarks stand – the Mwibale wa Mwanja and Sang'alo hills. From the summit of Mwanja Hills, there is a superb view of Mumias Town and Mumias Sugar Miller in neighbouring Kakamega County, Bungoma and Webuye, and endless view of sugarcane and other crops. In the caves and thick forest foliage that envelope Mt Elgon reside wild animals. The pigmy elephants that wander between Kenya and Uganda Kenya. Maeni, about 10km from Kimilili, is home of the Dini Ya Msambwa, Church of Spirits, of Elijah Masinde. Today, Dini Ya Msambwa is fading out but whose place in Kenya's liberation history is marked with an indelible ink. The people of Bungoma have passed on their culture from one generation to the next through the spoken word (Khubita and Kumuse), music and dance as well as oral narratives. The different sub-tribes have taken every stage of transition – from birth, circumcision to marriage and death as a platform to pass on their messages to young generations. Through music and dance – known for both its energy and grace – Bungoma has earned a reputation as a County of storytellers. The County's famous dance styles have gone on to earn global recognitions with contemporary musicians deploying dance. Kamabeka, the electric shaking of shoulders, has also caught on in party scenes (CGB, 2018).

FIGURE 1: STUDY AREA



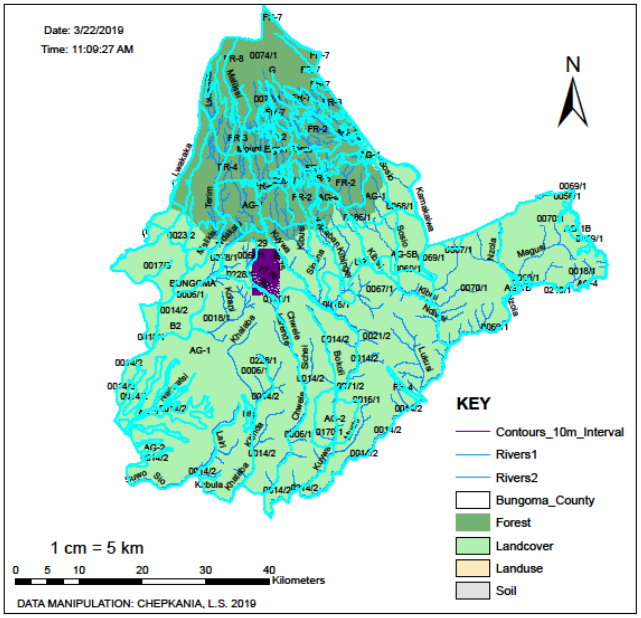
Source: ESRI 2012, Manipulation: Chepkania, L.S. (2019)

Method

In any GIS environment, four basic functions including data Input, data management, data manipulation and analysis, and data output are carried out. The data input component converts data from their existing form into one that can be used by the GIS. In this case the

data is for Bungoma County. Geo-referenced data are commonly provided as paper maps, tables of attributes, electronic files of maps and associated attribute data, and air photos increasingly in the form of satellite imagery. Data input is the major problem in the execution of a GIS due to cost and time. Data input methods and data quality standards for Bungoma County were carefully considered well before data entry began. The various methods of data entry were evaluated in terms of the processing to be done, the accuracy standards to be met, and the form of output to be produced. Data management functions included activities needed to store and retrieve data from the database. In the case of the study, the data had been stored on local disk D. The way data are structured and the way files can be related to each other place constraints on the way in which data can be retrieved and the speed of the retrieval operation. Data manipulation and analysis functions determine the information that can be generated by the GIS. To anticipate the way in which the data in a GIS will be analysed requires that the users be involved in specifying the necessary functions and performance levels. In the current study the researcher used Arc GIS 10.3, software, to manipulate and analyse data. Finally, output or reporting functions of GIS varies more in quality, accuracy, and ease of use than in the capabilities available. Reports may be in the form of maps, tables of values, or text in hard copy or soft-copy. The functions needed are determined by the user's needs.

FIGURE 2: BUNGOMA COUNTY PHYSICAL AND HUMAN FEATURES



Source of Data: ESRI 2012, Analysis and Manipulation Chepkania, L.S. (2019)

Mapping Bungoma County

The highest point (slope) in the study area is 2030 M above sea level. These are areas of Mount Elgon Forest. Lowest areas (valleys) are 1560M above sea level. One can determine where to carry out farming based on the slope of the study area. Steep areas are not suitable for farming due to cases of erosion and other external land forming processes including mass wasting.

The major rivers in the study area include Rivers Suwo, Kipsangui, Kimothon, Kamakaiwa, Lwakhakha, Sikhendu, Lairi, Nzoia, Kissowai, Kabukara, Bitonge, Khalaba, Chemanani,

Ririma, Malikisi, Kibindoyi, Ndakalu, Kabewyan, Kibingei, Kibisi, Toloso, Sosio, Kuywa, Suam, Naliwatsi, Chwele, and Bokoli. These rivers exhibit dendrite pattern of river flow.

Tributaries of the main rivers include Nambirima, Muchi, Lukusi, Kamukuywa, Cheptoigan, Wabukhonyi, Cheborani, Namarambi, Mitakuyu, Miyuke, Misimo, Ndivisi, Tambari, Kamakaiwa, Mugusi, Musindet, Sosio, Ruafwa, Kabuyefwe, Kipsangui Koptita, Chebumon, Chogoi, Kibusi, Kipchororo, Kimilili, Laboot, Chwele, Khalaba, Kibingei, Bokoli, Sichei, Kitinda, Lurende, Muyayi, Misikhu, Kolani, Nanjikobe, Kituni, Namilama, Namawanga, Kibisi, Kapkateny, Kiptaban, Kimobo, Kamusinga, Chepsitati, Ndakalu, Mwaimwai, Sinuna, Kibuk, Terim, Malikisi, Kikwechi, Lutonyi, Yabeko, Kabula, Kuywa and Sio.

The study has one natural forest at Mount Elgon. Land cover for study area compose of rain fed herbaceous crop, open low shrubs (65-40% crown cover), open shrubs (45-40% crown cover), open trees (65-40% crown cover), closed trees, very open trees (40-15% crown cover), forest plantation- undifferentiated, closed shrubs, scattered (in natural vegetation or other) rain fed tree crop (field density 20-40% of polygon area), scattered (in natural vegetation or other) rain fed herbaceous crop (field density 20-40% of polygon area), urban and associated areas, rural settlements and irrigated herbaceous crops.

Soil mapping has provided resource information about Bungoma County. It helps in understanding soil suitability for various land use activities. It is essential for preventing environmental deterioration associated with misuse of land. GIS helped in the study area to identify soil types and to delineate soil boundaries. It was also used for identification and classification of soil. Such information for example from Soil map can be used by farmers to retain soil nutrients and maximize yields.

A map is the most common way of reporting information from a GIS database. So these systems are not only for creating maps but also most importantly the collection of information about the geographic features such as building, roads, pipes, streams, ponds and many more that are located in the County.

The soils which the study extracted from GIS attribute table for Bungoma County included mountain slope soils (***M9***), volcanic foot ridges (***R1***), upland soils (***U115***), bottom land (valley) soils (***B11***), and foot slopes (***F1***). The above soil types are a sample from the many soil types found in the study area. The GIS soils data extracted from the study area (Figure 2) included ***M9***= Very clayey soils. These are Mountains and major scarps soils (steep; slopes predominantly over 30%; relief intensity more than 3000 m (mountains) or more than 1000 m (major scarps); altitudes up to 4250 m, ***M5***= Alluvial soils, ***R1***= Clayey loam soils, ***R2***= Sandy loam soils, ***F1***=Sandy clayey soils, ***F16***= Clayey soils, ***U113***= Sandy loam soils, ***U115***= Clayey loam soils, ***U117***= Loamy soils, ***U120***= Loamy soils, ***Um10***= Loamy soils and ***B11***= Clayey soils. ***F***=Foot slope soils (at the foot of hills and mountains; gently undulating to rolling; slopes between 2 and 16%; various altitudes), ***B***= Bottomland soils (flat to gentle undulating; slopes between 0 and 5%; various altitudes; seasonally pounded), ***U***=Upland soils with slope of 5%, and ***R***=Volcanic foot ridges soils (dissected lower slopes of major older volcanoes and older lava flows, undulating to hilly; slopes between 5 and 30%; altitudes between 2000 and 3000 m; Mt. Elgon.

Summary and Conclusion

GIS can be used to create more effective and efficient farming techniques. It can also analyze soil data and to determine the best crop to plant like maize, sugarcane, onions among other

crops in Bungoma County and how to maintain nutrition levels to best benefit crop to plant. It is fully integrated and widely accepted for helping government agencies and devolved governments to manage programs that support farmers and protect the environment. This GIS model if fully implemented to the latter can increase food production in different parts of the County so that the food crisis is avoided.

Land cover is the feature that covers the barren surface. Land use means the area on the surface utilized for particular use. The role of GIS technology in land use and land cover applications is that we can determine land use/land cover changes in different areas for example rural settlement and natural forest changes at Mount Elgon. Also it can detect and estimate the changes in the land use/ land cover pattern within time. It enables to find out sudden changes in land use and land cover either by natural forces or by other activities like deforestation.

REFERENCES

Alexander, E. David (2008). *"A brief survey of GIS in mass-movement studies, with reflections on theory and methods."* In: Geomorphology. Volume 94, Issues 3–4, 15 February 2008, Pages 261-267. Elsevier B.V.

Aronoff, S. (1989) Geographic Information Systems: A Management Perspective. WDL pub., Ottawa.

Burrough, P.A. (1986) Principles of Geographical Information Systems for Land Resources Assessment. Oxford University Press, Oxford.

Bwisa Muyoka Metrine (2016). Mapping tourist attractions, a case study of Bungoma County

Ndumbi Hezekial Muriuki (2016). Mapping flood vulnerability using GIS, case study: Nairobi CBD. University of Nairobi.

Chepkania, Levi Situma (2018). Assessment of soil erosion in Bungoma County, Kenya.. LAP LAMBERT Academic Publishing.

County Government of Bungoma-(CGB 2018). About the County Government of Bungoma

Environmental Systems Research Institute (ESRI 1995). ESRI Conservation Program; White Paper Series.

ERDAS IMAGINE (2015). Guide 15.00.01 Released

Kemunto, E.A (2013). Role of geo-information in enhancing tourism in national parks case study: Amboseli National Park. Uiversity of Nairobi.

Mutua Felix and Mwaniki Dennis (2017). GIS needs Assessment in Kenya. A National and County Level Analysis of the state of GIS and its Application for Spatial Planning in Kenya. University of Nairobi.

Reshma Parveen, Uday Kumar (2012). Integrated Approach of Universal Soil Loss Equation (USLE) and Geographical Information System (GIS) for Soil Loss Risk Assessment in Upper South Koel Basin, Jharkhand.

Spatio-Temporal Analysis of Rainfall Trends and in Northwestern Nigeria

Ma'aruf Murtala

Department of Geography, Jigawa State College of Education P.M.B. 1002, Gumel Jigawa State

*Corresponding Author's Email: maarufmurtala@gmail.com

Phone Contact: +2348037918076

ABSTRACT

The rainfall trends in Northern Nigeria are still poorly understood despite the significance of rainfall to agriculture. This study focused on spatio-temporal analysis of rainfall trends in Northwestern Nigeria. In order to achieve this, rainfall data for Kaduna, Kano, Yelwa, Katsina, Sokoto,and Gusau from 1956 to 2015 were used. Standardized coefficient of Skewness and Kurtosis for the six meteorological stations was employed to test the normality of the data. In order to examine the trend, 10-year running mean and linear trend lines were calculated and plotted using Microsoft Excel Statistical tool (2013). The rainfall series was also sub-divided into 10 years non-overlapping sub-periods and Cramer's test was then used to compare the means of the sub-periods with the mean of the whole record period. The result revealed that rainfall amount is generally increasing in the northwestern part of Nigeria in recent years; and that the amount is unevenly distributed. The study recommends that more opportunities should be provided by the government for professionals to study and develop realistic methods for utilization of ground water without socio-economic concerns, as well as managing flood events. In such a case, it would be possible to counter drought and flood crises occurrence in the northwestern zone and other areas having the same climatic conditions.

Keyword: Northwest zone, rainfall, running mean, sub-periods and trends

INTRODUCTION

Evidence show that climate change is increasing rainfall variability and the frequency of extreme events such as drought, floods, and hurricanes [1]. It was predicted that Africa is likely to warm across all seasons during this century with annual mean surface air temperatures expected to increase between 3^{0}C and 4^{0}C by 2099, roughly 1.5 times the average global temperatures [2]. Projections in East Africa suggest that increasing temperatures due to climate change will increase rainfall by 5-20 percent from December to February, and decrease rainfall by 5-10 percent from June to August by 2050 [1, 3]. Fluctuations of climatic elements, particularly rainfall in northern Nigeria is not new especially in the northwestern ecological zone which comprises the northern Guinea, and Sudan-Sahel ecological zones of West Africa [4, 5].

Rainfall variability is a major characteristic of the Sahelian climate, the last 40 years (since 1969) have witnessed dramatic reductions in mean annual throughout the region [3, 6, 7, 8, 9, 10, 11]. According to [1, 12] a rainfall decrease of 29-49 percent has been observed in the 1968-1997 period compared to the 1931 – 1960 baseline period within the Sahel region. In Northwest zone of Nigeria, particularly, rainfall shows a vivid effect on agriculture. Rain is essential to agriculture because without water no plant can survive. Thus, a regular rainfall is essential for healthy plants, too much or very little rainfall can harm plants and agriculture.

Extreme weather events have attracted considerable attention in recent years because of the large losses of life as well as tremendous increase in economic losses caused by such extreme events [1, 13].

Available literature on Nigeria shows the existence of spatial differences in the nature of disasters [14]. While oil and gas pollution is largely a Niger Delta problem, drought and quelea birds infestation occur in the Northern States [14, 15]. Several studies in the Northern region have indicated that the onset of the raining season is highly variable and unpredictable [16, 17, 18, 19].

One of the several hypotheses put forth to explain the decline of rainfall in West Africa and Nigeria in particular is the reduced northward excursion of the Inter-Tropical Discontinuity (ITD) during the raining season [20, 21, 22]. In addition, [22] noted that the displacement of ITD south of its normal position would result in drier years. The ITD is situated well to the north of West Africa in July and August thereby allowing Nigeria to be totally under the influence of Tropical Maritime Air mass [19]. In agreement with these views, [23, 24, 25] concluded that a reduced summer incursion of ITD would correspondingly result in a decrease in the Sahelian rainfall.

With further significant variations in the climate of the Sahel being predicated by the General Circulation Models (GCMs), it is important that scientific studies be undertaken at regional level so as to provide society with accurate information on the real and potential impacts of extreme climate variability, as well as, the mitigation and adaptation options available. At a time when the world is grappling with diverse environmental problems including global warning, ozone depletion, acid rain, killer hurricanes, destructive thunderstorms, recurrent drought and major flood episodes, any effort at finding explanations to these and other problems should be quite significant, since the environmental, social and economic cost of extreme climatic variability is bound to be enormous from the standpoint of society and human activity. This study therefore examined the spatio-temporal trends of rainfall in Northwestern Nigeria.

STUDY AREA

Northwest zone of Nigeria is located between Latitudes 9° 02'N and 13° 58'N and Longitudes 3° 08'E and 10° 15'E. The area so defined covers a land area approximately 212,350km^2 (Table 1). Northwest zone of Nigeria shares borders with Niger Republic in the northern part, Benin and Niger Republic in the Western part, Niger State and FCT to the south, and Yobe, Bauchi and Plateau States to the East.

The climate of northwestern Nigeria is the tropical wet-and-dry type (Koppen's Aw climate type). The wet season starts from April through October with a peak in August, while the dry season extends from November of one calendar-year to April of the next [39]. The annual average rainfall varies from about 2000 mm in the southern part of the region to about 500 mm in the northern part of the study area.

Table 1: Land Area of Northwest Zone by States

States	Square kilometers
Jigawa	23,287
Kaduna	42,481
Kano	20,280
Katsina	23,561

Kebbi	36,985
Sokoto	27,825
Zamfara	37,931
Total	212,350

Source: Office of the Surveyor-General

The rainfall intensity is very high between the months of July and August (ranging from 60mm hour^{-1} to 99mm hour^{-1}). The pattern of rainfall in this region is highly variable in spatial and temporal dimensions with an inter-annual variability of between 15 and 20% [40].

MATERIALS AND METHODS

Data Collection

Monthly rainfall data for period of 60 years (1956-2015) was obtained from the archive of Nigerian Meteorological Agency. The data were collected for six synoptic stations namely: Kano, Gusau, Sokoto, Katsina, Kaduna and Yelwa in the Northwest zone of Nigeria (Table. 2). These stations were selected because they are synoptic stations in the drought prone region of the country [26], and they equally satisfied the general criteria used by the European Climate Assessment and Dataset [27] that: (1) data must be available for at least 40 years, (2) missing data must not be more than 10% of the total, (3) missing data from each year must not exceed 20%, (4) more than three months consecutive missing values are not allowed, and lastly, the data were tested and found to be normally distributed.

Table 2: Metrological stations in the Northwest Zone of Nigeria

Stations	Station No.	Latitude	Longitude	Altitude	Period	No. of years
Kano	1206.03	12°03'N	08°32'E	475.80m	1956-2015	60
Gusau	1206.14	12°10'N	06°42'E	468.00m	1956-2015	60
Sokoto	1205.51	12°55'N	05°12'E	309.00m	1956-2015	60
Katsina	1307.04	13°01'N	07°41'E	516.63m	1956-2015	60
Yelwa	1004.54	10°53'N	04°45'E	224.00m	1956-2015	60
Kaduna	1007.34	10°36'N	07°27'E	644.96m	1956-2015	60

Source: Nigeria Meteorological Agency (NIMET).

Data analysis

The standardized coefficients of Skewness (Z_1) and Kurtosis (Z_2) statistics as defined by [28] was used to test for the normality in the seasonal (April to October) rainfall series for each of the stations. These are the months during which most of the stations in the region receive over

85% of their annual rainfall totals [3, 8, 29, 30]. The standardized coefficient of Skewness (Z_1) was calculated using:

$$Z_1 = \left[\left(\sum_{i=1}^{N} (x_i - \bar{x})^{3/N} \right) \Big/ \left(\sum_{i=1}^{N} (x_i - \bar{x})^{2/N} \right)^{3/2} \right] \Big/ \left(6/N\right)^{1/2} \quad \text{..... eq. 1}$$

and the standardized coefficient of Kurtosis (Z_2) was determined as:

$$Z_2 = \left[\left(\sum_{i=1}^{N} (x_i - \bar{x})^{4/N} \right) \Big/ \left(\sum_{i=1}^{N} (x_i - \bar{x})^{2/N} \right)^{2} \right] - 3 \Big/ \left(24/N\right)^{1/2} \quad \text{..... eq. 2}$$

where $\bar{x}$ is the long term mean of x_i values, and N is the number of years in the sample. If the absolute value of Z_1 or Z_2 is greater than 1.96, a significant deviation from the normal curve is indicated at 95% confidence level.

To examine the nature of the trends in the rainfall series, 10-year running mean was calculated and plotted using Microsoft Excel Statistical tool (2013). This was used in smoothening the time series. Linear regression was also used to determine the linear trends of the rainfall for the six stations. It is computed as:

$$y = a + bx \quad \text{..... eq. 3}$$

where a the intercept of the regression line on the y-axis; b is the slope of the regression line. The values of a *and* b can be obtained from the following equations:

$$a = \frac{\sum y - b(\sum x)}{n} \quad \text{..... eq. 4}$$

$$b = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum x^2) - (\sum x)^2} \quad \text{..... eq. 5}$$

The rainfall series was sub-divided into non-overlapping sub-periods (1956-1965, 1966-1975 through to the last sub-periods 2006-2015). Cramer's test [31] was then used to compare the means of the sub-periods with the mean of the whole record period. In applying Cramer's test, the mean ($\bar{x}$), and the standard deviation (δ), were calculated for each station in the study area for the total number of years (N), under investigation. The purpose of this statistic was to measure the difference in terms of a moving t-statistic, between the mean ($\bar{x}k$), for each successive n-year period and the mean ($\bar{x}$) for the entire period. The t-statistic is computed as:

$$t_k = \left(\frac{n(N-2)}{N - n\left(1 + \tau_k^2\right)} \right)^{1/2} \tau_k \quad \text{..... eq. 5}$$

where τ_k is a standardized measure of the difference between means given as:

$$\tau_k = \frac{\bar{x}k - \bar{x}}{\delta} \text{ ..... eq. 6}$$

where $\bar{x}$k is the mean of the sub-period of n–years. $\bar{x}$ and δ are the mean and standard deviation of the entire series respectively, and t_k is the value of the student t–distribution with $N-2$ degrees of freedom. This is then tested against the "students" t–distribution table at 95% confidence level appropriate to a two-tailed form of test. When t_k is outside the bounds of the two-tailed probability of the Gaussian distribution (equal to 1.96 at 95% confidence level), a significant shift from the mean is assumed.

RESULTS AND DISCUSSION

Rainfall Normality

The results of the Standardized Coefficient of Skewness (Z_1) and Kurtosis (Z_2) for the six stations are presented in Table 3. The results of Z_1 and Z_2 of data for the stations revealed that the rainfall data of all the stations were normally distributed at 95% confidence level with exception of Z_2 for Kaduna and Yelwa. Therefore, no transformation was made to the rainfall series.

Table 3: Standardized Coefficients of Skewness and Kurtosis for the Six Meteorological Stations

Statistics	Kaduna	Kano	Yelwa	Katsina	Sokoto	Gusau
Mean ($\bar{x}$)	1244.19	929.42	981.37	595.18	651.43	910.19
Standard Dev. (δ)	231.86	325.43	183.31	162.21	146.74	170.29
Skewness (Z_1)	1.26	0.78	0.51	0.20	0.74	1.21
Kurtosis (Z_2)	4.61*	0.12	2.19*	-0.36	1.19	1.84
Minimum Value	848.9	434	496.25	262	373.2	675.7
Maximum Value	2246.9	1869.3	1556.2	979	1150.6	1507.1

*Significant at 95% confidence level

Source: Fieldwork (2017)

Spatial Variation of the Rainfall

The highest mean annual rainfall of 1244.19 mm for the 60 years under investigation was recorded in Kaduna while the lowest mean annual rainfall of 595.18 mm was recorded in Katsina (Table 3). The maximum value of rainfall (2246.9 mm) was recorded in the year 1966 in Kaduna while a minimum value of 262 mm was recorded in the year 1993 in Katsina. The annual standard deviation, which has the potential to provide a result of deviation from normal, shows that Kano is having the highest standard deviation of 325.43 mm while Sokoto had the lowest standard deviation (146.74 mm). Generally, the station that recorded the highest amount of rainfall during the study period is Kaduna which is followed by Yelwa, Kano and Gusau, while Katsina recorded the least amount of rainfall during the 60 years under investigation.

Annual rainfall trend and fluctuation

Figure 1 (a-f) shows the graphical presentation of the annual rainfall trends and for the six stations smoothened out with the 10-year running means. Generally, the 10-year running means for all the stations was above the long-term mean from the early 2000s to the end of the study period. The only exception is Kaduna in which the 10-year running mean was along the long-term mean from the beginning of the data (1956) to the end (2015) indicating a normal condition. The linear trend lines for all the stations generally show an increasing trends. It is therefore clear from the results of the 10-year running mean and the linear trend lines that the rainfall has been increasing in recent years.

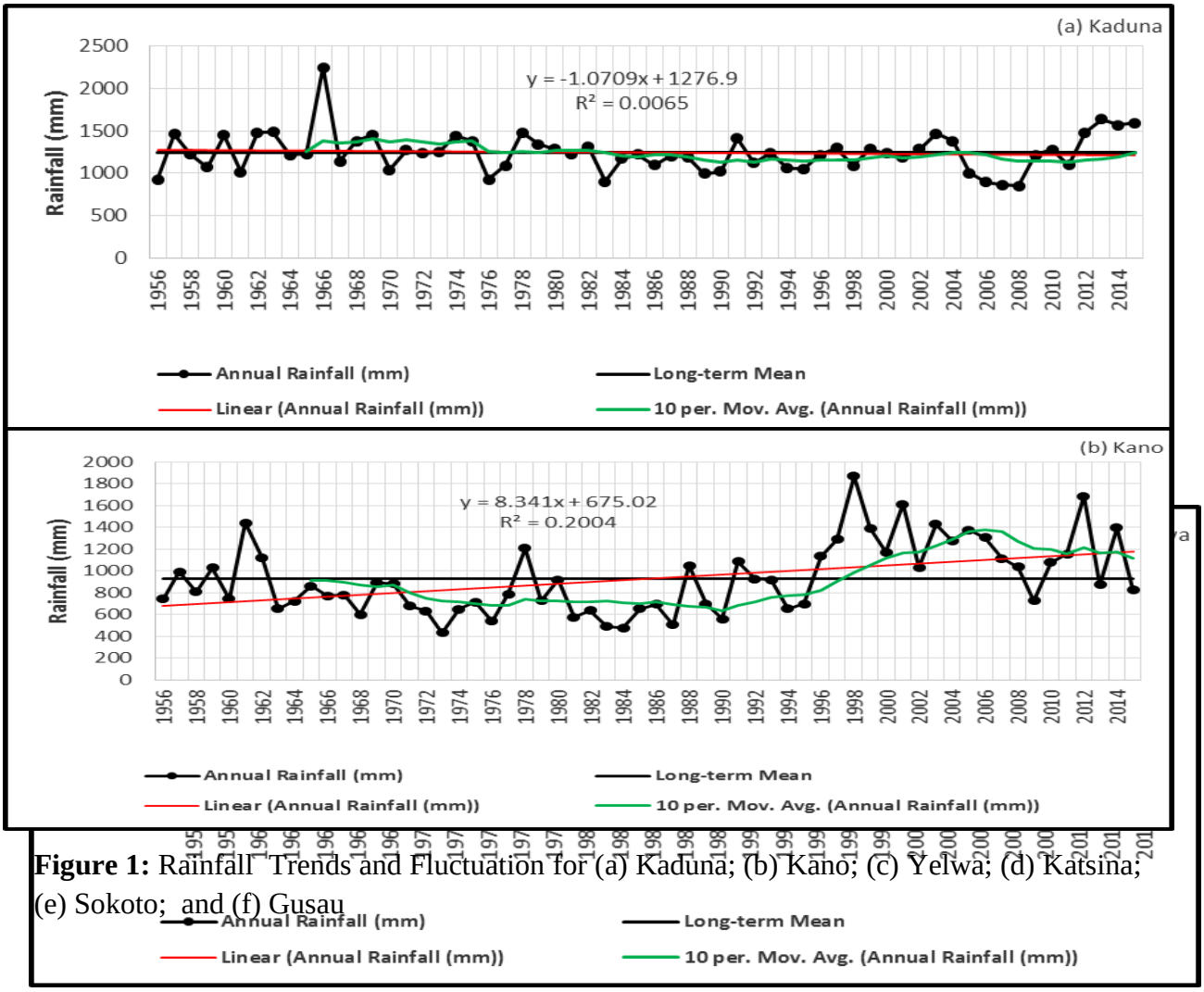
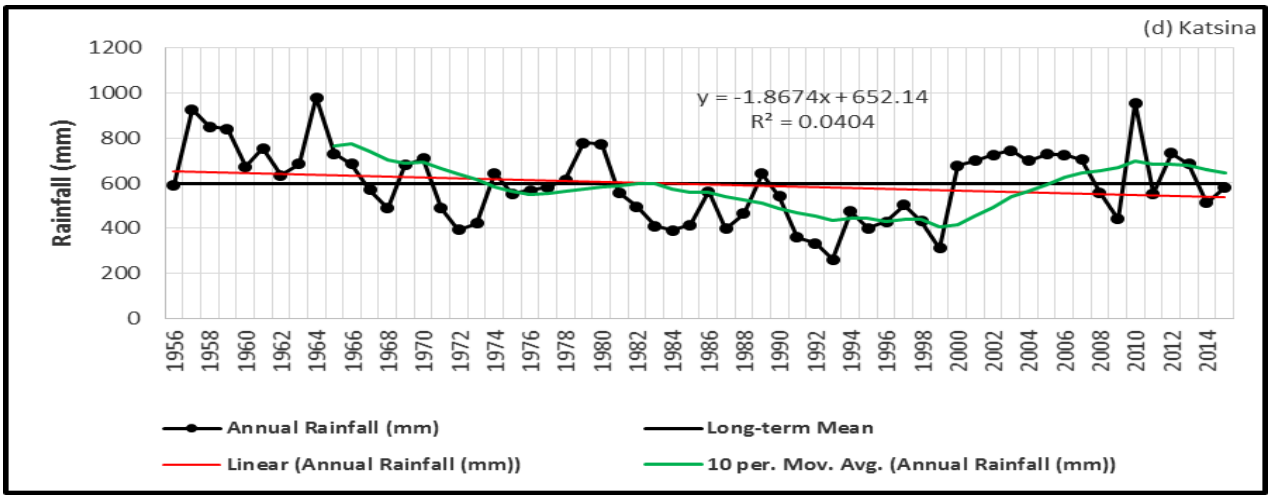


Figure 1: Rainfall Trends and Fluctuation for (a) Kaduna; (b) Kano; (c) Yelwa; (d) Katsina; (e) Sokoto; and (f) Gusau



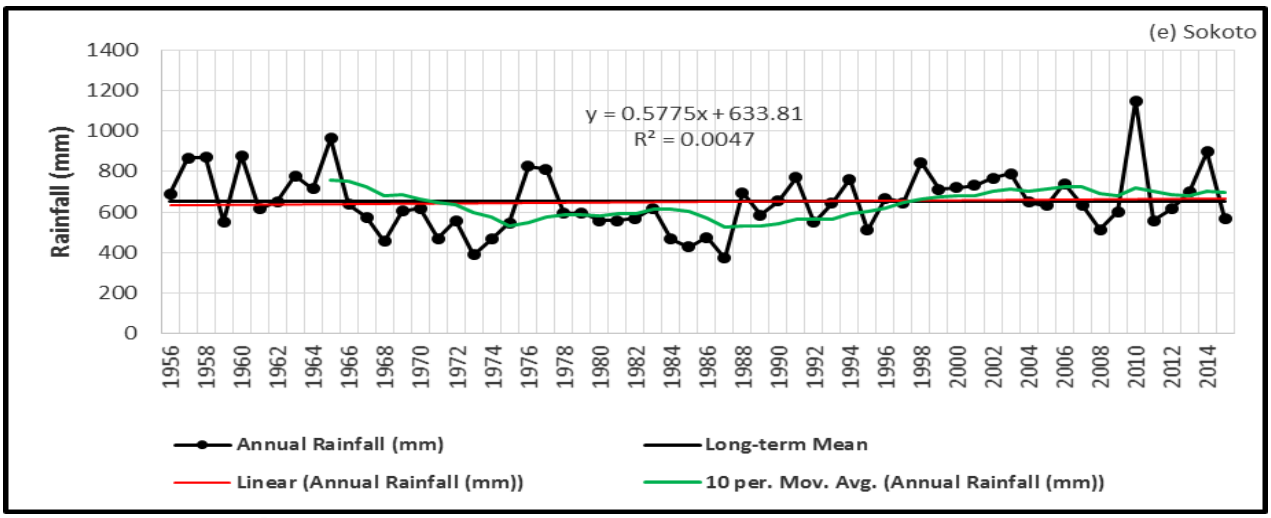


Figure 1 continued

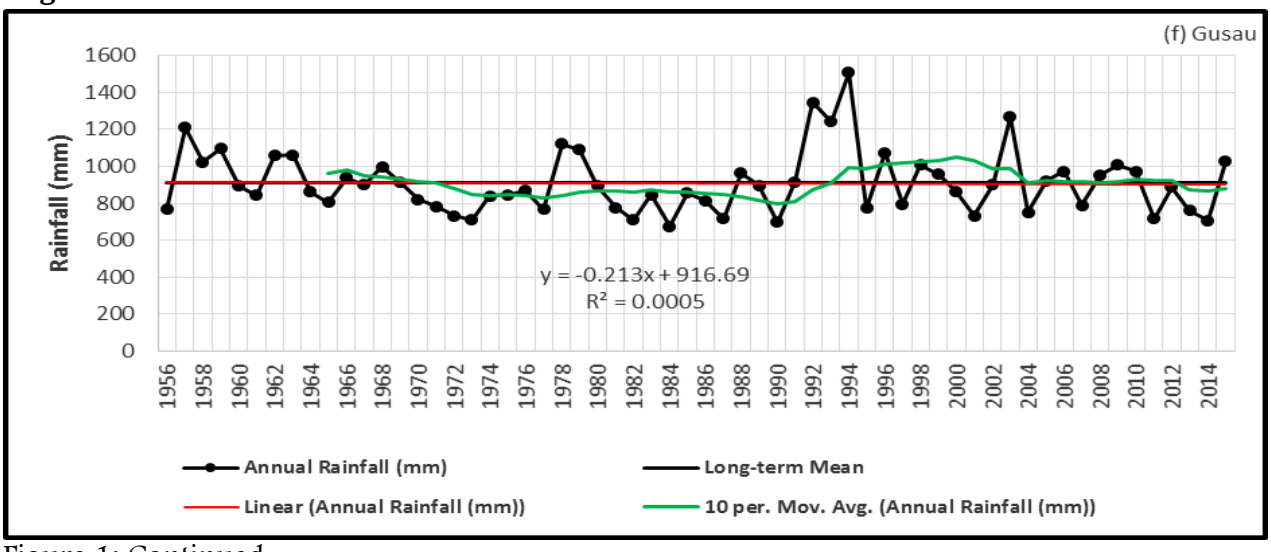


Figure 1: Continued

The result of Cramer's test for variability in the 10-year non-overlapping sub-period of annual rainfall in the six stations is presented in Table 4.

Table 4: Variability in 10 year non-overlapping sub-period analysis of rainfall (Cramer's Test)

Sub-period	Kaduna	Kano	Yelwa	Katsina	Sokoto	Gusau
1956-1965	0.15	-0.18	1.52	2.47*	2.01*	0.98
1966-1975	1.76	-1.94	-1.91	-0.65	-2.15*	-1.18
1976-1985	-0.69	-1.95	-1.71	-0.76	-1.08	-0.97
1986-1995	-1.42	-1.42	0.48	-2.32*	-1.09	1.40
1996-2005	0.00	2.71*	1.51	-0.01	1.38	0.32
2006-2015	0.05	1.73	0.42	1.00	1.02	-0.61

*Significant at 95% confidence level

Source: Fieldwork (2017)

The result revealed five significant cases at 95% confidence level in all. Two significant cases in the sub-period 1956-1965 for Katsina and Sokoto. These two sub-periods for Katsina and Sokoto were significantly wetter at 95% confidence level than the long term condition. All other stations in that sub-period (1956-1965) had a normal condition. The sub-period 1966-1975 had one significant case for Sokoto while the sub-period 1986-1995 had one significant case for Katsina. These two stations (Sokoto and Katsina) were significantly drier at 95% confidence level than the long-term condition as indicated by their negative t*k* values. These periods coincided with the droughts of the 1970s and 1980s that ravaged the northern part of the country. A closer examination of the three sub-periods (1966-1975, 1976-1985, and 1986-1995) showed that out of the 18 cases, only *tk* values of Kaduna (1966-1975), Yelwa and Gusau (1986-1995) were positive. This is an indication of dryness for the three periods. This finding agree with previous studies conducted by [13, 29, 32, 33] that a long run of dry years since the early 1970s has also been confirmed for the zone. [34]. Sub-period 1996-2005 was significantly wetter at 95% confidence level than the long-term conditions for Kano. A critical examination of the last two sub-periods (1996-2005 and 2006-2015) revealed that all the *tk* values were positive with the exception of Katsina (1996-2005) and Gusau (2006-2015) that were having negative *tk* values. This implies that rainfall in the Northwest zone of Nigeria is increasing in recent years. This is in agreement with studies of [30, 35, 36] that the late 1990s have been witnessing increasing annual rainfall totals. However, this result is not in agreement with the conclusions drawn by [3, 6, 8, 37, 38] that the drought-prone areas of northern Nigeria have been experiencing a decreasing trend in the frequency of wet conditions and increasing aridity in the decades 1971-2000. The decreasing frequency of wet conditions may be as a result of the fact that the study was based on data covering up to 2000; but studies that use recent data covering up to 2015 may arrive at the same result with the present study [Notably, 30 and 36]

CONCLUSION AND POLICY RECOMMENDATION

Different statistical methods were used to depict spatial and temporal trend of rainfall in the northwestern part of Nigeria. The result revealed that rainfall in the northwestern part of Nigeria is unevenly distributed. It decreases from the Southern part of the study area to the Northern part. The 10-year running means and the linear trends generally showed that rainfall amount is increasing in recent years. The non-overlapping sub-period analysis also revealed that the last two sub-periods (1996-2005 and 2006-2015) have witnessed increase in rainfall.

This study recommends that more opportunities should be provided by the government for professionals to study and develop realistic methods for utilization of ground water without socio-economic concerns, as well as managing flood events. In such a case, it would be possible to counter drought and flood crises occurrence in the northwestern zone and other areas having the same climatic conditions.

REFERENCES

1. Intergovernmental Panel on Climate Change (IPCC) (2007). Climate Change 2007: The Physical Science Basis Contribute of Working Group 1 to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Solomon, S., Qin, In: Manning, M., Chen, Z., Marguis, M., Averyt, K.B., Tignor, M. and Miller, H.L. (eds). Cambridge University Press, Cambridge, United Kingdom, pp. 996.

2. Boko, M., Niang, I., Nyong, A., Vogel, C., Githeko, A., Medany, M. & Yanda, P. (2007). Africa climate change 2007: Impacts, Adaptation and Vulnerability. In: Parry, M.L.; Canziani,O.F.;Palutiko,J.P.;VanderL.P.J.andHanson,C.E.(Eds.), *Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* Cambridge: Cambridge, UK University Press, pp 433-467.

3. Hulme, M., Doherty, R., Ngara, T., New, M. and Lister, D. (2001). African climate change: 1900-2100. *Journal of Climate Research*, 17: 145168.doi: http://dx.doi.org/10.3354/cr017145.

4. Asiedu, J.J. (1992). Processing Tropical cops. London. Macmillian press.

5. Abdulkarim, B., Oladipo, E.O. and Balarabe, M.L. (2015). Building resilience: Adaptive strategies for livelihoods most at risk to climate change impacts in desertification prone areas of Katsina State, Nigeria and a trans-boundary community in Niger republic, *A technical Report,* Education Trust Fund, Abuja, Nigeria.

6. Diop, M. (1996). A propos de la dureedela saison des pluies au Senegal. *Secheresse*, (7): 7-15.

doi:10.1038/320602a0, http://dx.doi.org/10.1038/320602a0

7. Le Barbe, L. and Lebel, T. (1997). Rainfall Climatology of the Hapex – Sahel Region during the years 1950-1990. *Journal of Hydrology*, 188-189, 43-73. Doi: 10.1016/S0022-1694 (96)03154-X, http://dx.doi.org/10.1016/S0022-1694(96)03154-X.

8. Ekpoh, I.J. (2007). Climate and Society in Northern Nigeria: Rainfall variability and farming. *International Journal Series on Tropical Issues*, 8(3): 157-162.

9. Camberlin, P. and Diop, M. (2003). Application of daily rainfall principal component analysis to the assessment of the rainy season characteristics in Senegal. *Climate Research*, (23): 159-169. Doi:10.3354/cr023159, hppp://dx.doi.org/10.3354/cr023159.

10. Giannini, A., Saravanan, R. and Change, P. (2003). Ocean forcing of Sahel rainfall on the inter-annual to inter- decadal timescales Science, (302): 1027-1030. Doi:10.1123/science.1089357, http://dx.doi.org/10.126/science.1089357

11. Dai, A., Lamb, P., Trenberth, K.E., Hulme, M., Jones, P.D. and Xie, P. (2004). The recent Sahel drought is real. *International Journal of Climatology,* (24): 1323-1331. Retrieved 13 December, 2013, from: doi:10.1002/joc.1083,http://dx.doi.org/10.1002/joc.1083.

12. IPCC. (2001). Climate Change: Impacts, vulnerability and Adaptation. Working Group II, WMO, Geneva.

13. Easterling, D.R., Meehl, G.A., Parmesan, C., Changnon, S.A., Karl, T.R. and Mearns, L.O. (2000). Climate extreme. *Observation, Modeling and Resource*, 25:229-243.

14. Daura, M.M. (2014), Disaster risk management in Nigeria: A challenge for Geographers. *Nigeria Geographical Journal*, 9(2): 1-22.

15. NEMA. (2012). National Emergency Management Agency, 2011 Annual Paper, Abuja, Yaliam.

16. Ilesanmi, O.O. (1971). An empirical formulation of the onset, advance and retreat of rainfall in Nigeria. *Journal of Tropical Geography*. (34): 17-24.

17. Ati, O.F. (1996). Comparison of method to determining onset of the rainy season in the Sudano Sahelian zone of Northern Nigeria. Unpublished M.Sc. Thesis, Department of Geography, Ahmadu Bello University, Zaria.

18. Iguisi, E.O. (1996). Variations of Soil loss in two sub-basins near Zaria, Nigeria. Unpublished Ph.D. Dissertation, Department of Geography Ahmadu Bello University, Zaria.

19. Hassan, Y.G. and Abdulhameed, A.I. (2012). Analysis of trends in monthly rainfall profile for Katsina, Katsina State (1946-2006). *Zaria Geographer,* 19(1): 111-124.

20. Odekunle, T.O. (2006). Determining rainy season onset and retreat over Nigeria from precipitation amount and number of raining days. *Theoretical and Applied Climatology*. 83: 193-201.

21. Odekunle, T.O., Andrew, O. and Aremu, S.O. (2008). Towards a wetter Sudano-Sahelian Ecological zone in Twenty first Century Nigeria. *Weather*, 63(3):66-70.

22. Oyediran, O. (1997). *The climate of West Africa*. London: Heinemann.

23. Jackson, I.J. (1997). *Climate, Water and Agriculture in the Tropics.* London: Longman.

24. Houndenou, C. and Hernandez, K. (1998). Climate of the Sahel 1961-1990. *Benin Sciences*, (9):23-35

25. Traore, S.B., Reyniers, E.N., Vakmann, M., Kouressy, M., Yattara, K., Yorote, A., Sidibe, A. and Kone, B. (2000). Adaptation a la Sacheresse des ecotypes locaux de Soegbo du mali. Secheresse, 11:227-237.

26. Abaje, I.B., Ati, O.F. and Iguisi, E.O. (2012). Changing climatic scenario and strategies for drought adaptation and mitigation in the Sudano–Sahelian ecological zone of Nigeria. In: Iliya, M.A. and Dankani, I.M. (Eds.). *Climate Change and Sustainable Development in Nigeria.* Sokoto: Publication of the Association of Nigerian Geographers (ANG) and the Department of Geography, Usman Danfodio University, Sokoto. 99-121

28. Brazel, S.W. and Balling, R.C. (1986). Temporal analysis of long-term atmospheric moisture levels in Phoenix, Arizona. *Journal of Climate and Applied Meteorology,* 25:112-117.

29. Oladipo, E.O (1993). Some aspects of the spatial characteristics of drought in Northern Nigeria. *Natural Hazards*, Netherlands. 8:171-188.

30. Ati, O.F., Stigter, C.J., Iguisi, E.O and Afolayan, J.O (2009). Profile of rainfall change and variability in the northern Nigeria, 1953 – 2002. *Research Journal of Environmental and earth sciences.* 1(2):58-63.

31. Lawson, M.P., Balling, R.C., Peters, A.J. and Rundquist, D.C. (1981). Spatial analysis of secular temperature fluctuations. *Journal of Climatology,* 1:325-332.

32. Olaniran, O.J. and Summer, G.N. (1989). "A study of climate variability in Nigeria based on the onset, retreated and length of the rainy season." *International Journal of climatology,* (9): 253-269. Doi:10.1002/joc.3370090304, http://dx.doi.org/10.1002/joc.3370090304.

33. Olaniran, O.J. (1991). Evidence of Climatic change in Nigeria based on annual rainfall series 1919-1985. *Climate Change*, 19, 507-520. Doi:10.1007/BF00140169. http://dx.doi.org/10.1007/BF00140169.

34. Nicholson, S.E., Some, B. and kone, B. (2000). An analysis of recent rainfall conditions in West Africa including the rainy seasons. *Climatology* (13): 2628 – 2640.

35. Odekunle, T.O. and Adejuwon, J.O. (2006). Climate variability in Nigeria. In: Adejuwon Y.O and Ogunkoya, O.O. (Eds.), *Climate Change and Food Security in Nigeria*. Ile-Ife: Obafemi Awolowo University Press. 210-220.

36. Adefolalu, D.O. (2007). Climate change and economic sustainability in Nigeria. Paper presented at the International conference on *Climate Change and Economic Sustainability*, held 12-14th June, 2007 at Nnamdi Azikwe University, Enugu, Nigeria.

37. Tarhule, A. and Woo, M. (1998). Changes in Rainfall characteristics of Northern Nigeria. *International Journal of climatology,* (18):1261-1271.38. Sawa, B.A. (2002). Trend in the Temporal Variability of Occurrence of Wet and Dry Spells North of Latitude 10°N in Nigeria.

In Iguisi E.O. (Ed.).*The Zaria Geographers.* 15 (1), 34-41.39. Abaje, I.B. (2016). Assessment of Rural Communities' Perceptions, Vulnerability and Adaptation Strategies to Climate Change in Kaduna State, Nigeria. Unpublished PhD Thesis, Department of Geography, Ahmadu Bello University, Zaria, Nigeria.

[40]Abaje, I.B., Sawa, B.A., Iguisi, E.O. & Ibrahim, A.A. (2015). Assessment of Rural Communities' Adaptive Capacity to Climate Change in Kaduna State, Nigeria. *Journal of Environment and Earth Science*, 5 (20), 14-23

Community Lessons on Participatory Forest Management (PFM) Performance within the Mau Forest Complex, Kenya

Dr. Stanley M. Makindi, Ph.D.

School of Environment and Natural resources management,

Machakos University

P.O. Box 136-90100, Machakos, Kenya

Email: *mankindsm@gmail.com*

Tel: +254 722 228001

Abstract

Forest resources are faced with challenges that range from mismanagement, overutilization, conflicts and competing claims. Consequently, this has given rise to legislation and policy to protect forests. However, many governments in the developing countries have difficulties in implementing sustainable forest management (SFM). One of the strategies advocated to foster SFM is participatory forest management (PFM). The PFM approach has been practised formally in Kenya since 2005 when the Forests Act of 2005 came into force. The aim of this study was to assess PFM performance since the inception of three project areas (Nairotia, Nyangores and Olenguruone) in the Transmara Forest Block within the Mau forest complex, Kenya. The data and information ranged from reviews from field meetings and in-depth focus group discussion with Community Forest Associations (CFAs), Kenya Forest Service (KFS) officials and various key stakeholders. The results indicated that there are variations in results and progress towards PFM implementation in Kenya. While a number of activities had been carried out at each of the CFAs reviewed in the study, there was variation in terms of how the forest management agreements and plans were being implemented. In particular, the level of community and stakeholder participation, number of consultative meetings held and level of donor funding to facilitate participatory forest management plans (PFMP) development and project activities. A number of issues were also noted by CFAs as having been omitted in the management plans, specifically, benefit sharing. Absence of benefit sharing framework was cited often as a major drawback in PFM as it has constrained some of the anticipated benefits from forest activities. However, the community members indicated that there was improved awareness amongst them on the need to conserve the forest resources and controlled access to sustainable utilization of the forest resources.

Key Words: Community, Sustainable, Participatory, Management plan, Forest Association

Introduction

Kenya´s forests have been managed under command and control beginning with the East Africa Forest regulations of 1902 which was later expanded into Forest Ordinance of 1911. The evolution saw the forest legislation undergo several amendments in 1941 to 1954 to capture the Constitutional changes in the then Kenya Colony. In 1964 further reviews resulted into the Forest Act Cap 385 which provided for establishment, control and acquisition of forests in independent Kenya.

Communities participated in forestry matters as forest workers on a paid basis or as cultivators who were instrumental in the establishment of industrial plantations under the Shamba System (now PELIS – Plantation Establishment through Improved Livelihood System). The increased forest destruction in 1970s, 80s and 90s was mostly blamed on inappropriate and non-inclusive forest governance policy and legislation (Nurse and Edwards, 1993). There was a general trend of decline of forest land from 1990 to 2000 due to degazettement of forestland to open up areas for agriculture especially in the Mau ecosystem (FAO, 2015). Consequently, in 2005 the Government of Kenya ratified a new Forests Act replacing Cap 385 (GOK, 2005). The act, generally referred to as the Forest Act 2005 introduced a new paradigm shift in forest management in Kenya. Under the Act, community participation is provided for through participatory forest management (PFM) as a major tool.

According to section 46 (1) of the Forest Act, a member of a forest community may together with other members or persons resident in the same area register a community forest association (CFA) under the Society's Act. According to section 46(2), an association registered under section (1) may apply to the Director of Forest Service for permission to participate in the conservation and management of a state forest or a local authority forest in accordance with the provisions of the Act (GoK, 2005).

Forest management has been decentralized to include forest adjacent communities and other stakeholders in management through the introduction of PFM (Ameha et al. 2014). Participatory forest management is a process and an approach in which a group of local individuals exercise some control in the use of the local forests especially those that are found within their local communities. It includes activities of forestry enterprises and public forest services, which encourage and assist forestry activities at the community level. Other features of PFM entail the sharing of authority, responsibility, revenues and duties with the organization responsible for forest management (Ribot et al., 2006; Saarikoski et al., 2010). The PFM approach is often held out as the instrument of choice for effecting an inclusive and equitable forest management in gazetted forests. Significant investment has been made to operationalise PFM. Reliable information on performance of PFM in the field however is lacking. The anticipation is that the development and implementation of PFM in a forest area would, among others, result in the following (Agrawal et al., 2008; Hjortso, 2004; Somanathan et al., 2009);

empowerment of marginalised groups through recognition of rights and responsibilities

stronger partnerships and alliances against external conservation threats

Enhanced incorporation of scientific approaches to forest management.

Enhanced involvement of the forest adjacent communities and other stakeholders in forest conservation,

Minimization of conflicts with forest adjacent communities and other stakeholders through enhanced mechanisms for working together,

Creation of opportunities for local people and other stakeholders to contribute towards protection and rehabilitation of forest resources and hence share the costs of management,

Support of sustainable forest-based livelihoods in poor rural communities.

Participatory Forest Management involves many stakeholders that have different roles and responsibilities (Somanathan et al., 2009). The main Stakeholders in Forest Management in Kenya are; Kenya Forest Service (KFS), Forest Adjacent Communities, Community Forest Associations (CFAs), Other Government Agencies (Local Authorities, Water, Agriculture, KWS, Regional Authorities, Wood Industry (pulp, paper, sawmills), Private Sector (lending institutions, tea estates) and Civil Society Organisations (CSO's) and other Non-Governmental Organizations (NGOs).

Government institutions led by KFS play regulatory and supervisory roles. The functions of CFAs is to formulate and implement forest programmes consistent with the traditional forest user rights of the community concerned in accordance with sustainable use criteria. It also assists the Service in enforcing the provisions of the Forest Act and any rules and regulations made pursuant thereto, in particular in relation to illegal harvesting of forest produce. The role of CSOs and other NGOs entail resource mobilization, lobbying and advocacy as well as capacity building and community mobilization. The Private Sector on the other hand is involved in providing marketing outlets, technology development and transfer, financial and other resource mobilization and forest development (woodlots, forest estates). To ensure the continuity in effective forest management there is need to ensure the smooth operation of CFAs (Agevi et al., 2014; Ongugo et al. 2007).

This paper documents findings of a study project on the transferable knowledge and insights arising from the implementation of activities in supporting participatory forest management (PFM) in Transmara forest block, Mau complex, Kenya for the last five years. The undertaking aimed at assessing the institutionalization and enhancement of PFM planning, development and implementation through the strengthening of three Community Forest Associations (CFAs) operating in the Transmara forest block. The three CFAs namely; Nairotia, Nyangores and Olenguruone signed Forest Management Agreements (FMA) with the KFS in 2014 to formalize working relations on forest co-management. This was to grant legal access and forest use rights to communities and assist in the long-term conservation of the forest, in tandem to the Forest Act 2005. Before this, their Participatory Forest Management Plans (PFMPs) were developed and officially launched in 2012. Towards this end the study assessed and documented the status of PFM planning and implementation using the experience of the three CFAs in order to synthesize the knowledge generated through project interventions by revealing the achievements, challenges and lessons learned.

Attainment of the above would not only spur development of the forest sector but contribute towards attainment of Vision 2030. This justifies investment of significant resources by the government, KFS and other partners to adopt and operationalise PFM in Kenya. In order to enhance the effective investment of these funds, this review was undertaken to establish performance and generate recommendations for enhancing PFM effectiveness in the future.

Methodology

Study area

The Mau Forest Complex is a montane forest in the Rift Valley region of Kenya covering an area of approximately 400,000 hectares (GOK, 2009). The forest is a vital resource to Kenya and the entire East African region and forms one of the five main water catchment areas in Kenya with the largest closed-canopy forest ecosystem in the country. The forest acts as a source of 12 major rivers running across Kenya (Were et al., 2014) that support settlements and livelihoods as well as key economic sectors across the country, including energy, tourism, agriculture and water supply.

Despite the ecological and economic services provided by the Mau forest, massive degradation have occurred in recent years. In the last two decades, 25% of the forest has been converted to other non-forest land uses mainly through ill planned settlements, expansion of agricultural lands and illegal extraction of forest resources (GOK, 2009). Apart from the ecological impact, the destruction and deforestation of the Mau forest complex has had considerable economic implications for the Kenyan economy. In addition, the forest adjacent communities are experiencing unprecedented challenge of environmental degradation impacts and the corresponding socio-economic losses. For instance, a joint report by United Nations Environment Program (UNEP) and KFS showed that deforestation deprived Kenya's economy KES 5.8 billion ($58 million) in 2010 (UNEP, 2012).

Data collection

Multi-faced structured approach was adopted in data collection and collating of information from both primary and secondary sources. This involved literature review, both structured and plenary discussions as well as consultative meetings. The undertaking was guided by the following variables in assessing PFM performance;

Review of work plans and operational plan guided activities

Definition of rights, roles/responsibilities of stakeholders

Sustainability of resource use

Level of awareness and involvement in the process of formulating of PFM and FMAs.

Training and organizational capacity of the CFAs

Sustainable forest management activities

Change in socio-economic indicators

Secondary data was collected through literature review following a checklist on selected variables to find out the baseline condition of the forest, prevailing status on sustainable participatory forest management in Kenya, its implementation as well as management gaps and emerging issues. Among the documents reviewed include; Constitution of Kenya 2010, Forest Act 2005, Water Act 2002, 2016, Land Act 2012, 2016, Draft Forest Policy 2014, Forest Conservation and Management Act 2016, FAO Forest Resource Assessment Framework 2015, KFS Strategic Plan 2009/10-2013/14, PFM guidelines, PFMP manuals and Review of successful global case studies, amongst others.

Primary data was collected via meetings and interviews conducted targeting representatives of CFAs, KFS and Key stakeholders including County governments and project partners. Structured discussions as well as questionnaires were used to gather information. The target was CFA members, CSO representatives and KFS foresters at station level. A consultative meeting session was held at each forest station, where emerging issues were captured and discussed. A total of nine field meetings were held three per each station.

Results and Discussion

Demographic information of the CFAs

The table below (Table 1) provides brief information on the membership of the three CFAs that were included in the study.

Table 1: The history and membership of the respective CFAs

CFA	Year of Formation	Year of registration	CFA members
Nyangores	2008	2011	1000
Nairotia	2008	2011	2300
Olenguruone	2009	2012	900

Participatory Forest Management

The process of developing both the PFMPs and FMAs was found to be inclusive and quite participatory as a significant number of stakeholders were involved, including; Ministry of Agriculture, KFS, National Environmental Management Authority (NEMA), CFAs, World Wide Fund for Nature (WWF), Forest Action Network (FAN), Kenya Tea Development Authority (KTDA), Religious groups, amongst others.

The community members reported that they were contented and satisfied with the agreements. They also noted that the regulations instituted enabled effective and supportive environment in moving towards SFM and enhancing livelihoods. However, implementation of some proposals in the agreement, such as Income Generating Agreements (IGAs) was indicated as not to have been implemented to the latter.

The PFMPs and FMAs outline the responsibilities of the communities. If people are unclear about their rights and responsibilities regarding forest land and resources, the results are conflicting claims to resources. Insecure tenure makes the people who inhabit or exploit forest areas unsure about their future, leaving them with little incentive to manage resources sustainably. Denial of access to vital forest resources can force local populations into destructive practices such as illegal logging, uncontrolled and damaging use of forest resources and unsustainable trade in forest products.

Key obstacles established by the assessment were as follows:

Inadequate financial resources to facilitate implementation of PFMPs.

All management plans for the three forest stations assessed were largely financed by development partners.

Support from development partners has focused on development of PFMPs and strengthening CFAs and not implementation.

KFS expenditure at station level is guided by targets set from the national government, where implementation of PFMPs is not prioritized but development of PFMP is factored in.

Lack of business plans and markets hamper successful development of nature based enterprises and investments as alluded to in PFMPs.

Absence of benefit sharing guidelines on specific activities in the forest such as grazing and fuel wood collection.

Little focus on IGAs like eco-tourism.

Lack of adequate information on Carbon trading its operation.

Various types of benefits were found to accrue from CFAs in relation to PFM implementation that mandate for the following user rights at household level, including;

Grass harvesting and grazing,

Collection of thatch grass,

Collection of medicinal herbs,

Fuel wood collection,

Ecotourism and recreational activities,

Honey harvesting,

Collection of forest products for community based industries,

Recruitment as scouts, and

Employment as casuals and contracts in carrying out some silvicultural operations.

The CFAs had developed, negotiated and signed FMAs with KFS. Largely, FMAs focused on user rights already granted by the Forest Act 2005 consisting of traditional uses such as grazing, fuelwood collection and herbal plants collection that are not deemed by communities as IGAs. In the absence of benefit sharing to spur participation, the effectiveness of PFMPs is greatly reduced. However, the CFAs has within the spirit of PFM started local arrangements to collect some fees from the collection of goods from the forest above the KFS charges.

Although majority of these IGAs fall within the traditional line, the effectiveness of the PFMP is felt through their implementation due to their contribution to livelihood support. The IGAs also contribute towards improved forest conservation by their nature of utilisation of natural environment such as bee keeping and ecotourism. Again, the IGAs create a culture of positive relationship with the forest although presence of benefit sharing framework would lead to more benefits. The IGAs act as incentive to community and an important aspect in PFM. This is especially important in forest related activities as they are by nature long term hence need for having buy-in for the community as they wait for forest related benefits.

CFA Challenges

All CFAs studied indicated they are faced with lack of adequate funding for PFM implementation. All the CFAs are highly dependent on donor funds but have inadequate capacity to undertake proposal writing even in the absence of direct funding from government. Where CFAs have funding it is tied to donor conditions and which is seasonal meaning that long term planning cannot be effected. In addition, CFAs had not put in place mechanisms for raising own funds through membership subcription, annual fees and income from supported IGA activities. This presents a big challenge to the CFAs during activity implementation and project termination and they should put in place mechanism for sustainable funding with view of being self reliant and sustenance.

Currently the main activities implemented under PFMPs is afforestation, grazing and tree planting. Others include livelihood aspects such as bee keeping, fruit farming and firewood collection for sale. Low income and poverty present among the community members was a challenge to the regulated access and harvesting of forest resources. Some community members lack money to pay the access fees hence they have to enter illegally and harvest forest resources.

Effectiveness of PFM/ CFA in achieving project objectives

The effectiveness of PFM and CFAs can be considered from the viewpoint of both biophysical and socio-economic outcomes that collectively contribute to sustainable forest management and enhanced livelihoods. Changes in forest condition since the commencement of a PFM regime can be judged from indicators such as: changes in area of forest, wood volume or biomass and regeneration. Changes in biodiversity can be judged from changes in species diversity over time.

Another indication of the effectiveness of a PFM regime is a reduction in the level of threats that can be associated with improved overall management. Key threats affecting forest conservation in Kenya identified by Forest Action Network (FAN, 2015) include; illegal extraction of forest products (such as fuel wood, charcoal, timber and poles), uncontrolled grazing and wildlife damage.

Improvement in social outcomes is generally an explicit part of the rationale for adopting community based forestry. Continuing community support for PFM is contingent on community members receiving sufficient benefits from their involvement to outweigh the costs involved. Many, but not all, benefits have a financial value, although it is not always easy to assign a monetary value to them. Much of the rationale for promoting PFM is based on a stated intention of improving the livelihoods of rural people. This generally involves improving access to subsistence goods and services and increasing income from the sale of goods and services.

The following criteria and indicators for the CFAs assessment in achieving project objectives were operationalized and scored as below, (+) indicating an Increase, while (–) indicates a Decrease):

Change in area, condition of forest and biodiversity (+).

Change in level of threats, including unplanned or wild fires, illegal logging, wildlife poaching, encroachment for agricultural purposes, land grabbing, charcoal burning, overgrazing, extraction of firewood and over-exploitation of Non Tree Forest Products (NTFPs) (-).

Change in quantity of forest products harvested including firewood, poles, fodder, leaf mulch, wildlife, food and Non Wood Forest Products (NWFPs) (-).

Change in key social indicators and financial indicators including social capital, human capital, availability of forest goods and services (+).

Table 2 indicates the overall effectiveness of the three CFAs under study in achieving PFM objectives by combining the ratings for each of the key indicators into one score. The score indicates that the enabling environment is supportive and effective in achieving SFM and enhancing livelihoods.

Table 2: Summary of level of effectiveness of PFM in enhancing the achievement of the project objectives

Key indicators	Summary of indicator ratings from Appendices 1, 2, 3, 4 and 5, and overall effectiveness of achieving objectives				
	(1)	(2)	(3)	(4)	(5)
Area and condition of forest (+)				X	
Threats to forest (-)				X	
Quantity of products harvested (-)			X		
Social indicators and Financial indicators (+)				X	
Overall assessment of effectiveness in moving towards SFM and enhancing livelihoods 1 being ineffective in moving towards SFM and enhancing livelihoods and 5 being highly effective in moving towards SFM and enhancing livelihoods	4				

Lessons Learned

A notable lesson learned was the need for more stakeholder and community involvement in the implementation of PFM projects. Thus, in order to have effective change, there is need to harmonise development of PFMPs in terms of process and content including programmes and sustainable activities that not only directly benefit the communities but also foster their attitudes to conserve the forest. Such lessons as cited can be summarised as follows;

Formulation of PFMPs varies widely in terms of cost, process followed and level of stakeholder participation. The 3 CFAs outlined areas of improvements and expansion of forest user rights.

Benefits from payments for ecosystem services such as carbon trading and ecotourism has not been realised in spite of improved forest conservation.

Benefit sharing of revenue between KFS and CFAs is highly skewed towards KFS. Alternative IGAs are still inadequate and benefits to communities are still meager with KFS benefiting more from controlled forest harvesting activities and community policing (patrols by scouts).

Discussions on PFM planning and implementation tend to focus on KFS and CFAs, yet other players such as count governments are also critical partners.

CFAs are characterised by several challenges that are related to funding, governance and sustainability, which weakens their position in terms of engagement with KFS and other stakeholders within the forest sector.

Inadequate incorporation of conflict management mechanisms within CFAs structure, PFMPs and operations to a large extent has contributed to escalation of conflicts among CFAs.

Absence of budgetary allocation to CFAs activities from KFS and weak resource mobilisation negatively impact on CFAs activities.

The decision by KFS management to engage CFAs in short term contracts to undertake silvicultural operations has significantly boosted CFAs participation in PFM activities.

Communication and partnerships between KFS and CFAs is weak and ad hoc.

CFAs have diversified their income streams by investing in alternative non-nature based enterprises in order to sustain CFA operations.

Conclusion and Recommendations

Conclusion

The study has demonstrated that major steps have been made to strengthen forestry and integrate community concerns in the forest regulations. However, there still exist constraints and gaps in steps to be taken for full implementation. Most forest adjacent communities are willing to participate in forest conservation and management. There is substantial evidence to confirm the general assumption that PFM, when well facilitated, can enhance sustainable forest management as manifested in activities such as assisting in firefighting, rehabilitation of degraded areas and involvement in forest protection through reporting of illegal activities. PFM is also contributing to livelihood improvement especially where communities are engaged in forest based enterprises and ecotourism activities.

There are variations in results and progress towards PFM implementation in Kenya across the different community based forest regimes. Main weaknesses are that PFMs require huge financial resources for their implementation and are heavily reliant on donor funding. The communities also have limited access to markets for their produce, are faced with competing land uses, lack adequate capacity to engage in forest conservation and are subjected to inappropriate benefit sharing mechanisms. The three CFAs reviewed have been formerly legislated and existed for less than five years. Assessing the performance of PFM in enhancing the extent and condition of forests and improving the livelihoods of the communities is a long term process. However, despite the challenges, overall, the PFM in these areas was highly

successful in achieving its objectives in creating an enabling environment highly supportive in moving towards sustainable forest management and enhancing livelihoods. This can be summarised as follows:

A substantial improvement in forest condition and biodiversity.

An overall reduction in threat level and decrease in quantity of forest products harvested.

Improvement in social outcomes.

Improvement of livelihoods of CFA members and adjacent communities through income from sale of forest products, community based enterprises, micro-credits and casual employment.

Recommendations

To further address the challenges and obstacles experienced in enhancing the opportunities for PFM, and in order to effectively internalise forest management activities within the PFMPs, the study recommends following;

There is need to focus more on IGAs through setting mechanisms to provide startup capital for IGAs and development of business plans. Such activities include;

Increasing the area and number of tree nurseries to increase seedling production and providing market for seedlings in the local market and region,

Training of farmers on zero grazing to reduce pressure on the use of the forest as grazing land,

Develop a complete value chain of agroforestry and commercialize fruit trees,

Strengthen opportunities in honey production and farming of bamboo,

Enhancing alternative energy saving and sources like energy saving "jikos" and biogas production.

The issue of benefit sharing should be addressed as it has remained largely unclear especially in the absence of a benefit sharing framework breeding conflicts among the stakeholders.

There is need to wean CFAs from donor dependency to self-sustenance through provision of an enabling environment for gainful engagement in enterprise development and development of funding opportunities and raising of their own funds to enhance financial sustainability.

To guarantee adequate stakeholder participation in preparation of PFMPs, effective communication among all stakeholders is critical. Targeted support should be provided to enhance adequate consultation between KFS, CFAs and other partners.

Capacity building of KFS officers at station level (foresters and forest rangers) and CFA members should be prioritized to enable them effectively participate in, and take charge of PFM

implementation and monitoring. This should entail providing the necessary capacity that should include skills as well as infrastructure. Among priorities include;

Support to CFAs to have functional offices.

Training of CFAs on governance, record keeping, financial management, and group dynamics.

Organize joint trainings on PFM for CFA scouts and forest rangers.

Increase budget allocation at the forest station level for enhanced PFM implementation.

Strengthen partnership with other stakeholders including the county government and local authorities.

Acknowledgement

This study was financed by the Forest Action Network (FAN) Kenya through WWF- Germany.

References

Agevi, H., Wabusya, M., & Tsingalia, H. M. (2014). Community Forest Associations and Community Based Organizations: Redesigning their Roles in Forest Management and Conservation in Kenya. International Journal of Science and Research, 3, 1916-1922.

Agrawal, A., Chhatre, A., & Hardin, R. (2008). Changing governance of the world's forests. Science, 320: 1460–1462.

Ameha, A., Nielsen, O. J. & Larsen, H. O. (2014). Impacts of access and benefit sharing on livelihoods and forest: Case of participatory forest management in Ethiopia. Ecological Economics, 97:162–171.

Forest Action Network. (2015). Community Forest Situation in Kenya. A scoping study. Forest Action Network. Nairobi, Kenya.

Food and Agriculture Organisation. (2015). Global Forest Resource Assessment 2015. Country Report Kenya, Rome.

Government of Kenya. (2005). Kenya Forest Act (2005). Retrieved from http://www.law.pace.edu/sites/default/files/IJIEA/ForestsAct2005.pdf

Government of Kenya (2007). Sessional Paper No. 1 of 2007 on Forest Development Policy. Nairobi: Government Printer.

Government of Kenya. (2009). Rehabilitation of the Mau forest ecosystem. A project concept prepared by the interim co-ordinating secretariat, office of the prime minister, on behalf of the Government of Kenya. Nairobi

Hjortso, C. N. (2004). Enhancing public participation in natural resource management using Soft OR- an application of strategic option development and analysis in tactical forest planning. European Journal of Operational Research, 152, 667–683.

Ribot, J. C., Agrawal, A. & Larson, A. M. (2006). Recentralizing while decentralizing: how national governments reappropriate forest resources. World Dev., 34, 1864–1886.

Nurse, M. C. & Edwards, S. R. (1993). Strategies for Sustainable Conservation of Forests Under Threat from their Adjacent Communities. KIFCON Kenya and Birdlife International.

Ongugo, P. O., Mbuvi, M. T. E., Obonyo, E., Mogoi, J. N, Maua, J. O., Koech, C. O. & Othim, R. A. (2007). Emerging roles of Community Forest Associations in Kenya: the cases of Arabuko-Sokoke Forest adjacent Dwellers Associations (ASFADA) and Meru Forest Environmental and Protection Community Association (MEFECAP). Proceedings of International conference on Poverty reduction and Forests. Bangkok September, 2007.

Saarikoski, H., Tikkanen, J., Leskinen, L. A. (2010). Public participation in practice assessing public participation in the preparation of regional forest programs in Northern Finland. Forest Policy and Economics, 12, 349–356.

Somanathan, E., Prabhakar, R. & Mehta, B. S. (2009). Decentralization for cost-effective conservation. Proc. Natl. Acad. Sci., 106, 4143–4147.

United Nations Environment Programme. (2012). Deforestation Costing Kenyan Economy Millions of Dollars Each Year and Increasing Water Shortage Risk. Retrieved from http://www.unep.org/newscentre/Default.aspx?DocumentID=2698&ArticleID=9316&l=en.

Were, K., Dick, O. B. & Singh, B. R. (2014). Exploring the geophysical and social-economic determinants of land cover changes in Eastern Mau forest reserve and Lake Nakuru drainage basin, Kenya. Geo Journal, 79, 775-790.

Small Holder Tea Industry Sustainability: Environmental Accounting and Reporting as a Strategy to Cushion on Environmental Concerns

Onyango, S[1]; Muchina, S.W[2]; and Ng'ang'a, S.I[2]

Email: profsylver@yahoo.com

Tutorial Fellow, School of Business, Karatina University, Kenya

Lecturer, Finance and Accounting, Karatina University, Kenya

Associate Professor in Entrepreneurship, Karatina University, Kenya

Abstract

Human activity over the years has caused environmental degradation which in turn has led to climate change. The reversal of climate change is one of the most pertinent agenda as expressed in the World's SDGs, Africa's Agenda 2063, and Kenya's Vision 2030. However, there has been unclear relationship between economic performances and environmental performance in organizations. Whether or not environmental reporting can be used as a mitigation measure to cushion environmental conservation and ensure sustainability is still unanswered. It is in this context that this study's objective was to establish the influence of environmental reporting on sustainability accounting in the Tea industry in the Mount Kenya region by analyzing. Data was collected from 93 factory unit managers and accountants selected through simple random sampling and analyzed by simple binary regression techniques. It was established that environmental reporting influences sustainability accounting as anchored under stakeholder theory. The study also found out that tea factories practice social activities and environmental activities for which they incur costs which were treated as overhead costs and benefits derived by tea factories in terms of long term financial gains and by stakeholders in terms of social and environmental gains. Tea factories are therefore advised to adopt and practice environmental accounting and reporting by integrating it in annual financial reports which will refocus attention to environmental concerns in the tea sector and cushion the tea industry from continuous degradation and eventual collapse.

Key words: Tea Industry, Environmental Accounting, Environmental Reporting, Sustainability

Introduction

Human activity over the years has caused environmental degradation (Mahendra, Govind, & Yogesh, 2015) which in turn has led to climate change especially over the last two centuries (Nafiu, Taherul, & Aboh, 2018). The reversal of climate change is one of the most pertinent agenda as expressed in the World's SDGs (Goal 13), Africa's Agenda 2063, and Kenya's Vision 2030. This means that climate change is a menace in both developed and developing countries. Some of the leading human activities that is creating climate change include overpopulation, agriculture, industrialization and deforestation (Tyagi, Garg, & Paudel, 214). The world has witnessed economic growth since the rapid industrialization which continues to utilize the diminishing scarce resources. There has been continued call for environmental reporting alongside economic reporting (Sulaiman, Theodore, & Hughes, 2003). However, there has been unclear relationship between economic performances and environmental reporting in organizations (Sulaiman et al., 2003). Whether or not environmental reporting can be used as a mitigation measure to cushion environmental conservation and ensure sustainability is still unanswered in the basis of accounting research.

Problem Statement

Management of the environment has become part and parcel of every business undertaking in the world. Environmental management is hence a business strategy both at strategic, operational and tactful levels of management. Accounting, as business language (Hall, Millo, & Barman, 2015) need to communicate every aspect of business to the stakeholders where financial reporting alone has fallen short of revealing complete, reliable and accurate information to the stakeholders (Nikolina, Renata, & Donato, 2017). . In the past, companies assumed that financial reporting was enough to tell of sustainability accounting (Al Amosh & Mansor, 2018). Businesses are required to report environmental information as a process of performing accountability and to reduce environmental remediation costs. Environmental financial reporting has continued to gain importance amongst businesses (Mahammad & Aziz, 2010) hence relevance of environmental accounting to financial reporting form Sustainability Assurance. Sustainability assurance improves the quality of information used for managerial decision making which in turn creates higher degree of sustainability investment by reducing asymmetry in information (Steinmeier & Stich, 2017). It is also revealed that sustainability assurance information boosts investors' confidence of a firm's sustainability performance (Reimsbach, Hahn, & Gurturk, 2017). However, despite these findings, there has been little research to demonstrate the cushioning of environmental concerns through environmental reporting as a strategy in Small Holder Tea Industries in Kenya which informed this study's objective as:

To establish the influence of environmental reporting on sustainability accounting in the Tea sector in Mount Kenya region.

Literature Review

Literature was reviewed in terms of the predictor variable (environmental reporting) and the independent variable (sustainability accounting).

Sustainability Accounting

Sustainability is a concept that encompasses both present and forthcoming generations which envisages that the needs of the people be met. The needs which goes beyond normal profit, are both social and environmental (Gray & Bebbington, 2010). Sustainability hence entails meeting the needs of the present generation without interfering with the quality of life of the future generations. Sustainability accounting is a term used to refer to gathering, analysis, interpretation and communication of information related to sustainability of an organization's financial and economic dealings (Schaltegger & Burrit, 2010) and the purposes of such information to those who bear interest in them (Schaltegger, Zvezdor, & Bennett, 2013). According to Gray (2000) sustainability accounting has materialized from the philosophical debates and has emerged from conceptual developments in the field of accounting (Schaltegger & Burrit, 2010). This is both an extension of conventional accounting and a new accounting field in entirety (Knight, 2013).

Traditional system of accounting is a sticker of internal inventory and flow of financial information and value on the statement of business position and profits and loss on statement of comprehensive income (Parkin, Andy, Buckland , Brooker, & White, 2003). These internal reporting relates to the shareholders alone. Parkin et al (2003), further states that sustainability accounting reports shows costs and benefits accruing from performances on economic, sociocultural and environmental engagements. The magnitude with which stakeholders continue to pile up pressure in relation to organizational responsibility disclaimers, offer a good incentive towards organizational sustainability, to a much extent lead to effectiveness. Such pressures are guiding organizations to put in strategic management and sustainability reporting for stability in offering healthy and stable products (Lungu, Caraniani, Dascalu, & Guse, 2011). The 2012 United Nations Conference on Sustainable Development (Rio+20) further asserted that sustainability reporting in general is an enabling factor for businesses to foster Green Economy (Gobal Reporting Initiative, GRI, 2011).

Sustainability Accounting can be categorized into two: Internal Sustainability Accounting (ISA) and External Sustainability Accounting (ESA). The ISA creates clear visibility between the linkage of unseen costs and benefits and those of financial performance within the context of the institutional operations (Parkin et al, 2003). ESA on the other hand deal with externalities which are not covered in the organization's financial accounts.

Sustainability accounting takes dimension of economic feasibility while incorporating social responsibility aspects and environmental sensitivity (Gray, 2010) in which proponents are putting pressure for better quality of information regarding sustainable practices (Albelda, 2011). The three proponents are not cost-free but bear economic trade-offs and opportunity costs between each other's contents. The social element and environmental components still carry economic viability (Gould, 2011) hence it is important that accountants consider accounting sustainability as part of strategic and routine decision making (Albelda, 2011).

Accountants, especially the management accountants, have a role to facilitate decision making at the strategic level management (Albelda, 2011). Annually throughout the centuries, the management accountant has had his role skewed towards financial disclosure, taxation and auditing which is related to the internal control of the organization. This function sidelines the sustainability in accounting to the externalities. In order to achieve this, accountants can use

such tools as triple bottom line disclosure, Environmental Management Accounting System (EMAS) (Albelda, 2011), and balance scorecard (IFAC, 2011), techniques which are also confirmed by (Horngren, et al., 2011) as workable for accountants towards measuring sustainability accounting. The management accountant's role as influencer of decision making is one enough a strategic sustainability focus. While participating in strategy formulation, mission statement and vision declaration of the organization, management accountants need to play an active role in sustainability accounting right at this point (CIMA, 2011). The organization should hence develop concrete goals towards achieving sustainability accounting (Vinal, Sharma, & Low, 2012). Numerous reason exist justifying the need for accountants' engagement in sustainable development. First, new jurisdiction advancing towards sustainable development for organizations, secondly, the global pressure from international leaders pushing for organization's sustainability knowledge, and thirdly is the unwavering call for accountants to put in the forefront practices of sustainable development (Ferreira, Moulang, & Hendro, 2010).

Environmental Reporting

The phrase 'Environmental accounting" may take different dimensions of definitions. Simply it entailed consequences that arise due to a firm's usage of input and release of output (ACCA, 2015). The inputs are drawn from the environment while releasing outputs to it. These bear costs which leads to another definition of environmental accounting as the act of identifying, measuring and allocating environmentally associated costs whose integration to decision making is prudent which is then communicated to the stakeholders (Institute of Management Accountants, IMA, 2015). The careful examination of the impact of the organization's products and services while utilizing input is what is referred to as identification. Environmental reporting is therefore the practice with which accountants incorporate propositions of environmental management techniques and conservation modules into the conventional annual disclosures (International Federation of Accountants, 2015).

Environmental reporting is tool for measuring environmental practices and performance by organizations (Hajnalka, 2012), in which business terms focus on understanding the costs and returns from environmental engagements. The fundamental aim of environmental accounting system is to help in the comprehension of existing tradeoffs on conventional accounting and economic aims and environmental strategic purposes as a tool to formulate policies (Ahmad, 2012). Environmental Reporting (ER) forms part of the company's communication system. ER is valuable towards realization of the environmental performances apart from profit making objective. ER is hence a means of communicating to all stakeholders (Ahmad, 2012) whose concern on environmental issues continues to grow every other day.

Ahmad (2012) recommends that any environmental expenditure incurred while a company engages in environmental concerns, need to be treated as capital expenditure. This is so because it is from the environment that the business draws its resources that is converted for the purposes of further sales to earn considerable profits. These process can be guided by EMAS which reduces the organization's impact in the environment that also responds to environmental interests of both internal and external stakeholders (Pederson, 2007). Moreover, EMS is a way of complying with the regulations while minimizing costs of audits by customers and magnify market image and still lead to change management which is profitably achieved if sustainability accounting is accomplished (Mohamad, Saravanan, & Seetharaman, 2007).

Environment entails the totality of plants, animals, socioeconomics and cultural tenets which include physical factors such as land, air, biological factors, soil and water surrounding human beings (GoK, 2013). Environmental issues according to (CSR Report, 2011) include environmental protection and improvements, careful resource use that lead to controlling the environmental impact on aspects of quantity of emitted gas, recycling of waste materials (Schaltegger, Bennet, Burrit, & Jasch, 2008). This leads in using resources to maximize production and so are returns while retaining the status of the environment or improving it (Ahuja, 2014). Accountants need to pay attention to environmental pollution prevention prevailing due to economic activities hence budget for costs pollution prevention rather than costs abatements (Russo & Fouts, 1997). Vision 2030, medium plans and sustainable development goals advocate for combating climate change, protection of freshwater and wetlands (water management), accounting for natural resources and depreciation of natural resources, soils fertility and depletion, protection of wildlife habitats, air quality (GoK, 2013).

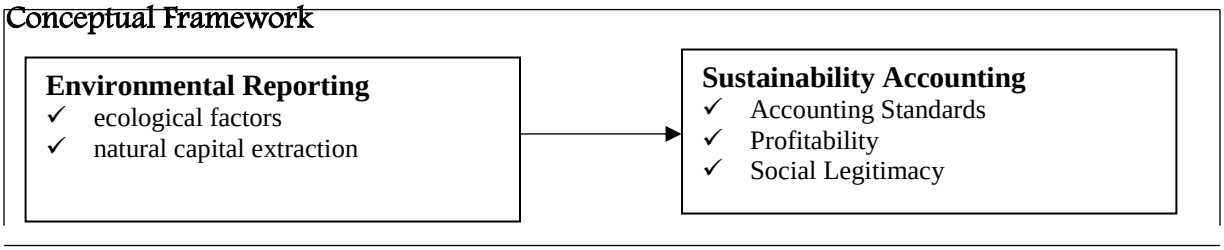


Figure 1: Conceptual framework

The conceptual framework in Figure 1 indicates the hypothesized relationship that environmental report influence sustainability accounting in the tea sector in Mount Kenya region among the industries of small holder tea farmers.

Research Methodology

The study adopted Mixed Method Research (MMR) design which was coiled into existence approximately the year 2000 (Lund, 2012). Some researchers like (Venkatesh, Brown, & Bala, 2013) have also referred to MMR as the third methodological movement which was gaining imminence use among researchers. Adoption of MMR for this study was justified by the fact that it provided greater discernment (Creswell, 2012) in the understanding of SEA Accounting and Reporting and Stakeholders while determining their influence on Sustainability Accounting; assisted in obtaining mass knowledge in order to draw informed conclusions and arrive at future research areas as the researcher was not be pegged on one research design alone (Gail, 2013; Frels & Onwuegbuzie, 2013). In this context, the study found it even better to term MRR as Mixed Method Accounting Research (MMAR), (Ihantola & Kihn, 2011) as based on the study context.

The study targeted 111 respondents drawn from 37 tea factories around the entire Mount Kenya region. The tea factories included Chinga, Gacharage, Gachege, Gathuthi, Gatunguru, Githambo, Githongo, Gitugi, Igembe, Ikumbi, Imenti, Iriaini, Kagwe, Kambaa, Kanyenyaini, Kathangariri, Kiegoi, Kimunye, Kinoro, Kionyo, Kiru, Makomboki, Mtaara, Michimikuru, Mungania, Mununga, Ndarugu, Ndima, Nduti, Ngere, Njunu, Ragati, Rukuriri, Theta, Thumaita,

and Weru. The study sort information from Factory Unit Managers, Factory Accountants, Factory Assistant Accountants or Accounts Clerks drawn from each tea factory. Data was obtained from 68 tea factory unit managers and accountants. The Likert scale data was coded and transformed to categorical qualitative values in which counts were obtained to run binary logistic regression model. Interview schedule was also applied in strengthening the findings of binary logistic regression.

Study Findings

The study findings were presented both descriptively

Association between Environmental Reporting and Sustainability Accounting

The study further assessed the how different strength of environmental reporting relate with the sustenance of sustainability accounting. The counts for the measure of environmental reporting (Table 4.26) was cross tabulated with the counts of the measure of sustainability accounting (Table 4.5). The output was presented in a contingency table where sustainability accounting was cross-tabbed by environmental reporting. The results indicated that all the respondents (n=9) who believed that the influence of environmental accounting is weak, also felt that it would make sustainability accounting unsustainable. Out of the 43 respondents that believed that the influence of environmental reporting is strong, 8.8% felt that even with the strength of influence it would lead to unsustainable practice of sustainability accounting while 54.4% felt that it would lead to sustainable practice of sustainability accounting. The output is as presented in Table 4.27.

Table 1: Tabulation of Sustainability Accounting by the Environmental Reporting

Strength	Unsustainable		Sustainable		Total	
	Frequency	**Percentage**	**Frequency**	**Percentage**	**Freq**	**%**
Weak	9	13.2	0	0.0	9	13.2
Moderate	13	19.2	3	4.4	16	23.6
Strong	6	8.8	37	54.4	43	63.2
Total	**28**	**41.2**	**40**	**58.8**	**68**	**100.0**

The study findings revealed that when the strength of influence of environmental reporting is intensified, then the practice of sustainability accounting is actually sustainable. This is taken into consideration that there are costs incurred and benefits derived from elements of environmental reporting.

This study further tested hypothesis that there was a significant influence of environmental reporting on sustainability accounting in tea factories of Mount Kenya region. The null hypothesis was stated as:

$\boldsymbol{Ho_3}$: There was no significant relationship between environmental reporting and sustainability accounting in the tea sector of Mount Kenya Region

The Chi-square test of independence was first run to examine the association between social reporting and environmental reporting at 5% level of significance. The Chi-square test of

independence revealed that the probability values were less than the level of significance as in Table 4.19. The null hypothesis was thence rejected and the study concluded that there was a significant association between environmental reporting and sustainability accounting as evidence by Pearson chi-square as $(\chi^2_{(2)} = 36.622, p = 0.001)$. The findings were also confirmed by Likehood Ratio value in which $\left(\chi^2_{(2)} = 41.943, p = 0.001\right)$. The output also revealed that linear by linear association between the variables was significant $(\chi^2_{(1)} = 33.589, p = 0.001)$. The results are presented in Table 4.28.

Table 2: Chi-square test for Sustainability Accounting against Environmental Reporting

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	36.622	2	.000
Likelihood Ratio	41.943	2	.000
Linear-by-Linear Association	33.589	1	.000
N of Valid Cases	68		

The study findings hence confirmed that there was a statistically significant association between environmental reporting and sustainability accounting. This means that sustainability accounting is assured by the practice of environmental reporting to the stakeholders of the tea factories.

The influence of environmental reporting on sustainability accounting was further explored by running a simple binary logistic regression model. The output confirmed that environmental reporting had significance influence on sustainability accounting $\left(Wald's\ test: \chi^2_{(1)} = 20.272, p < \alpha\right)$ at five percent level of significance. Further, the simple binary regression indicated that the sustainability odds ratio of sustainability accounting at 95% confidence level for environmental reporting was 28.659 with confidence interval of $(6.651 \leq CI \leq 123.488)$. This means that environmental reporting was 28.659 times more likely to increase sustenance of pursuit for sustainability accounting than when it is not practiced. The output are shown in Table 4.20.

Table 3: Odds Ratio for Logistic Regression of Sustainability Accounting on Environmental Reporting

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	ER	3.355	.745	20.2721		.000	28.659	6.651	123.488
	Constant	-8.234	2.023	16.5691		.000	.000		

The model produced is presented below:

$$log\left\{\frac{\pi(x)}{1-\pi(x)}\right\} = -8.234 + 3.355X_3$$

The results indicated that environmental reporting positively influence sustainability accounting. These results were confirmed by the interview schedule in which some accountants asserted that sustainability accounting can only be pursued to a sustainable level when items of environmental reporting are disclosed since costs are incurred and the benefits are enjoyed by the stakeholders and the tea factory.

Discussion of Findings

The study findings indicated that the tea factory commits funds in undertaking environmental reporting factors that included undertaking forestry activities, protection of wildlife and habitats, maintenance of soil fertility management, use of renewable energy and innovative energy conservation measures. However, the tea factories itself rarely commit funds to use of alien species of tea. The study further reveals that the tea factories derived benefit from undertaking the ecological and energy factors like forestry activities and wildlife management. These findings are congruent to those of (Linda, Jan, Keizer, & Goda, 2014) which established that organizations incur costs and derive benefits in ecological factors and energy factors (Ileana & Antohe, 2014). However, in most occasions, environmental costs are allocated as overhead costs which make such costs invisible (Jamil, Rapiah, Muhammad, & Amin, 2014).

The study revealed that the tea factories commit funds in undertaking natural capital extraction factors that included land degradation control program, combating of climate change, natural resource efficacy use, water management, agricultural waste control, waste management and control. This is agreement with the study by (Barbie, 2013) that studied how ecological capital is utilized. Further, by undertaking the activities, the tea factories derive financial benefits which benefit their stakeholders too. These findings are consistent with the study on environmental management accounting and its cost by (Ileana & Antohe, 2014) which found out that environmental costs are those expenses arising from economic firm which are incurred directly or indirectly by way of voluntary practice or due to legal fines. According to Dewi (2014), environmental costs at times are computed by comparing the company's waste generated with the total revenue, this is slightly different with the findings of this study where environmental costs are measured in terms of direct expenditure incurred.

The study established that the tea factories practices ecological and energy factors which included forestry activities, protection of wildlife, soil fertility and salinity management, use of renewable source of energy, and undertaking innovative energy conservation measures. These results are supported with the previously discussed results where the tea factory commit funds to undertake the activities. Hence such activities gauge the organization's efficacy in utilization of environmental resources (Elkins & Tomei, 2010). The study by Dewi (2014) had similar results with these findings in which it is shown that organizations have environmental exposure.

It was revealed that environmental reporting had significance influence on sustainability accounting $\left(Wald's\ test: \chi^2_{(1)} = 20.272, p < \alpha\right)$ at five percent level of significance. Further, the simple binary regression indicated that the sustainability odds ratio of sustainability accounting at 95% confidence level for environmental reporting was 28.659 with confidence interval $(6.651 \leq CI \leq 123.488)$. This means that environmental reporting was 28.659 times more likely to increase sustenance of pursuit for sustainability accounting than when it is not practiced. These findings were consistent with the findings by (Ferrero, Sanchez, & Beatriz, 2013). In most cases, company's annual reports are the ones used to communicate financial information (Othman & Ameer, 2010) from which some simply communicate positive information on environment in order to remain legitimate (Bouten et al, 2011). Stakeholder's require for environmental accounting information in order to make economic decisions is growing (De Villiers & Van Staden, 2010), but they are keen to check at the quantitative information in terms of costs and benefits as established by this study. According to (Gatimbu & Wabwire, 2016) environmental reporting not only influence sustainability accounting but also the practice increases organization's financial performance and improve eco-efficiency (Hossain, Rowe, & Mahammad, 2012) in developing countries like Kenya. Despite these merits environmental reporting has been found to be very incomplete and incredible (Bouten et al, 2011; Gillet, 2012) and this gap that this study has filled by establishing the areas of environmental reporting and its influence to sustainability accounting through the merits to stakeholder and the company; which are of economic importance (Zulkifli, 2012).

Conclusions and Recommendations

The study established that environmental reporting in terms of ecological and natural extraction factors highly influence sustainability accounting. Environmental accounting and reporting brings about environmental benefits accruing from environmental costs incurred. This study encourages practice of environmental reporting of environmental assets and liabilities. The study having established environmental costs, benefits, assets and liabilities; it recommends the integration of environmental reports into the annual financial reports. The study argues that such integrated reporting shall cushion small holder tea industries from environmental concerns. Such recommendation is pegged on the fact tea industries draw a lot of wood fuel from the environment, use a lot of fertilizer in the firms that may affect soil and hence water during run-offs and emits fumes from the factory into the air including vibrations and noise. The practice of environmental accounting and reporting is imperative of creating sustainability accounting that will lead to informed managerial decision making, investor confidence with performance of the industries, increased stakeholder confidence with the sustainability performance of the tea industries which in the long run transforms to improved industry performance.

References

ACCA. (2015, August 2015). *ACCA Think Ahead*. Retrieved from Environmental Accounting and Reporting: http://www.accaglobal.com

Ahmad, A. (2012). Environmental Accounting & Practices: Significance and Issues. *Global Journal of Management and Business Research, 12*(14), 118 - 127. Retrieved February 15, 2016,

from https://globaljournals.org/GJMBR_Volume12/10-Environmental-Accounting-and-Reporting.pdf

Ahuja, H. L. (2014). *Managerial Economics: Analysis of Managerial Decision Making* (8th ed.). New Delhi: S. Chand & Company Ltd PVT Ltd (an ISO 9001:2008 Company).

Al Amosh, H. A., & Mansor, N. (2018). Sustainability corporate responsibility. A review of environmental and social disclosures. *International Journal of Accounting, Finance & Business, 3*(8), 78-87.

Albelda, E. (2011). The Role of Management Accounting Practises as Facilitator of the Environmental Management: Evidence from EMAS Organizations. *Sustainability, Management and Policy Journal*, 76 - 100. doi:http://dx.doi.org/10.1108/2048021111162137

Barbie, E. B. (2013). Wealth Accounting, Ecological Capital and Ecosystem Services. *Environment & Development Economics, 18*(2), 133-161.

Bouten, L., Everaert, P., Van, L., De, M., & Christiaens, J. (2011). Coroporate social responsibility: A comprehensive picture. *Accounting Forum, 35*(3), 187-204.

CIMA. (2011). Sustainability and the Role of the Management Accountant. *Research Executive Summary Series, 7*(14), 1-14.

Creswell, J. W. (2012). *Education Research: Planning, Conducting and Evaluating Quantitative and Qualitative Research* (4th ed.). Boston: Pearson Education International.

CSR Report. (2011). A Study on Awareness of Managers and Consumers in Vietnam. *Journal of Accounting and Taxation, 3*(8), 162 - 170. doi:10.5897/JAT11.016

De Villiers, C., & Van Staden, C. J. (2010). Stakeholders' Requirement for Corporate Environmental Disclosures: A Cross Country Comparison. *The British Accounting Review, 42*(4), 227-240.

Dewi, S. (2014). Social and environmental accounting. *International Journal of Scientific & Technology Research, 3*(3), 2277-8919.

Elkins, P., & Tomei, J. (2010). Eco-Efficiency and Resource Productivity: Concepts, Indicators, and Trends in Asia Pacific.

Ferreira, A., Moulang, C., & Hendro, B. (2010). Environmental Management Accounting and Innovation. *Accounting, Auditing and Accountability Journal, 23*(7), 920 - 948.

Ferrero, M. J., Sanchez, M. I., & Beatriz, C. B. (2013). Effects of Financial Reporting Quality on Sustainability Information Disclosure. *Corporate Social Responsibility and Environmental Management, 22*(1), 45-64. doi:10.1002/csr.1330

Gatimbu, K. K., & Wabwire, M. J. (2016). Effect of Corporate Environmental Disclosure on Financial Performance of Firms Listed in Nairobi Securities Exchange. *International Journal of Sustainability Management and Information Technolgy, 2*(1), 1-6.

Gillet, C. (2012). A study of sustainability verification practices: The French case. *Journal of Accounitng and Organizational Change, 8*(1), 62-84.

Gobal Reporting Initiative, GRI. (2011). *Sustainability Repoting Guidlines.* Amsterdam.

GoK. (2013). *National Environmental Policy.* Ministry of Environment, Water and Natural Resources. Nairobi: Government Printers Ltd. Retrieved from http://www.environment.go.ke

Gould, S. (2011). Accounting for Sustainability. *Accountancy Plus, 1*, 19-20.

Gray, R. (2000). Social and Environmental Accounting and Reporting: From Ridicule to Revolution. *Centre of Social and Environmental Accounting Research.*

Gray, R., & Bebbington, J. (2010). Environmental Accounting, Managerialism and Sustainability. *Journal of Advances in Environmental Accountancy & Management.*

Hajnalka, V. (2012). *Environmental Benefits and Its Statement in the Environmental Management Accounting.* Hungary: University of Szeged Press. Retrieved May 2016, from Focus on Accounting:https://www.asz.hu/storage/files/files/public-finance-quarterly-articles/2012/a_437_452_vanh_2012_4.pdf?download=true

Hall, M., Millo, Y., & Barman, E. (2015). Who and what really rounts? Stakeholder prioritization and accounting for social value. *Journal of Management Studies, 52*(7), 907–934. doi:http://doi.org/10.1111/joms.12146

Horngren, C. T., Maguire, W., Tan, R., Datar, S. M., Foster, G., Rajan, M. V., & Ittner, C. I. (2011). Cost Accounting: A Managerial Emphasis.

Hossain, M. M., Rowe, A. L., & Mahammad, Q. (2012). Drivers and Barriers of Corporate Social and Environmental Reporting (CSER) Practices in a Developing Country. *10th Interdisciplinary Perspective on Accounting Conference.* UK: Cardiff University Press.

IFAC. (2011). *Sustainability Framework 2.0.* Newyork : IFAC.

Ihantola, E. M., & Kihn, L. A. (2011). Threats to Validity in Mixed Methods Accounting Research. *Qualitative Research in Accounting and Management, 8*(1), 35 - 58. doi:http://dx.doi.org/10.1108/11766091111124694

Ileana, S. R., & Antohe, A. (2014). Environmental Cost - An Environmental Management Accounting Component. *International Journal of Research in Accounting and Management Sciences, 4*(4), 166-175. Retrieved from http://www.hrmars.com

Institute of Management Accountants, IMA. (2015). *Tools & Techniques of Environmental Accounting for Business Decisions.* Montivale: Institute of Management Accountants Publishers, 10 Paragon Drive. Retrieved August 2016, from http://www.imanet.org

International Federation of Accountants, I. (2015). *Handbook of International Accounting Pronouncements.* International Accounting Education Standards Board. Retrieved from http://www.accountingedu.org/environmental-accounting.html

Jamil, Z. M., Rapiah, M., Muhammad, F., & Amin, A. (2014). Environmental management accounting practices in small and medium manufacturing firms. *Global Conference on Business and Social Sciences*, (pp. 619-626). Kuala.

Knight, G. (2013). *Exploring Management Accounting for Sustainability.* London, EC2R: Chartered Accountacts .

Linda, S., Jan, W. B., Keizer, K., & Goda, P. (2014). An integrative framework of encouraging pro-environental behavior. *Journal of Environmental Psychology, 38*, 104-115.

Lund, T. (2012). Combining Qualitative and Quantitative Approaches. *Scandinavian Journal of Education Research, 56*(2), 155 - 165. doi:10.1080/00313831.568674

Lungu, C. L., Caraniani, C., Dascalu, C., & Guse, R. G. (2011). Exploratory study on social and environmental reporting of European companies in crisis period. *Accounting and Management Information System, 10*(4), 459-478.

Mahammad, F., & Aziz, A. (2010). Environmental accounting and International Reporting Standards. *International Journal of Business Management, 5*(10), 105-112. doi:10.553/ijbm.v5n10.105

Mahendra, P. C., Govind, S. C., & Yogesh, K. K. (2015). Environmental degradation: causes, impacts and mitigation. *National Seminar on Recent Advancements in Protection of Environment and its Management Issues (NSRAPEM-2015).* Kota, Rajasthan.

Mohamad, I., Saravanan, A., & Seetharaman, A. (2007). Environmantal Accounting as a Tool for Environmental Management System. *Applied Science Environmental Management, 11*(2), 137 - 145. Retrieved from http://www.bioline.org.br/ja

Nafiu, A., Taherul, I. K., & Aboh, A. (2018). Climate chnage and environmental degradation: A serious threat to human security. *European Journal of Social Sciences Studies, 3*(1), 161-172. doi:10.5281/zenodo.1307227

Nikolina, M. V., Renata, V., & Donato, C. (2017). Non-finacial reporting as a new trend in Sustainability Accounting. *Journal of Accounting and Management*, 13-26.

Othman, R., & Ameer, R. (2010). Environmental Disclosures of Palm Oil Plantation Companies in Malaysia: A Tool of Stakeholder Engagement. *Corporate Social Responsibility & Environmental Management, 17*(1), 52-62.

Parkin, S., Andy, J., Buckland , H., Brooker, F., & White, E. (2003). *Accounting for Sustainability.* Educative Report, Higher Education Programme for Sustainability, London. Retrieved from http://www.heps.org.uk

Pederson, E. R. (2007). Perceptions of Performance: How European Firms Experience Environmental Accounting System. *Corporate Social Responsibility and Environmental Management*, 61-73.

Reimsbach, D., Hahn, R., & Gurturk, A. (2017). Integrated reporting and assurance of sustainability information. *European accounting review, 27*(3), 559-581.

Russo, M., & Fouts, R. (1997). A Resource Based Perspective on Corporate Environmental Performance and Profitability. *Academy of Management Journal, 40*, 534 - 559.

Schaltegger, S., & Burrit, L. R. (2010). Sustainability Accounting for Companies. *Journal of World Business*, 375 - 384.

Schaltegger, S., Bennet, M., Burrit, R. L., & Jasch, C. (2008). Environmental Management Accounting (EMA) as a Support of Cleaner Production. *Co-Efficiency in Industry and Science, 4*, 3 - 28.

Schaltegger, S., Zvezdor, D., & Bennett, M. (2013). *Exploring Practises in Management Accounting for Sustainability.* London: Chartered Accountants Trustees Limited. Retrieved January 2016, from https://www.icaew.com/~/media/corporate/files/products/sustainability/tecpln11121a%20exploring%20corporate%20practices%20in%20management%20for%20accounting.ashx

Steinmeier, M., & Stich, M. (2017). Does sustainability assurance improve management investment decisions? *European Accounting Review*, 177-209.

Sulaiman, A. A.-T., Theodore, E. C., & Hughes, K. E. (2003). The relations among environmental disclosure, environmental performance, and economic performance: A simultaneous equations approach. *SSRN Electronic Journal*. doi:10.2139/ssrn.405643

Tyagi, S., Garg, N., & Paudel, R. (214). Environmental degradation: Causes and consequences. *European Researcher. Series A*, 1491-1498.

Venkatesh, V., Brown, S., & Bala, H. (2013). *Bridging the Qualitative-Quantitative Divide.* Management Information System Quarterly.

Vinal, M., Sharma, U., & Low, M. (31 August 2012). Management Accountant's Role in Accounting for Sustainability. *Sustainability Accounting Research Symposium.* New Zealand.

Zulkifli, N. (2012). Social and Environmental Accounting: Educational Issues in Malaysia.

Land cover change and its Implications on Urban Heat Island in Nairobi County: A GIS and Remote Sensing Approach.

Authors

Temitope Ezekiel Idowu[1, *, 2], Nelly Cherono Kiplangat[2], Rose Waswa[3]

Jomo Kenyatta University of Agriculture & Technology, Kenya, P O Box 62000-00200, Nairobi Kenya, 0718111621, lois.temitope@gmail.com.

Technical University of Kenya, P O Box 52428-00200, Nairobi Kenya, 0711652932, cherononelly34@gmail.com

Regional Centre for Mapping of Resources for Development, P O Box 632-00618, Nairobi Kenya, 0780447225, rwaswa@rcmrd.org

Abstract:

As cities expand and more megacities emerge, the impacts on the environment are increasingly becoming apparent. One of such impacts is the Urban Heat Island (UHI) phenomenon. Several studies have identified progressive vegetation losses and decrease in pervious surfaces as two of the main factors contributing to UHI. However, location-based studies help determine the pertinent contributing factors, thereby providing a valuable basis for the formulation of efficient mitigation strategies in such areas. This study investigated the impact of land cover changes on UHI and its evolution from the year 2000 to 2018 in Nairobi – a major city in East Africa. Medium resolution Landsat TM, ETM+ and OLI data were obtained for assessing the Land cover changes and establishing the relationship between the changes and the corresponding Land Surface Temperatures (LST). The datasets were acquired in intervals of 2002-2010-2018. A pixel-based supervised classification was used for assessing the land cover changes. The NDVI and emissivity for each LULC map were estimated. Final LST maps indicating the extents of UHI were developed from the emissivity's and NDVI values using empirical equations. The results show that there was a direct link between the progression of LULC towards urbanization and the increase in the LST in the study area from 2000 to 2018, i.e. as Nairobi became more urban it engendered higher of UHI values. The study also reveals that UHI is a dynamic phenomenon usually higher in dryer hotter months and lower in colder months.

Keywords: Urban Heat Island (UHI), Land surface temperature (LST), Vegetation Index, Land cover (LC) change, Urbanization, Remote sensing

*Corresponding author: Temitope Ezekiel Idowu

1.0 INTRODUCTION

The last two decades have seen a surge in the number of researches related to land cover changes, urbanization and their ecological as well as social impacts. One of the identified global environmental changes is an observed rise in the near surface temperatures with an increase in

urbanization in different parts of the world. The phenomenon is widely referred to as the Urban Heat Island (UHI). The UHI phenomenon was studied and first described by Luke Howard in 1810 as a case where an area of land consistently experience temperatures higher than that of the surrounding area (Surawar & Kotharkar, 2017). Aleksandrowicz et al., (2017) termed UHI as the inclination towards experiencing temperature values up to 12 K higher than the surrounding rural periphery. The intensity of the UHI is invariably the temperature difference between the warmest zone in the urban area and the contiguous rural setting (Voogt & Oke, 2004). Global population trends show a bias towards urban migration. In a relatively short timeframe, the world's population residing in urban areas had passed 50% by 2018, and the percentage is expected to stand at 68% by 2050 (UN, 2018). Hence, the issue of UHI and its attendant effects cannot be taken lightly and according to Favretto, (2018) UHI should be regarded as a global challenge capable of negatively impacting the smooth running and habitability of the urban environments. The impacts of UHI may be felt in the areas of human health and comfort, urban planning, energy management, and urban air pollution.

UHI invariably increases peak energy demand and energy consumption in the form of increased electricity demand for cooling systems. This is evidenced by studies which reveal that for every 0.6 ℃ increase in ambient air temperatures, electricity requirement for cooling increases by 1.5 – 2 % at temperatures higher than 20 ℃, implying that 5 – 10% of the municipal demand for electricity goes into UHI compensation (Akbari, 2005). Other possible impacts of UHI include increased air pollutants and greenhouse gases emissions, thermal pollution in aquatic systems, discomfort and human health risks, alterations to local climate such as wind and rainfall patterns, fogs formation and humidity, and impaired water quality (EPA, 2019; Rinkesh, 2019).

The body of research on UHI has grown steadily in the past two decades with Asia leading the park in the number of studies done, while Africa is the least researched. Ngie et al., (2014) provides a comprehensive review of some few UHI related studies done in Africa and provides further insights on remote sensing approaches to the UHI study in the wake of the growth of megacities in the continent and the resulting energy and sustainability challenges. Two factors identified as significant causes or contributors to UHI are urbanization and human activities due to the changes they induce on the physical characteristics of the earth's surface and the alterations to near-surface flow and radioactive fluxes. Physical parameters on the earth's surface which undergo the changes include the thermal capacity, albedo, moisture, and heat conductivity (Ngie et al., 2014). These changes occur because urbanization and anthropogenic activities lead to the conversion of hitherto pervious and natural surfaces such as forests, and natural swarms into impervious surfaces like roads and cemented surfaces. Studies demonstrating how increases in impervious surfaces positively correlate with an increase in UHI are abundant in the literature (Madanian, et al., 2018; Mohajerani, Bakaric, & Jeffrey-Bailey, 2017; Zhang, Ji, Shu, Deng, & Wu, 2008). Other causative factors with no less impact include the urban geometry (e.g. narrow streets and tall buildings); wind and cloud cover; climate and topography; and the changes in land use/land cover (LULC) patterns (Ngie et al., 2014).

When the geometry of the urban settings tends towards narrow streets and tall buildings, the ease of air circulation and wind flow are easily impeded. Unobstructed air movement and wind flow contribute to the cooling of the near-surface thereby reducing the build-up of UHI. Cloud cover and strong winds have been observed to reduce the impacts of UHI while clear skies and calmer winds achieve the opposite because they help make the most out of the solar energy hitting the surface and minimize surface heat being lost by convection (Kim & Baik, 2005).

Climate and topography may also influence the formation of UHI. For instance, the presence of abundant water bodies close to an urban setting can produce cooling effects while mountain ranges may affect the local wind patterns in an area which will invariably impact UHI formation either positively or negatively. Finally, the spatial changes in LULC with respect to urbanization have been observed to have noticeable effects on UHI patterns in many studies with temperatures over built-up areas relatively higher than that of vegetative areas (Lo & Quattrochi, 2003; Obiefuna, Nwilo, Okolie, Emmanuel, & Daramola, 2018; Surawar & Kotharkar, 2017).

The oldest approach to the assessment of UHI has been with the use of fixed-thermometer networks for taking ground-based readings or the use of thermometers mounted on vehicles which form transverses and generates empirical data. This approach measures the air temperature at specific heights above the ground. A typical example is the 1973 study by Oke where data were gathered with the use of automobile transverses and then compared with previously published literature for establishing the relationship between city sizes and UHI (Oke, 1973) The second and relatively more recent and more widely used approach, is the use of satellite remote sensing. This approach involves the measurement of Land Surface Temperatures (LST) on the premise that all surfaces emit thermal energy in specific wavelength ranges. Sensors mounted on satellites can detect and take the readings of these wavelengths. It has therefore been established that satellite imagery is capable of providing measurements of energy reflecting and being emitted from different land surface types such as paved surfaces, roofs, water, bare ground and vegetation (Ngie et al., 2014). For instance, the Landsat Thematic Mapper (4, 5) and Enhanced Thematic Mapper plus (7) are multispectral images with bands 2, 3 and 4 used for land cover classification while the band 6 is a thermal band which can be used for determining the LST and subsequently identifying the UHI.

The advantages satellite remote sensing-based surface measurements hold over air measurements are its ability to provide more extensive spatial coverage, the comparatively low cost of imagery and the recent milestones made in image processing techniques. However, surface measurement approach is not without its limitations. The first limitation is that the images do not entirely capture the thermal emissions from vertical surfaces like the walls of tall buildings but only the horizontal surfaces like the rooftops (Goldreich, 2006). Another major challenge in the past is how to manage the inaccuracies generated as radiations travel to the earth's surface and reflected. However, these issues have been worked on and currently, many satellite image providers now provide corrected images. For instance, it is now possible to download Top of Atmosphere (TOA) corrected Landsat TM, ETM+ and OLI images. Air temperature measurements usually taken at about 1.5 m above the ground using hand-held devices or equipment (sensors) mounted on vehicles and aircrafts (Kraaijenbrink et al., 2018; Wong & Yu, 2005) is also a viable alternative. However, the demerits of air temperature measurement approach seem to outweigh the limitations associated with satellite remote sensing based LST measurements.

Mirzaei & Haghighat, (2010) identified 3 significant limitations of air temperature measurements; a) the need for weather station data both within and outside the city which are oftentimes challenging to obtain; b) changes in instrumentation and data collection need to be considered in each microclimate; c) comparing central urban areas with the surrounding non-urban regions is a challenge, since many weather stations are usually situated close to airports which become urbanized over time. Hence, remote-sensing based measurements using satellite imagery seems to be the preferred approach to UHI studies.

The study of UHI based on LST deduced from satellite imagery requires an in-depth understanding of the nature of imagery available for use. Some currently available and widely used images containing Thermal-Infrared region (TIR) bands include NOAA, AVHRR, MODIS, ASTER, Landsat (MSS, TM, ETM+, OLI), SENTINEL-2A, and SENTINEL-3 SLSTR. These datasets come in different spatial and temporal resolutions broadly classified as high, medium or low resolutions. The fine (0.6 – 4 m), medium (4 – 30m) and low (30 m) resolution images do not have uniform band resolutions. In the bid to harmonise the trade-offs between image resolutions and data availability, it has been observed that most researches on UHI apply the medium resolution images containing TIR bands (Ngie et al., 2014). The Landsat, a widely used medium resolution multispectral image has its TIR on band 6 for MSS, TM and ETM+ although the spatial resolutions are 120m and 60m for the MSS and TM/ETM+ respectively. The TIR is captured in Bands 10 and 11 of the Landsat 8 (OLI) both at 100m resolutions. Similarly, SENTINEL-3 SLSTR's thermal-infrared ambient bands are S7, S8 and S9 bands (NASA, 2019). Other medium resolution data include ASTER with a 15m-resolution visible & near infrared (VNIR) data.

The broad approaches to the analyses of LST such as reference channel, emissivity normalisation, spectral ratios, alpha residuals methods are highlighted by Ngie et al., (2014). However, several improvements have been made in recent studies, especially for emissivity normalisation. For instance, the distribution pattern of LST has been studied in association with LULC surface types (Obiefuna et al., 2018; Surawar & Kotharkar, 2017). In these studies, the Normalized Difference Vegetation Index (NDVI), a measure of the extent of vegetation has been used to estimate spectral emissivity of data. This data together with the Top of Atmosphere Brightness Temperature (TOABT) can be used to calculate the LST using linear regression equations (Favretto, 2018). In this paper, preprocessed Top of Atmosphere (TOA) Landsat TM, ETM+ AND OLI images with <1 % cloud cover were sourced covering the 16 years from 2002 to 2018. The LULC changes were detected using a pixel-based supervised classification approach. NDVI values were further estimated, and the LSTs for each map were derived. Subsequently, these results were used to establish the relationships between the LULC/degree of urbanisation and the UHI. The insights gained from the results are further discussed.

STUDY AREA

Nairobi county is located on latitude 1°16'59.99" S and longitude 36°49'0.01" E of the Greenwich meridian, slightly below the equatorial belt. It is one of the 47 counties in the country and the most-urbanised county. It is not just the nation's capital but, its city is the largest and most populous in Kenya. On the other hand, it is one of the smallest counties in terms of landmass covering only an area of 696 km^2 and is sub-divided into 17 sub-counties. Nairobi has over the years experienced rapid urban growth, and this growth is projected to continue at over 4% growth rate per annum which is well above the national average of approximately 3% per year (UNDESA, 2014). The county is home to over 6.5 million residents, and the current population density stands at about 4,850 residents per square km (World Population Review, 2019). It lies on the River Athi in the southern part of the country and has an average elevation of 1795m above sea level. Nairobi County can be described as a warm and temperate climate with a dry season in July – September and two rainy periods, April – May and November. The average rainfall is 869 mm, and the temperature is 19.0 °C. Figure 1 below shows a map of the study area.

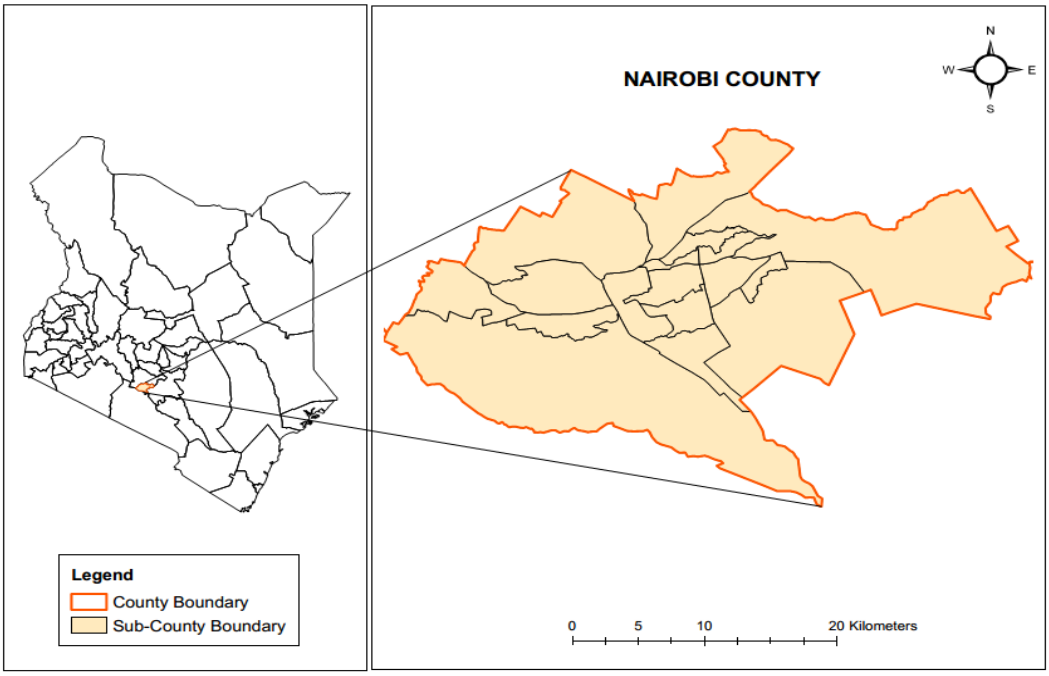


Figure 4: Map of Nairobi County

3. DATA AND METHODS

3.1. Data

In obtaining data for LULC classification and further analysis like the UHI studies, the importance of cloud-free images cannot be overemphasised. Hence cloud-free images (below 1%) with fairly even intervals were sourced. Details on the Landsat types and band characteristics are well documented in the literature (Barsi et al., 2014; USGS, 2018). Based on availability and fairly even interval of 2002, 2010 and 2018, the multitemporal images used in this study are; Landsat 5 TM (Thematic Mapper), Landsat 7 ETM + (Enhanced Thematic Mapper Plus) and Landsat 8 OLI (Operational Land Imager) images. The images were downloaded for path/row 168/061 from the USGS website and projected to WGS84 zone 37S UTM projection. Table 1 represents the summary of the information on the satellite imagery used in this study.

Table 4: Satellite Imagery Used in the Study

SN	Landsat Sensor	Acquisition date	Acquisition time	Sun Elevation	LULC Bands		Thermal Bands
1	Landsat 7 (ETM+)	10-02-2002	07:32:05	54.45805777	4(NIR), 2(Green)	3(Red),	6
2	Landsat 5 (TM)	19-08-2010	07:33:29	56.58427677	4(NIR), 2(Green)	3(Red),	6
3	Landsat 8 (OLI)	29-01-2018	07:43:05	55.92707521	5(NIR), 3(Green)	4(Red),	10 (TIRS 1), 11 (TIRS 2)

NIR – Near Infrared; TIRS – Thermal Infrared

The study area boundary shapefile was obtained from the Regional Centre of Mapping for Development (RCMD), Kenya in shapefile format.

3.2. Methods

The Landsat 7 (ETM+), Landsat 5 (TM) and Landsat 8 (OLI) obtained for the years 2002, 2010 and 2018 respectively were used to acquire land use/cover characteristics as well as land surface temperatures for each year. The boundary shapefile was used to clip the images into the area of interest before processing. Software used include; ENVI 5.3, Impact Tool and ArcGIS 10.3. ENVI 5.3 was used in land use/ land cover classification and the determination of land surface temperature. Impact tool which is an online based software was used to perform pre-processing on the raw images for LULC classifications. ArcGIS 10.3 was used in post classification editing and map layer production.

The study's methodology is summarised in Figure 2.

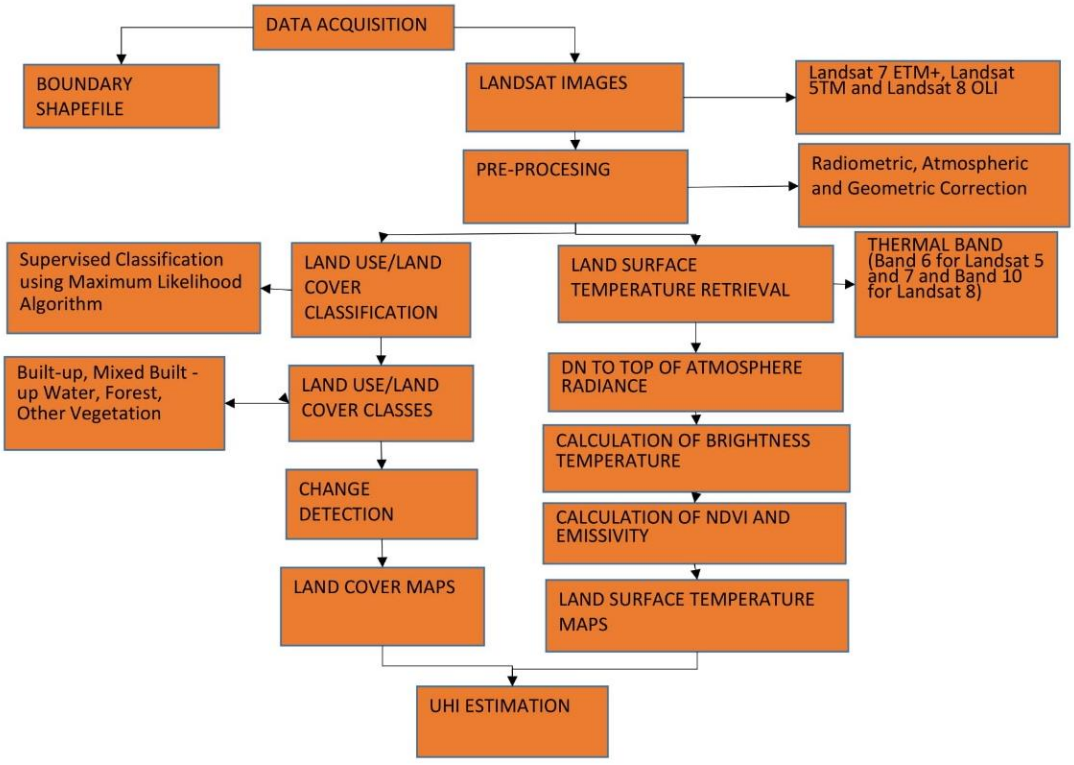


Figure 5: Study Methodology

3.2.1. Land Use/Land Cover Classification

Analysis of the land use/land cover (LULC) changes progressed with layer-stacking, followed by the pre-processing of the downloaded images using the impact tool for their radiometric and atmospheric corrections. A pixel-based supervised classification was done on the three images using Maximum likelihood algorithm in ENVI 5.3. Colour infrared band combination

comprising the NIR, Red and Green bands were used for the LULC change detection and classification (Table 1). The identified five LULC categories based on the progression of urbanisation are; Built-Up, Mixed built-up, Other vegetation, Forest and water. Each category is briefly explained below;

Built-Up – Fully urbanised region, void of any green vegetation. Typical examples are downtown areas or central business districts of most major cities.

Mixed built-up – Urbanized area with few vegetative components like public spaces with some ornamental trees, shrubs and green playgrounds.

Other vegetation – This encompasses land cover classes like shrublands, grasslands, agricultural areas and general vegetative area that cannot be regarded as forests.

Forest – An area of land with over 10% tree canopy larger than 0.005 km² (0.5 ha), whose primary land use is not agricultural or other non-forest related land use.

Water – includes waterbodies such as rivers, perennial streams, lakes etc.

3.2.2. Land Surface Temperature

As highlighted in Table 1, Band 6 of the Landsat TM and ETM + and band 10 and 11 of Landsat 8 OLI were used for the assessment of the Land Surface Temperatures (LST). Band 10 was chosen based on the caution given by USGS on the potential unreliability of Band 11 in terms of calibration caused by stray light (USGS, 2019). The general methodology adopted in this study takes its cues from a wide range of studies (Avdan & Jovanovska, 2016; Favretto, 2018; Jiménez-Muñoz, 2003; Kaplan, Avdan, & Yigit Avdan, 2018; Lo & Quattrochi, 2003; Sobrino, Jiménez-Muñoz, & Paolini, 2004; Surawar & Kotharkar, 2017) and is represented by Figure 2.

The first step involved determining the Top of Atmosphere Spectral Radiance $L\lambda$. This was carried out using USGS formulas as shown in Avdan & Jovanovska, (2016). The second step involved the conversion of the $L\lambda$ to Brightness Temperature (BT). The conversion formula is as shown in (2) (Avdan & Jovanovska, 2016).

$$BT = \frac{K_2}{\ln\left[(K_1/L\lambda) + 1\right]} - 273.15, \quad (1)$$

Where:

"BT = TOA Brightness Temperature, in Kelvin.
L_λ = Spectral radiance (Watts/ (m^{2*} sr^{*} µm))
K1 =Thermal conversion constant for the band (from the metadata)
K2 =Thermal conversion constant for the band (from the metadata)"

The 273.15 in (1) indicates the conversion of the temperature values from degree kelvin into Celsius. The calibration constants K1 and K2 for Landsat 5TM and Landsat 7 ETM+ were obtained from the metadata and also shown in Chander & Markham, (2003).

The third step involved generating the Normalized Difference Vegetation Index (NDVI) for estimating the vegetation cover of the study area. The NDVI which ranges from -1.0 to +1.0 is essential for assessing the extent of vegetation cover of various land cover types. The formula for achieving this step is represented as Equation (2)

$$NDVI = \frac{NIR\ Band - R\ Band}{NIR\ Band + R\ Band} \qquad (2)$$

Where; NIR is the near infrared band values for the multispectral image (Band 4 for TM and ETM+ and Band 5 for OLI); RED is the red band value of the image (Band 3 for TM and ETM+ and Band 4 for OLI). Calculation of NDVI is necessary to further calculate the proportion of vegetation (Pv) and emissivity (ε). Details of the role of NDVI in retrieving LST are well documented (Jiménez-Muñoz, 2003; Sobrino et al., 2004).

The fourth step involved the calculation of land surface emissivity using NDVI. The method adopted for emissivity calculation in this study was proposed by Zhang, Wang, & Li, (2006) and applied by Surawar & Kotharkar, (2017). It is worth noting that the land surface emissivity (LSE) is required to estimate LST. This is because LSE is a proportionality factor that calibates blackbody radiance based on Planck's law to predict emitted radiance. It represents the efficiency of transmitting thermal energy into the atmosphere from the surface (Jiménez-Muñoz et al., 2009).

The fifth step was to calculate the LST using brightness temperature (BT) of bands 6 for Landsat TM and ETM+ and band 10 for Landsat 8 (OLI) and Land Surface Emissivity derived from NDVI. Land Surface Temperature was retrieved using (3).

$$T_s = \frac{\mathrm{BT}}{\{1 + [(\lambda \mathrm{BT}/\rho) \ln \varepsilon_\lambda]\}}, \qquad (3)$$

Where, Ts is the Land Surface Temperature in Celsius (C°C), BT is at- sensor Brightness Temperature (°C), λ is the average wavelength of band 6 and 10 (for Landsat 5, 7 and 8 respectively), ελ is the emissivity. And ρ was calculated as shown in (4).

$$\rho = h\frac{c}{\sigma} = 1.438 \times 10^{-2}\ \mathrm{m\ K}, \qquad (4)$$

Where σ is the Boltzmann constant (1.38×10^{-23} J/K), h is Planck's constant (6.626×10^{-34} Js), and c is the velocity of light (2.998×10^{8} m/s) (Weng, Lu, & Schubring, 2004). The LSTs were determined for each image, and the general trends in the datasets were observed. Different representative areas were selected for observation of point land surface temperatures for a more comprehensive comparison of the evolution of the LULC with the LST over the years observed. A

comparison of the intensity of urban heat island from 2002 to 2018 was made to understand the changes in the temperature of Nairobi County.

Urban Heat Island

Identification of the UHI is based on the estimation of threshold temperatures as described in Ma, Kuang, & Huang, (2010) and applied by Kaplan et al., (2018): as follows

$LST > \mu + (0.5\ \sigma)$ - refers to UHI area

$0 < LST \leq \mu + (0.5\ \sigma)$ - denotes non-UHI areas

Where μ is the mean LST value of the study area, and σ is the standard deviation of the LST. The UHI intensity the further obtained by subtracting the LST of the referenced least urbanised area (forested) from that of the UHI area (Ma et al., 2010).

4. RESULTS AND DISCUSSION

The study throws some light on the progression of the LULC change of the study area over the 16-year period from 2002 to 2018 and how the LST has changed correspondingly over the same period. First, the general trend shows that progressive increases were observed in built-up and mixed built-up categories while other vegetation and forest categories experienced declines. Waterbody category, on the other hand, has only experienced slight changes tilting towards the positive. The summary of the LULC changes is represented in Table 2. It can be observed from Table 2 that built-up areas experienced the highest growth in the period under study with an overall increase of 7.29% between 2002 and 2018. Conversely, Forest cover experienced the highest decrease in the same period with an overall decrease of 5.74%. A high progressive increase in built-up areas and a large matching decrease in forestland is perhaps the major contributor to the increase in UHI intensity in urban areas. Figure 3a-c represents the LULC maps.

Table 2 LULC Feature Classification

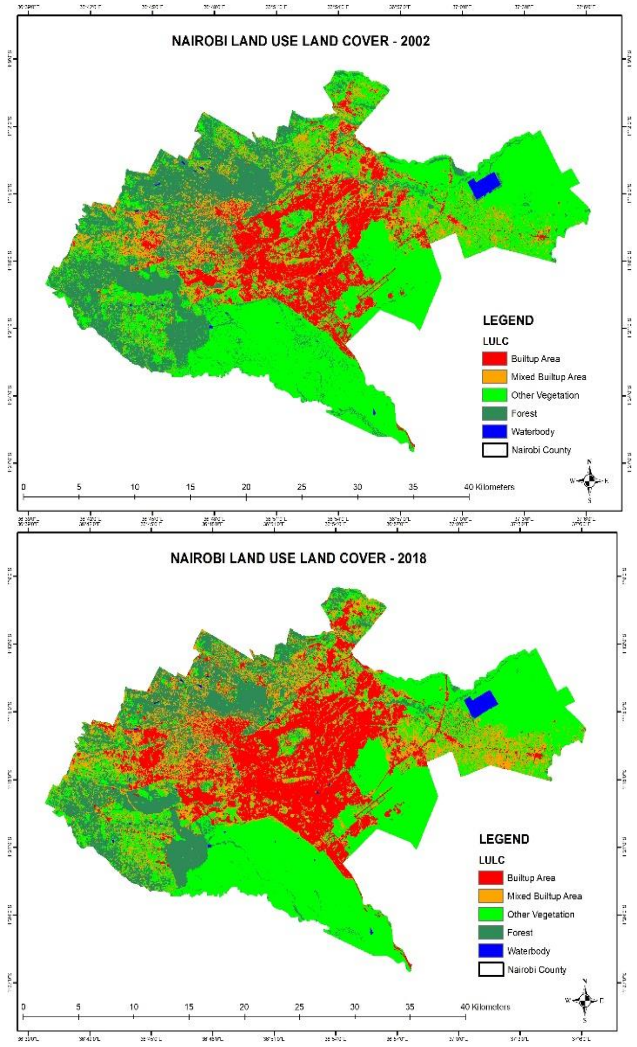
	LULC AREAS (km²)						LULC Change Detection		
LULC Classes	2002	2002 (%)	2010	2010 (%)	2018	2018 (%)	2002 – 2010 (%)	2010 – 2018 (%)	2002 – 2018 (%)
Built-up	102.80	14.77	138.54	19.91	153.51	22.06	5.13	2.15	7.29
Mixed Built-up	93.32	13.41	102.67	14.75	116.69	16.77	1.34	2.01	3.36
Other Vegetation	320.66	46.07	305.47	43.89	286.12	41.11	-2.18	-2.78	-4.96
Forest	175.20	25.17	144.96	20.83	135.28	19.44	-4.34	-1.39	-5.74
Waterbody	4.02	0.58	4.35	0.62	4.41	0.63	0.05	0.01	0.06
TOTAL	696	100.00	696	100.00	696	100.00			

The daytime LST values are shown in Figure 4 a-c and represented in Tables 3. Twelve strategic observational points representative of the LULC features were taken across the study area. The

computed threshold UHI temperatures and the corresponding daytime UHI intensities were also calculated as shown in Table 3.

Table 3 Variation of LST at representative points with changed LULC between 2002 and 2018

SN	Observation Location	LULC Feature	LST 2002	LST 2010	LST 2018
A	Mwiki	Built-up	31.76	26.15	35.24
B	Shauri Moyo Estate	Built-up	33.65	25.71	34.51
C	JKIA	Built-up	35.52	28.57	39.57
D	University of Nairobi	Mixed built-up	24.88	19.79	28.10
E	St. Mary's School Off Waiyaki Way	Mixed built-up	28.85	20.22	29.18
F	Kikuyu Road, Waithaka	Built-up	31.26	24.48	34.98
G	Nairobi City Park	Forest	24.87	17.60	26.66
H	Wastewater Plant, Eastern Bypass	Water	22.35	26.53	26.35
I	Karura Forest - ICRAF Road	Forest	23.86	16.26	24.85
J	Karura Environ	Other Vegetation	24.37	16.26	24.83
K	Karura Forest - From Kiambu Road	Forest	23.36	16.71	24.44
L	Nairobi National Park	Other Vegetation	30.09	23.22	35.59
		UHI Threshold	30.15	24.22	33
		Daytime UHI Intensity	12.16	11.86	15.12
	Differences in UHI Intensity between 2002 and 2018				2.96



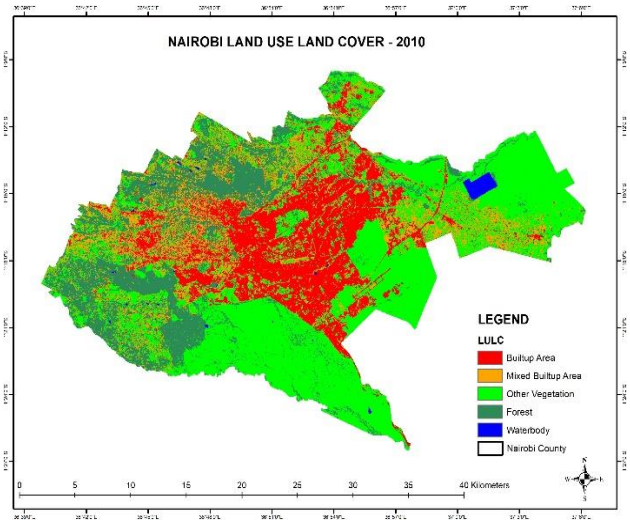
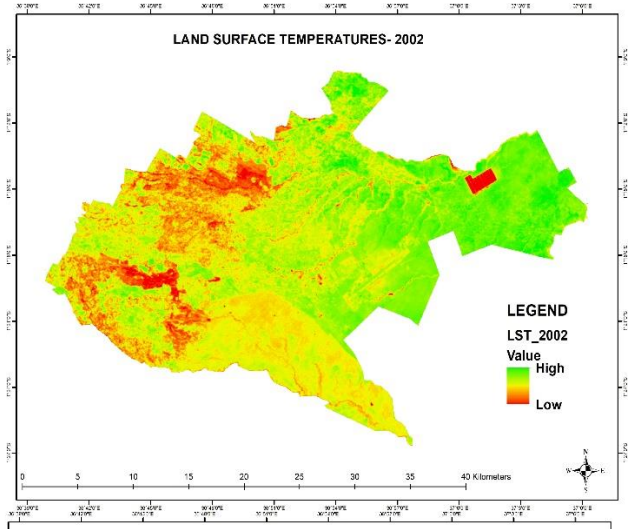
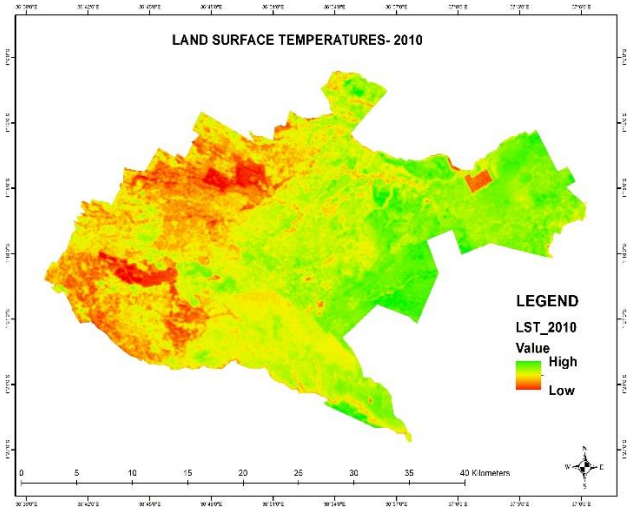


Figure 3: a) LULC 2002; b) LULC 2010; c) LULC 2018





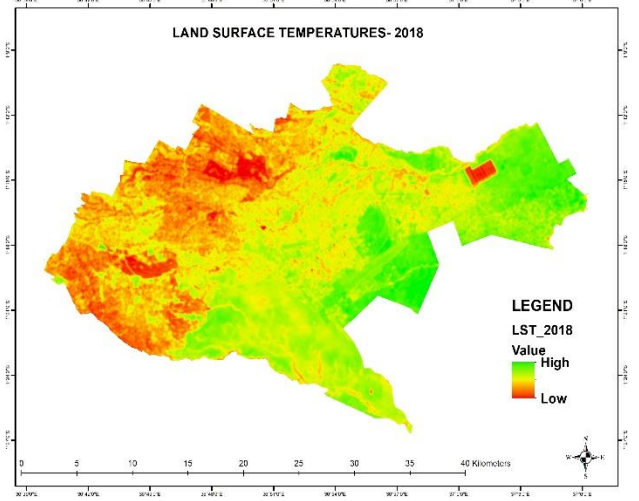


Figure 4: a) LST 2002; b) LST 2010; c) LST 2018

Firstly, it was observed that LST values taken in August 2010 were generally lower. This is likely because air surface temperatures in August are equally lower, as the coldest time of the year is the 3-month period from June to August (HWC, 2019). This finding implies that UHI is not static but more of a dynamic phenomenon which tends to increase during dryer and hotter months and tend to be lower in the colder months. It is worthy of note that Nairobi's daytime surface air temperatures (SAT) now peaks at values above 30 ℃ especially from January to March – the hottest times of the year (AccuWeather, 2019; HWC, 2019). Although Land Surface Temperatures are not the same as surface air temperatures, different studies have shown that there is a direct relationship between the two. The daytime LST has been observed to be generally higher than daytime SAT values especially in rougher terrains with a mean difference as high as 7 ℃ (Mutiibwa, Strachan, & Albright, 2015). This explains the relatively high values of the daytime LST with respect to the average surface air temperatures in the study area.

Table 3 shows built-up areas (points A, B, C, F) had consistently higher LST values than forested areas (points G, I, K). Also, the study shows that the LST of Nairobi increased at every observation point between 2002 and 2018 with Nairobi National Park experiencing the highest increase in LST from 30,09℃ to 35.50℃ (a 5.50℃ rise in temperature). The causes of the observed general increase in LST are likely to be a holistic one, encompassing not just increased urbanisation and generation of Greenhouse Gases but other broader concerns like climate change and deforestation. However, the role of urbanisation and anthropogenic influences are likely to have been substantial as depicted by the changes in LULC over the years. For instance, since urbanisation causes a decrease in pervious surfaces, engenders

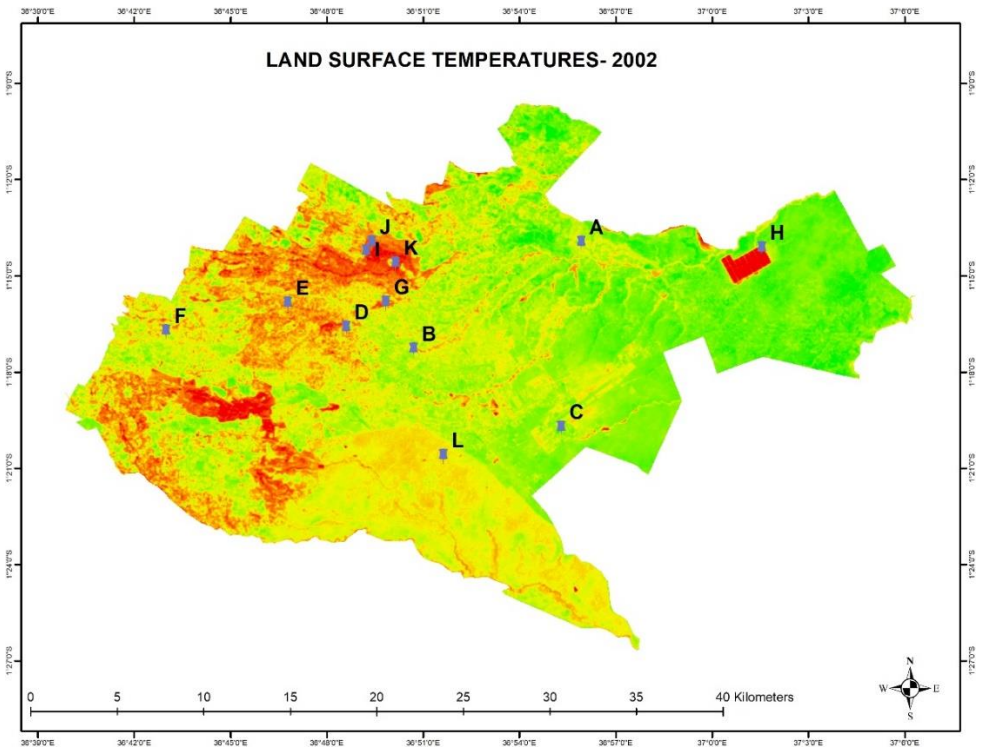


Fig 5: a) The LST map of the study area in 2002 showing the observation points

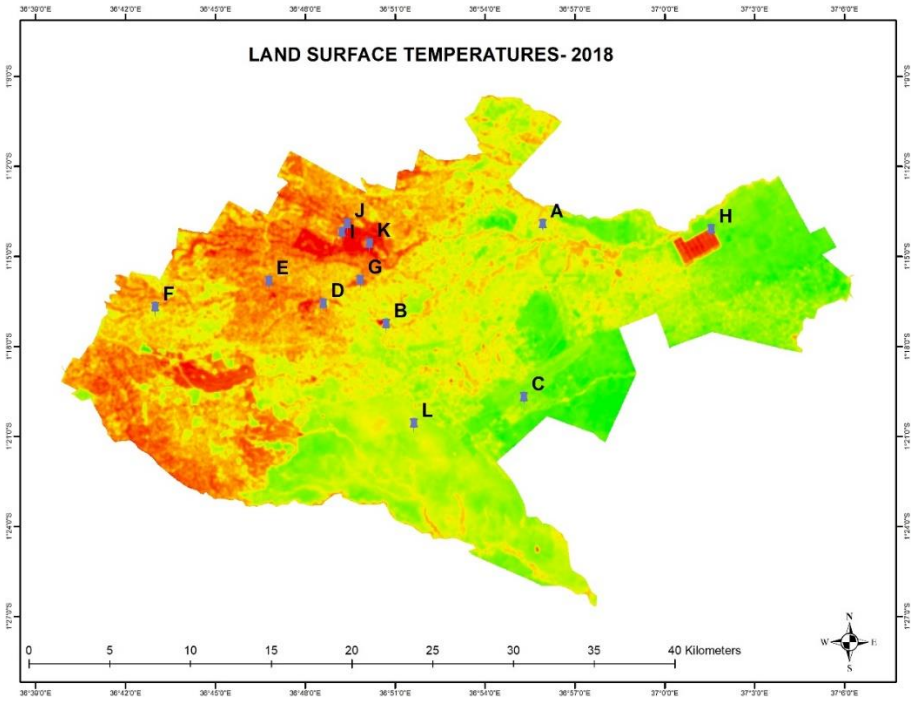


Fig 5: b) The LST map of the study area in 2018 showing the observation points

high industrial energy consumption, automobile exhaust emissions, domestic heating and decreases in vegetation and water surfaces, these ultimately alters the thermal conditions of the study area in various ways and thus affect the local temperature. The daytime UHI intensity was observed to increase by a value of 2.96 between 2002 and 2018 (Table 3). Some previous studies on UHI on the study area focused on portions of the city such as the Central Business District (Odongo, 2016); and Upper hill (Mwangi, Karanja, & Kamau, 2018). The studies considered short observation periods (2013/2014) and more extended periods from 1987 to 2017 (30 years) respectively. Another study by Oyugi, Karanja, & Odenyo, (2017) also observed the impact of LULC changes on surface temperatures from 1988 to 2015. An overarching conclusion from all these studies is that LST has been on the rise in Nairobi as also observed in the current study.

5. CONCLUSION AND RECOMMENDATION

This study shows that LULC in Nairobi County has changed from 2002 to 2018 with an increase of 7.29 % in built-up land, 3.36 % mixed built up and 0.06% in water bodies and decreases of 4.96% and 5.74% in forested and other vegetation areas respectively. Furthermore, urban growth trends implied an increase in LST from 2002 to 2018. Built-up areas represented by points A, B, C and F experienced a high rise in temperatures in comparison to forested areas represented by G, I, K. The highest increase in temperature was observed at Nairobi National Park with an LST increase from 30.00°C to 35.50°C (a 5.50°C increase). This may be a cause for ecological concern for the national park as progressively high LST temperatures could put more stress on wildlife. The study also shows that UHI varies with months and tends to be highest in the peak of the dry season. The findings of this study, therefore, necessitates more concerted efforts towards achieving a greener environment. Lastly, further studies need to be done to provide a more detailed understanding of the impacts of urban morphology on UHI in the study area.

REFERENCES

AccuWeather. (2019). Nairobi, Kenya. Retrieved March 20, 2019, from https://www.accuweather.com/en/ke/nairobi/224758/daily-weather-forecast/224758

Akbari, H. (2005). *Energy Saving Potentials and Air Quality Benefits of Urban Heat Island Mitigation*. United States.

Aleksandrowicz, O., Vuckovic, M., Kiesel, K., & Mahdavi, A. (2017). Current trends in urban heat island mitigation research: Observations based on a comprehensive research repository. *Urban Climate*, *21*, 1–26.

Avdan, U., & Jovanovska, G. (2016). Algorithm for Automated Mapping of Land Surface Temperature Using LANDSAT 8 Satellite Data. *Journal of Sensors*. https://doi.org/10.1155/2016/1480307

Barsi, J. A., Lee, K., Kvaran, G., Markham, B. L., & Pedelty, J. A. (2014). The spectral response of the Landsat-8 operational land imager. *Remote Sensing*. https://doi.org/10.3390/rs61010232

Chander, G., & Markham, B. (2003). Revised Landsat-5 TM Radiometrie Calibration Procedures and Postcalibration Dynamic Ranges. *IEEE Transactions on Geoscience and Remote Sensing*. https://doi.org/10.1109/TGRS.2003.818464

EPA. (2019). Heat Island Impacts. Retrieved March 12, 2019, from https://www.epa.gov/heat-islands/heat-island-impacts

Favretto, A. (2018). Urban Heat Island analysis with Remote Sensing and GIS methods : an application in the Trieste area (North-East of Italy). *Bollettino Della Società Geografica Italiana Serie*, *1*(1), 215–229. https://doi.org/10.13128/bsgi.v1i1.101

Goldreich, Y. (2006). Ground and top of canopy layer urban heat island partitioning on an airborne image. *Remote Sensing of Environment*, *104.*, 247–255.

HWC. (2019). Nairobi, Kenya: Annual Weather Averages. Retrieved March 20, 2019, from https://www.holiday-weather.com/nairobi/averages/

Jiménez-Muñoz, J. C. (2003). A generalized single-channel method for retrieving land surface temperature from remote sensing data. *Journal of Geophysical Research*. https://doi.org/10.1029/2003jd003480

Jiménez-Muñoz, J. C., Sobrino, J. A., Plaza, A., Guanter, L., Moreno, J., & Martínez, P. (2009). Comparison between fractional vegetation cover retrievals from vegetation indices and spectral mixture analysis: Case study of PROBA/CHRIS data over an agricultural area. *Sensors*. https://doi.org/10.3390/s90200768

Kaplan, G., Avdan, U., & Yigit Avdan, Z. (2018). Urban Heat Island Analysis Using the Landsat 8 Satellite Data: A Case Study in Skopje, Macedonia. In *2nd International Electronic Conference on Remote Sensing, 22 March–5 April 2018* (p. 5171). MDPI. https://doi.org/10.3390/ecrs-2-05171

Kim, Y.-H., & Baik, J.-J. (2005). Spatial and temporal structure of the urban heat island in Seoul. *American Meteorological Society*, 591–605.

Kraaijenbrink, P. D. A., Shea, J. M., Litt, M., Steiner, J. F., Treichler, D., Koch, I., & Immerzeel, W. W. (2018). Mapping Surface Temperatures on a Debris-Covered Glacier With an Unmanned Aerial Vehicle. *Frontiers in Earth Science*, *6*(64), 1–19.

Lo, C. P., & Quattrochi, D. A. (2003). Urban Heat Island Phenomenon, and Health Implications : A Remote Sensing Approach. *PHOTOGRAMMETRIC ENGINEERING & REMOTE SENSING*, *69*(9), 1053–1063.

Ma, Y., Kuang, Y., & Huang, N. (2010). Coupling urbanization analyses for studying urban thermal environment and its interplay with biophysical parameters based on TM/ETM+ imagery. *International Journal of Applied Earth Observation and Geoinformation*. https://doi.org/10.1016/j.jag.2009.12.002

Madanian, M., Soffianian, A. R., Koupai, S. S., Pourmanafi, S., & Momeni, M. (2018). Analyzing the effects of urban expansion on land surface temperature patterns by landscape metrics: a case study of Isfahan city, Iran. *Environmental Monitoring and Assessment*, *190*(4).

Mirzaei, P. A., & Haghighat, F. (2010). Approaches to study Urban Heat Island – Abilities and limitations. *Buildings and Environment*, *45*, 2192–2201.

Mohajerani, A., Bakaric, J., & Jeffrey-Bailey, T. (2017). The urban heat island effect, its causes, and mitigation, with reference to the thermal properties of asphalt concrete. *Journal of Environmental Management*, *197:*, 522–538.

Mutiibwa, D., Strachan, S., & Albright, T. (2015). Land Surface Temperature and Surface Air Temperature in Complex Terrain. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, *8*(10), 4762–4774. https://doi.org/10.1109/JSTARS.2015.2468594

Mwangi, P. W., Karanja, F. N., & Kamau, P. K. (2018). Analysis of the Relationship between Land Surface Temperature and Vegetation and Built-Up Indices in Upper-Hill, Nairobi. *Journal of Geoscience and Environment Protection*, *6*, 1–16. https://doi.org/10.4236/gep.2018.61001

NASA. (2019). Copernicus Sentinel-3 Sea and Land Surface Temperature Radiometer (SLSTR). Retrieved March 11, 2019, from https://ladsweb.modaps.eosdis.nasa.gov/missions-and-measurements/slstr/

Ngie, A., Abutaleb, K., Ahmed, F., Darwish, A., & Ahmed, M. (2014). Assessment of urban heat island using satellite remotely sensed imagery : a review. *South African Geographical Journal*. https://doi.org/10.1080/03736245.2014.924864

Obiefuna, J. N., Nwilo, P. C., Okolie, C. J., Emmanuel, E. I., & Daramola, O. (2018). Dynamics of Land Surface Temperature in Response to Land Cover Changes in Lagos Metropolis. *Nigerian Journal of Environmental Sciences and Technology*, *2*(2), 148–159.

Odongo, S. O. (2016). *URBAN HEAT ISLAND: INVESTIGATION OF URBAN HEAT ISLAND EFFECT. A Case Study of Nairobi.* University of Nairobi.

Oke, T. R. (1973). City size and the urban heat island. *Atmospheric Environment*, *7*(8), 769–779.

Oyugi, M. O., Karanja, F. N., & Odenyo, V. A. O. (2017). Modelling the Effect of Land Use and Land Cover Variations on the Surface Temperature Values of Nairobi City, Kenya. *Resources and Environment*, *7*(6), 145–159. https://doi.org/10.5923/j.re.20170706.01

Rinkesh. (2019). What is Urban Heat Island? Retrieved from https://www.conserve-energy-future.com/effects-solutions-urban-heat-island.php

Sobrino, J. A., Jiménez-Muñoz, J. C., & Paolini, L. (2004). Land surface temperature retrieval from LANDSAT TM 5. *Remote Sensing of Environment*. https://doi.org/10.1016/j.rse.2004.02.003

Surawar, M., & Kotharkar, R. (2017). Assessment of Urban Heat Island through Remote Sensing in Nagpur Urban Area Using Landsat 7 ETM + Satellite Images. *International Journal of Urban and Civil Engineering*, *11*(7), 868–874.

UN. (2018). 68% of the world population projected to live in urban areas by 2050, says UN. Retrieved February 2, 2019, from https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html

UNDESA. (2014). *World Urbanization Prospects*. *Undesa*. https://doi.org/10.4054/DemRes.2005.12.9

USGS. (2018). What are the band designations for the Landsat satellites? Retrieved December 5, 2018, from https://landsat.usgs.gov/what-are-band-designations-landsat-satellites

USGS. (2019). How are the Thermal Infrared Sensor (TIRS) thermal bands aboard Landsat 8 used? Retrieved from https://landsat.usgs.gov/how-are-thermal-infrared-sensor-tirs-thermal-bands-aboard-landsat-8-used

Voogt, J. A., & Oke, T. R. (2004). Thermal Remote Sensing of Uran areas. *Remote Sensing of Environment*, 370–384.

Weng, Q., Lu, D., & Schubring, J. (2004). Estimation of land surface temperature-vegetation abundance relationship for urban heat island studies. *Remote Sensing of Environment*. https://doi.org/10.1016/j.rse.2003.11.005

Wong, N. H., & Yu, C. (2005). Study of green areas and urban heat island in a tropical city. *Habitat International*, *29*, 547–558. https://doi.org/10.1016/j.habitatint.2004.04.008

World Population Review. (2019). Nairobi Population 2019. Retrieved March 13, 2019, from http://worldpopulationreview.com/world-cities/nairobi-population/

Zhang, J., Wang, Y., & Li, Y. (2006). A C++ program for retrieving land surface temperature from the data of Landsat TM/ETM+ band6. *Computers and Geosciences*. https://doi.org/10.1016/j.cageo.2006.05.001

Zhang, Z., Ji, M., Shu, J., Deng, Z., & Wu, Y. (2008). SURFACE URBAN HEAT ISLAND IN SHANGHAI, CHINA : EXAMINING THE RELATIONSHIP BETWEEN LAND SURFACE TEMPERATURE AND IMPERVIOUS SURFACE FRACTIONS DERIVED FROM LANDSAT ETM + IMAGERY. *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, *37*(B8), 601–606.

Assessing The Constrains of Water Supply for Irrigation in Hadejia Valley Irrigation Project Area, Jigawa State Nigeria.

Babangida Garba

Email: babangidagarba80@gmail.com

GSM: 0803 362 8342

GEOGRAPHY DEPARTMENT,

JIGAWA STATE COLLEGE OF EDUCATION GUMEL,

JIGAWA STATE.

Abstract

The study assess water supply constrains to irrigated crops in the Hadejia Valley Irrigation Project (HVIP). The HVIP has been identified with declining yields over the years. Different researchers have investigated the reason why soil quality has been the target of many of the researchers. However, findings on the soil have indicated that, the problem is not only on the soils but to water supply. Considering the importance of water supply to irrigated crops, the study investigates into the water supply situation. This study uses random sampling in selecting the sectors and questionnaire survey in the field for data collection. The study show that there is no problem of water availability but the constraints are in the destruction of irrigation infrastructures and the apathy of farmers towards canal maintenance couples with the emergence of a notorious invasive species of plant (typha grass). Simple statistical techniques and descriptive statistics were used in the study. It recommends that H-J.R.B.D.A should provide funds for provision of more irrigation infrastructures and maintenance of existing ones and for research. It also shows the need to encourage Famers Associations to undertake self-help activities for the maintenance of the irrigation structures.

Keyword: assessing, constraints, water supply, irrigation, project

Introduction

Irrigation is an old-age art historically civilization has followed the development of irrigation. Pre-historic tablets and carvings indicate that early civilization developed along rivers that supplied irrigation water to the fields. Egypt claims to have had the world's oldest dam built, 5,000 years ago to store water for drinking and irrigation (Ngaba, 2000) with new development in irrigation today it can be considered as a modern science for the whole world.

The world is facing twin challenges of water stress and food insecurity challenges that are projected to grown (Rockstom, 2009). Because crop production is the largest global consumer of freshwater, and because water is a key resource in food production, neither of these challenges can be addressed in isolation (Rockstom, 2009) this producing more food for each drop of water will be a crucial strategy to address both challenged (Linker, 2010) many recent studies have tied water scarcity to agricultural water consumption (Hoff, 2010).

The importance of irrigation to dry land areas cannot be over emphasized. In most developing countries, agriculture plays more important role than any other sector of the economy in the development process. In Nigeria, agriculture has contributed greatly to the national income in form of food supply and export crops. (Yahaya, 2007).

The Hadejia Valley Irrigation Project (HVIP) is part of the project under the supervision of the Hadejia Jama'are River Basin Development Authority (H-J.R.B.D.A) which is a parastatals under the Federal Ministry of Water Resources and Rural Development. It was established by decree No. 87 of 1979 and was formally launched on 1st June, 1976. (Terrumun and Deniel, 2002.) Other project under authority is the Kano River Irrigation Project (KRIP). All the projects were designed for irrigation purposes. Globally there has been recognition of the important contribution made by irrigation activities towards agricultural productivity, especially in dry areas with variable rainfall.

Dhawan (1989) in Ngaba (2000) stated that every community will unexceptionally subscribe to the following goals of irrigation management. Maximum farm production along stable growth path, realizing fall utilization of created irrigation potential, minimizing over irrigation and ecological development, attaining cost effectiveness and reliability in irrigation services, achieving high water conveyance and storage efficiency and, promoting sustainable irrigation farming.

Accordingly, the introduction of the Hadejia Valley Project has introduced an increase in the total production of tomatoes, wheat, maize, rice etc (Olofin, 1984). These have led to double cropping increase in farmers' income as well as an improvement in the Gross National Product (Olofin, 1984). Jamil (1996) defined irrigation as the application of water to the soil for the purpose of supplying the moisture essential for the growth of arable plants, this process secures the plant against short term drought through cooling the soil and the atmosphere so that plants grow under favourable conditions. Irrigation is an artificial application of water to the soil usually for assisting in growing crops in crop production. It is mainly used in dry areas and in periods of rainfall shortfalls Snyder (2005).

Additionally, irrigation helps to suppress weeds growing in rice fields (William, 2007). Irrigation is a system of farming that has been practiced for long.

Archeological investigation has identified evidence of irrigation in Mesopotamia and Egypt as far back as the 6th millennium BCE, where barley was grown in areas where the natural rainfall was in sufficient to support such crops Dillehay (2005).

Agriculture for Irrigation has developed most extensively in the arid and semi-arid regions, with areas having prolonged dry spells. The practice is essentially to supplement the available rainfall in an area. A review of the development of irrigation in the world is fascinating. It reveals the ingenuity and foresightedness of many of the ancient civilization in harnessing the resources of nature for the benefit of man; it also shows the importance of careful planning of irrigation system and efficient water management for maintaining the productivity of the land (Michael, 2009).

The principal irrigation practice of the ancient times was diverting the flow of springs and streams with temporary barriers, constructed across them and irrigating the adjoining fields. The practice is still common in small scale works owned by farmers. The practice of storing water in tanks was subsequently developed. Tanks of various sizes were in existence since the ancient times. Major river diversion projects to harness water of large rivers constructed by ancient ruler using indigenous technology. However, modern well designed large scale

irrigation systems were developed mainly after the 18th century. Irrigation technology made rapid development in the 20th century (Michael, 2009).

Amina (2006) reported that, Hadejia Jama'are River Basin is located in vulnerable zone in northern Nigeria. It is characterized by long dry season October – May with a relatively short wet season (June-Sept). The rainfall is scanty and erratic in distribution. Also the rainfall pattern is characterized by spatial and temporal variabilities and has often led to drastic reduction in the growing season, low yields, malnutrition, and even famine.

Statement of the Problems

Old traditional irrigation has been practiced in the area, but, the modern system came in to being in the 1970s. At the beginning of the modern irrigation project, peoples obtained high yield of crops per acre especially rice. Unfortunately, the yield is decline due to certain constrain. Various studies has been conducted in the area which gives more attention to soil, while this study concentrate on water supply.

Objectives of the Study

The objective of the study is to evaluate the constraints of water supply for irrigational purposes in Hadejia Valley Irrigation Project area.

The specific objectives include:

Identify the problems of water supply for irrigational purposes.

To find out the causes associated with insufficient water supply for irrigation.

Identify the nature of water supply for irrigation.

To find out possible solution to the constraint of water supply for irrigated crops.

Description of the Study Area

The Hadejia Valley Irrigation project lies in the Auyo and Kafin Hausa local government areas of Jigawa state, between Hadejia River and its branch of Kafin Hausa river around the Fadama town of Auyo. It is a multipurpose project involving the use of water resources, land and irrigation development to enhance agricultural production of the farming communities in and around Hadejia town. The project was conceived to give employment opportunities and livelihood to farmers in the immediate vicinity, who are expected to produce tons, of assorted agricultural products such as wheat, rice, corn, sugarcane, sorghum and vegetable annually the design of the project is to top the water releases from Challawa Gorge and Tiga Dams in to Kano – Hadejia River system. A barrage was constructed to store water, where it is diverted through water control structures in to the canals and laterals of the project. The H-J.R.B. covers about 6,175 hectares and is located approximately between latitude 10^0N and 13^0 20' N and longitude 7^0 25'E and 11^0 E. (Consolint International, 1975) in Tanko, (1999).

Methodology

The methodology employed in carrying out this study includes issues such as the main sources of data, project design, research population, research sample and sampling techniques, research instruments, data collection procedure and data analysis procedure were used for the study.

Population of the Study

The population of this study consists of all irrigation farmers in the ten (10) sectors, out which population of farmers in the five (5) selected sectors which are 743 were used for the study (Hadejia Jama'are River Basin Authority, 2014).

Research Design

The study conducted by the use of survey design using a structured questionnaire and focus group discussion.

Sample and Sampling Techniques

Two hundred and fifty (250) farmers were selected using simple random sampling process. Five (5) sectors were selected through balloting and the farmers to be given questionnaire were selected using a Microsoft Excel in computer by the formula: -

Random Between (1, any number of population).

e.g. Random Between (1,184) then press enter menu, the computer will automatically select the number without bias.

The numbers selected by the computer were traced in the farmers list and questionnaire given to them.

Results

Table 1: Demographic Characteristics of the Farmers in the study area

Sectors	Sex	Age Range	Marital Status	Educational Level

	M	F	01-20	21-30	31-40	41-50	51-60	61-Above	Married	Single	Non Formal	Primary	Secondary	Post Secondary	None
AUYO	50	-	-	5	12	11	12	10	50	-	10	13	12	15	-
GAMSARKA	45	05	1	4	19	19	1	3	50	-	-	-	-	50	-
FURAWA	39	09	-	11	10	10	9	8	34	14	06	16	21	01	-
MARINA	46	04	-	17	18	12	03	-	35	15	03	05	04	38	-
ZUMONI	40	10	-	26	08	11	05	-	50	-	01	48	01	-	-

From the above table it shows that, majority of the farmers were males even though there are few females farmers which total to be 28. Majority of the respondents falls within the age category of 31to 40 years and less in category of 60 years and above. Also the study found that, majority of the farmers was married. In terms of educational background of the respondents, majority of them were found to have Post Secondary Education.

Table 2: Nature of Water Supply in the Five Sectors

Sector	Less Water Supply	Over Water Supply	Regular Water Supply
AUYO	50	-	-
GAMSARKA	-	-	50
FURAWA	48	-	-
MARINA	45	-	05
ZUMONI	50	-	-

The above table indicates that, there is less water supply in Auyo, Furawa, Marina and Zumoni Sectors. While there is Regular Water supply in Gamsarka sector only.

Table 3: Causes of Insufficient Water Supply

Sector	Typha Plant Species	Flooding	Deterioration of Field Channel	Erosion	Other
AUYO	04	-	46	-	-
GAMSARKA	50	-	-	-	-
FURAWA	38	08	01	-	01
MARINA	43	05	02	-	-
ZUMONI	50	-	-	-	-

The table revealed that typha plant species is the major cause of insufficient water supply in the area, as reported by the farmers. The other factor is the destruction of channels, followed by flooding.

Table 4: Ways of Improving Water Flow

Sector	Removal of Typha Species of Plant	Avoiding Flooding	Maintenance of Field Channel	Others
AUYO	-	-	50	-
GAMSARKA	50	-	-	-
FURAWA	23	07	18	-
MARINA	36	02	12	-
ZUMONI	28	-	22	-

The table indicates that some strategies that improve water flow include: Removal of typha species of plant, avoiding flooding and maintenance of field channel.

Table 5: Communal or Agency Responsible for the Task.

Sector	H-J.R.B.D.A	Farmers	Farmers Association	All of the above
AUYO	14	11	12	13
GAMSARKA	-	-	-	50
FURAWA	21	09	01	17
MARINA	20	-	-	30
ZUMONI	10	10	10	20

The constraints of water supply improvement could be improve based on the efforts of Hadejia Jama'are River Basin Development Authority or combine effort of farmers and farmers association.

Conclusion

The study assesses the constraints of irrigational water supply in Hadejia Valley Irrigation Area. It was found that most of the constraints are related to typha plant species, destruction of field channel and flooding. The project area has eleven sectors, the study also found that there is no problem with water availability. To enhance food production in the area it was found that, all stakeholders like Hadejia Jama'are River Basin Development Authority, farmers and farmer's association should take responsibility of solving the constraints to water supply in the study area.

Discussion

The result of the study indicated that the major constraints to water supply in the HVIP, is typha species this is in line with finding of Jibrin (2007) in his work of IUCN – NCF Komadugu Yobe Basin Project for improving land and water resources management.

Also with regard to the destruction and lack of maintenance couple with emergence of typha species was the finding of the Afremeser (2014) which also correspond with finding of this study.

However, some finding on other studies indicated that problem of water supply is connected to the construction of Tiga Dam at the upstream of river Hadejia not typha species, these are in line with studies of Barbier (2003) on the upstream dam and downstream water allocation. The case of Hadejia Jama'are flood plain northern Nigeria Water Resources Research 39(ii): 1311 – 1318.

Recommendations

The study recommends that:

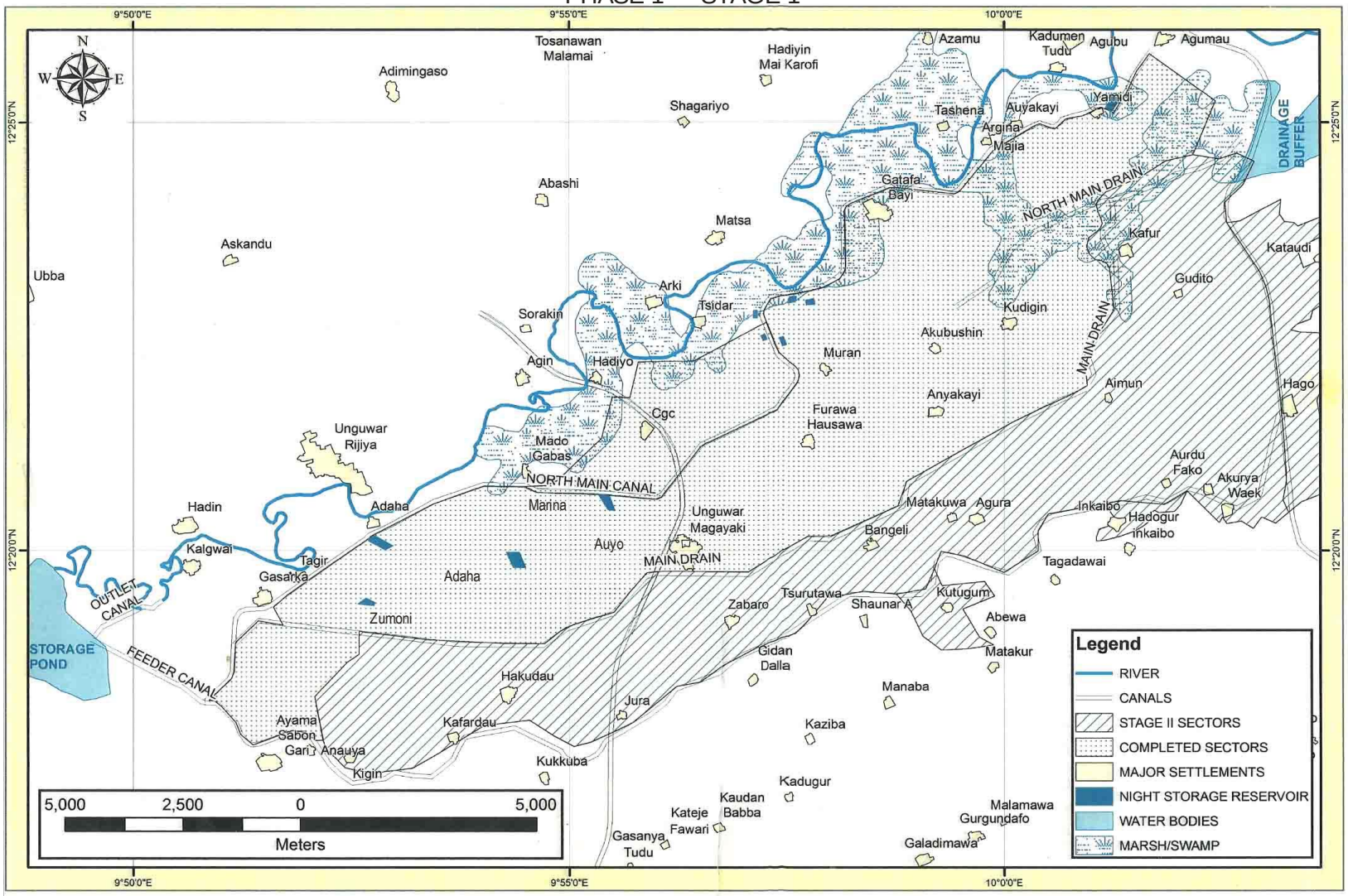
Typha plant and other related species that hinder the flowing of water need to be controlled or eradicated in this area.

Provision and maintenance of infrastructures such as extension of feeder roads, construction of small bridges, culverts and channels should be extended to small scale irrigation area.

Public enlightenment campaign on the issues of typha plant eradication, maintenance of field channel and self-0help activities in the Hadejia valley Irrigation Project should be encourage.

Timing of irrigation should be varied among the farmers in the project area to avoid interrupted supply of water when most people are irrigating or watering their plots at the same times.

HADEJIA VALLEY IRRIGATION PROJECT
PHASE 1 - STAGE 1



Source: GIS LAB., Geography Department, Bayero University, Kano. 2016

References

Afremeser, A. (2006) Water Audit for Yobe Basin, FMWR-IUCN – NCF, Komadugu Yobe State Project Report, Abuja Afremeder.

Amina, S. (2006). Effects of Irrigation Project on Small Scale Farmers in Auyo Local Government Area, Jigawa State. Unpublished Msc Thesis Department of Geography, Ahmadu Bello University, Zaria.

Barbier, E.B. (2003), Upstream dam and Downstream water allocation. The Case of the Hadejia Jama'are Floodplain, northern Nig. Water Resource Research 39(ii):1311 – 1318.

Dillehany, T. O. Eling, H.S. Rossenj (2005). "Preceramic Irrigation Canal in the Peruvian Andes". Proceeding of the National Academy of Science Vol. 47 No. 22.

Hoff H. (2010) the Global Water Challenges Modeling Greenland Blue Water J. Hydrol 384-175-6.

Jamil, F.S. (1996), the Evolution and Development of Decentralized Management in the Kano River Irrigation Project-Nigeria. A Research Project Department of Development Administration, School of Public Policy: The University of Birmingham.

Jibrin, I. J. (2007) FMWR – IUCW – NCF Komadugu Yobe State Basin Project for Improving Land and Water Resources Management.

Linker R. et al (2010) Mind the Gab: How do Climate and Agricultural Management Explain the Yield Gab of Cropland around the World? Glob.ecol.biogeogr, 19 76 9 82.

Michael, A. M., (2009). Irrigation Theory and Practice. Vikas Publishing House PVT Ltd Masjid Road Jongpura New Delhi India.

Ngaba, Y. (2000). The Effect of Irrigation on Same Soil Characteristics in the Kano River Project (phase I) Kano state unpublished MSC thesis Geography Department BUK.

Rockstom J. et al (2009) A Safe Operating Space for Human Nature 461-475-6.

Syder, R. C, & Melo-Abreu, PP. (2005), Frost Protection: Fundamental Practice and Economics Vol. I. Food and Agricultural Organization of the United State.

Tanko A. I. (1999). Changes in Soil and Water Quality, and Implication for Sustainable Irrigation in the Kano River Project (KRP), Kano State, Nigeria. Unpublished Ph.D Thesis, Department of Geography Bayero University Kano.

Ter-rumun, A. and Daniel, V. U. (2002). African Atlases Bieflot Registration of Copy Right, Belgium pp 93.

William, J. F., Roberts, S.R. & Hills S. (2007). "Managing Water for Weed Control in River" U.C. Davis Department of Plant Science, Vol. 33 No. 14.

Yahaya, M. M. (2007). An Assessment of Soil Quality and Agricultural Suitability of Hadejia Valley Irrigation Project Area Jigawa unpublished MSC thesis BUK.

Community Participation in Sustaining Safe and Clean Water: The Case of Kyampisi Child Care Ministries Water Project in Mukono District, Central Uganda

By

Shelin Kasozi, Kyampisi Childcare Ministries email; shelindanielle@gmail.com

Tel: +256774558004

Dr Emmanuel Mutungi, Kyambogo University email; emutungi@kyu.ac.ug Tel; +256772502553

Abstract

The purpose of this study is to examine how community participation can support the sustainability of community-based projects in Uganda, using Kyampisi Childcare Ministries clean water project as a case study. The clean water project in Kyampisi sub county, Mukono district in Central Uganda is implemented by Kyampisi Childcare Ministries (KCM) and provides the community with bore holes and protected wells. Although safe water has been emphasized and promoted as a human basic need by several agencies such as WHO, UNICEF and other UN agencies, this has only worked in some parts of the world while others are still in need of safe clean water. This has kept the communities with unsafe water which has resulted in several atrocities such as child abductions and sacrifices that happen when children go looking for safe water. The objectives of the study are; to investigate the perceptions of the community at the stage of project inception, to examine the role of the community during implementation of the project, and to analyze the community preparedness to maintain the project after the hand over by Kyampisi Childcare Ministries. Data was collected from 10 community members, three local leaders and two staff members of Kyampisi Childcare Ministries purposely selected. In-depth interviews were used to gather views from the selected participants. The results revealed that there is need to involve the community members at the inception, planning and implementation of the project so as tocreate a sense of ownership which will result in continued maintenance.

Key words: *Community participation, safe and clean water, sustainability, community based projects*

Introduction

World over sustainability is becoming one of the most important project management areas. Project managers need to take care of sustainability issues (McKinlay, 2008 as cited by Silvius, & Schipper, (2014). Sustainability and projects are interconnected, and sustainability should be incorporated at different levels of the project cycle (Linger,& Owen, 2012; Brown, Hanson, Liverman, & Merideth, 1987). It is believed that when sustainability is realized, projects gain reputation and can reduce financial risks, majority of corporate CEOs (93%) say that sustainability will be critical to the future success of their companies (Tharp, 2012).All in all, sustainability is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations General Assembly, 1987,

p. 43).A number of projects implemented at huge costs often tend to have trouble with sustainability. Major donors such as UN, World Bank, IFAD and other bilateral aid agencies are expressing concerns on this matter. In addition, despite putting in place a number of attempts to tackle the problem many still fail to maintain the flow of expected benefits over their intended project lifecycle. The idea of sustainability dates back more than 35 years. In the 1970s books such as Goldsmith's blueprint for Survival (1972) and the Club of Rome's limits to growth (1972) linked the concept of sustainability to human development. The concept sustainability was coined to clearly suggest that it is possible to achieve economic growth and industrialization without environmental damage. United Nations and other bodies have handled the issue of sustainability and demonstrated its importance in development (refer to; United Nations Conference on Environment & Development, 1992; Sustainable Development Goals, 2015; European Union, 1992; The Amsterdam Treaty,1999; The Johannesburg Summit, 2002)

Water is a fundamental right. According to UN-HABITAT (2003), nearly half of the earth's population does not have enough water to support human needs. Despite efforts made over the past few years, inadequate and poor water supply remains an acute problem in sub-Saharan Africa.Research shows that one of the reasons that has kept Africa poor include lack of access to clean drinking water (World Health Organization [WHO], 2015). Although water is an issue that relates to all aspects of human development in Africa, including health, agriculture, education, economics, and even peace and stability, Africa's water problem needs better water management systems (Naik, 2016).The problem seems to be much more serious in rural areas where most of the people are not provided with water services and maintenance of the available sources of water. Statistics show that by 2015 one out of three people using safely managed drinking water services (1.9 billion) lived in rural areas, 844 million people still lacked even a basic drinking water service, 263 million people spent over 30 minutes per round trip to collect water from an improved source (constituting a limited drinking water service), and 159 million people still collected drinking water directly from surface water sources, 58% lived in sub-Saharan Africa (World Health Organization (WHO) and the United Nations Children's Fund (UNICEF), 2017).

Much as project sustainability has been given attention, its incorporation in project management practices still desires efforts in East Africa. Rural water development projects are not new in East Africa, Uganda and Tanzania in particular, since they have attracted the attention, of both the colonial and post – colonial administrations. For instance, during the independence period in 1960s the water policy of the government of Uganda and Tanzania was "free, clean and safe water for all", the objective being to provide clean and safe water to all villages in rural Uganda and Tanzania by the year 2000. However, the policy failed because costs were borneby governments for maintenance and rehabilitation without involvement of the community. Following the Arusha declaration in 1967, water was recognized as a public good and the Government undertook to cover all capital costs of investment (Maganga, Butterworth, & Moriarty, 2002). Despite changes in policy introduced since the 1990s, people are still used to the old policy of free water and government intervention in all operation and maintenance. Sustainability of community projects, and of the benefits they deliver, has been a major concern (Onkoba, 2016). There is need for community participation for any project to survive.

In this study we adopted Paul's(1987) definition of community participation as posited by Bamberger (1986 p.5) that community participation is "an active process whereby beneficiaries influence the direction and execution of development projects rather than merely receive a share of project benefits".In this study community participation will be conceptualized as the engagement and involvement of the beneficiaries in the development projects that help them

solve community concerns. We argue that community participation promotes the spirit of ownership which is fundamental to project sustainability. When community members get involved at the different stages of the project for example at planning, implementation, maintenance and repair they eventually become part of the project. Involvement of the members can be recognized through attending meetings, making decisions, offering materials, offering skilled and unskilled labor, maintaining and repairing of the facility. The present study will concentrate on the communities in Kyampisi Sub-County.

Kyampisi Sub-County is found in Mukono district in the Central Region of Uganda. According to Mukono District Five Year Development Plan 2015-2020, Mukono district has 3094 water points of which 39% are protected springs and 19% are bore holes (Mukono District Local Government, 2017). Although such statistics may portray considerable safe water coverage, Kyampisi Sub-County is still faced with water scarcity. Even if several NGOs such Globe Med and Vision for Africa have constructed water facilities in the district, sustainability by the community is very low (Mukono District Local Government, 2017). Similarly, Kyampisi Childcare Ministries Water project which was put in place to increase accessibility to clean and safe water also noticed that communities were not fully involved in project maintenance. As a result, the community still experiences poor performance in areas such as water and sanitation, disease prevention and treatment, child abuse and sacrifice, economic and community development.The purpose of the study therefore was to examine the effect of community participation on the sustainability of Kyampisi Childcare Ministries Water Project in Mukono district.

The Theory

The Ladder of Citizen Participation Theory by Arnstein(1969) explains the levels at which people in the community participate in development projects (Figure 1). The ladder of citizen Participation shows the relevance of empowering the citizens andhow citizens participate based on how much power they hold in the community (Schlossberg&Schuford, 2005). Arnstein declared at the outset that her typology was provocative and focused on the redistribution of power as an essential element in meaningful citizen participation (Connor, 1988).Theladder consists of eight rungs-two levels of non-participation (Manipulation and Therapy), three levels of tokenism (Informing, Consultation, and Placation) and three levelsof citizen power (Partnership, Delegated Power and Citizen Control).In the levels of non-participation (Manipulation and Therapy) the power holders train the community members about the proposed project but the community members neither plan nor conduct any programs. In the three levels of tokenism (Informing, Consultation, and Placation), the community members have a voice but lack the power to ensure that their views and ideas are taken into consideration by the powerful therefore no assurance of changing the status quo, while in the three levels of citizen power (Partnership, Delegated Power and Citizen Control), there is power redistribution, dominant decision-making over plans and full managerial power over the project. This theory was deemed relevant to Kyampisi Childcare Ministries Safe Water Project because the rungs clearly show how the community members were involved in the project cycle and how they could participate in its sustainability. Althoughthe theory is criticized that it fails to recognize that some people participate for example targeting a goal or as a social impact (Tritter& McCallum,2006; Collins, &Ison,2006),the theory functions as a catalyst in hastening development projects planning (Parker,2003; Lithgow 2008 as cited by Kisumbi, Omboto&Nassiuma, 2017).



Figure 6. The Ladder of Citizen Participation as explained by Arnstein (1969) *source: www.georgejulian.co.uk/2013/01/22/social-media-and-citizen-engagement/*

Method

Case study research design was used in this study to logically guide the process of collecting, analyzing and interpreting data in relation to project sustainability and participation (Yin, 2011).

The study population was the beneficiaries in Kyampisi where the water facilities were constructed. The respondents wereten community members, three local leaders and two staff members of Kyampisi Childcare Ministries all purposely selectedbecause of the knowledge and experience they possess (Etikan, Musa, &Alkassim, 2016).In-depth interviews were used to gather views from the selected participants. In addition, several documents were reviewed to collect secondary data from documents such as minutes for meetings and reports. The data was coded and thematically analyzed.

Findings

Community perception of the safe water project.

The community members were aware of the work Kyampisi Childcare Ministries was doing in the community. All the ten community members interviewed were aware and had visited more than one safe water project constructed by Kyampisi Childcare Ministries. Among the activities spearheaded by Kyampisi Childcare Ministries are clean water sources, schools, houses, church, health facility and protecting children from child abuses. One of the respondentsobserved that "My children no longer fall sick and fail to go to school. We now have clean water, not the one we used to share with cows. The springs are now protected, water flows from pipes. we are very happy". Similarly, another respondent said that

The water project helps the community because the water is now safe and clean. In the olden days, springs were un protected, cows could drink, people would swim and eventually the community members would collect water from the same source which made most members especially the children to fall sick and miss school. Now the community members collect clean water from the protected water sources.

One of the staff members of Kyampisi Child Care Ministries who participated in this study observed that when they started work in Kyampisi area, they discovered that community members were sharing water with animals. He affirmed that many community members especially children were falling sick quite often affecting their performance. He further posited that Kyampisi Childcare Ministries realized that the community of Kyampisi could not develop unless issues that were hindering sustainable development were addressed. As an organization, they decided to start different projects such as safe water, schools, church, health center and construction of houses for the elderly.On the other hand, the local leaders pointed out that the work Kyampisi Childcare Ministries is doing in the community has improved lives of the households in the area. People no longer collect water from the shallow wells, engage in routine cleaning of the water sources, digging the trenches and removing mud from the wells because KCM Safe Water Project has provided a solution.

The role of the community during the construction of the safe water project

The staff of Kyampisi Childcare Ministries reported that before construction of the water sources, the community members are consulted. The official from KCM said that;

Whenever we are to start a project, we talk to the LC Chairman who takes us to different springs wells. This is because some spring wells dry up during the dry season. So, if you simply build one that has water in the rainy season, during the dry season it will not have water. The LCs and the community know those springs that have been serving people for ages and which never dry up. Once we identify one then we talk to the community through the chairman.

The KCM official further said that the community members participate in the project by digging the trenches and clearing the bush during the project implementation. However, the KCM officials reported that some community members do not fully support the development of some springs because they attach them to their gods. They do not understand where water comes from and therefore, they are scared of tempering with the water source or else it dries up. KCM then carries out sensitization to explain why they want to protect the wells and the benefits of doing so.

Although the KCM official argued that the community members are consulted in the planning process of the project, the community members and the local leaders were of dissenting opinion. The community members argued that the LCs are the ones that are consulted and for them, they there are only informed. One of the respondents said that he refused to have a project constructed in his place because he feared that people collecting water would damage his crops and create walk ways in his land. Onthe other hand, the local leader said, "the role of the community membersis to provide labor because they do not have money." The projects are only introduced to the community members, but they are never part of the planning.

The local leader posited that some members of the community may contribute ideas for example guiding us where to get local materials, others may contribute food stuffs during the construction

and others labour. However, some are not willing because they believe that "the bazungu (whites) have come to work because they have free money. No one invited them and they should pay for everything in the project" it was basing on such assumption that the community thinks that the sponsors of such projects have free money. One of the respondents praised KCM forpaying his school feesandwas not aware of other projects such as safe water project.

Benefits of safe water project

The respondents reported that KCM safe water project has helped the community in various ways. Before the construction of safe water facilities in the area, collecting water was a problem. The available water sources were shared between people and animals. As a result, many community members suffered from different ailments as a result of taking dirty water. One of the respondents reported that his children hardly attendedschool because they were always un well. The area leader concurred with the respondent that since the construction of the water sources, school attendance has improved.

The KCM leader reported that in their other project of child rights protection, they are handling several cases related to child abuse that happen as children travel long distances to collect clean water. One of the activities KCM is involved in is delivering justice for families who have become victims of child abuse. The most rampant vice in Kyampisi is child sacrifice where victims are children who are abducted as they go to fetch water and sacrificed. The perpetrators normally abdjuct the children as they walk long distances in the wilderness to fetch water. With the introduction of protected safe water sources, this vice is being handled because parents can easily trace their children.

Maintaining the constructed safe water projects after completion

The official from KCM explained that once the project is complete, the local community is invited and the facility is handled over. The official explained that since the community are involved from the start, they expect them to take care of the facility. Maintenance of the project involves appointing the committee that looks after the protected safe water source. The role of the committee is; to stop children from playing in the water, clearing and opening the trenches to allow proper flow of water so as to avoid stagnation of water, slashing around the facility to avoid snakes and other biting insects and keeping the access way clear and clean. The committee is not appointed by KCM but the community through their local council leaders. The selected committee is also trained on how to clean the water tank in case the water becomes dirty. The KCM official reported that during the project planning process, they provide for Uganda Shillings 300,000/= annually for maintaining the water project. He mentioned that the money is usually enough because unlike the bore holes, the protected water source does not easily break down and if it does, repair costs are less. On the issue of planning and budgeting for maintenance, the official said that the community is not involved but they are always informed accordingly. The budget estimates are determined by a technical person in the organization and the community are taken on board to fit in the existing budget.

Similarly, the leaders and community members reported that although they are in charge of maintenance, they do not determine the cost of maintenance. They further reported that most of the community members are poor and do not have sustainable incomes to contribute in case the committee requires money to fix a broken water source. One of the respondents narrated a story of how their previous experience of forced collection of repair funds hinders them to be

effective in contributing repair money. He argued that the local leaders used to ask community members to contribute money to repair bore holes. This was before the coming on board of KCM safe water project. The repair costs would go beyond Uganda Shillings 1 million (1,000,000/=) which scared the community and this was happening quite often. As a result, when projects were handed over to the community, members felt it was to be the same case as it was for the boreholes. Many community members then opted to remain using their old un protected water sources. He argued that during the borehole time, those who contributed money for repair would own the boreholes and start harassing those without money.

Discussion

Setting out what to do and how it's going to be done is very important in project management. Planning is the first activity to do before any other activities. In project management, planning determines what should be done in the project and calls for early community involvement. The intensity of community involvement in the facility development is influenced by the willingness of the project manager to involve the community from the early stages of the project. (Ngowi, &Mselle, 1998). Although the community in Kyampisi was aware of the safe water project, they were not part of the initial planning and hence their perception was detached from ownership. The fact that the project implementers confirmed that the community was brought on board after the project inception may be used to explain why the community members in Kyampisi are not fully committed to the maintenance of the safe water project. The local leaders some of whom are part of the maintenance committee revealed that they do not determine the money KCM puts in place for maintenance. In addition, neither KCM leaders nor the community leaders talked about how long that money was going to be provided. Basing on the past experience of the borehole where community members were asked to contribute money despite the poverty levels, we therefore argue that communities do not want to face the same challenge as the one of the boreholes. KCM needed to have empowered the community on the onset of the project through a series of meetings to enable them to appreciate that the project benefits the community not the implementers. This is a key factor of planning in project cycle as Howard- Grabman (2000) posit that meetings are a platform for community members to discuss issues that relate to the project.

KCM could have brought the community on board by allowing the community to identify they need and then support them. Although the community leaders were involved early, it was the same community leaders that were responsible for the boreholes which community members were not happy with. KCM would have built their entry point on resources in the community. Resources in a community are anything that can be used to improve the quality of a community life. They are several resources available in a community that can be used for the project to be successful. Those sources include land, labor, in- kind donations, finances, supplies, sand, bricks, services and skills like training, mobilization and coordination this leads to community engagement. The community willingly offers resources to be used on the project. Gibbons, Kennedy, Burgess, & Godfrey, (2012), argue that there is a need for the community and the technical team to understand how resources will be deployed and how best aligned to maximize their value. Community resource consultations is significant because it helps in identifying, mobilizing community assets which will enables the community members to gain control over the project which will create ownership of the water facility. When the community dedicates it's time talents and resources to the project the people feel more positive about it leading to its sustainability. In order to know the resources available and offered by the community the organization must engage the community members, in the short-long run the project will be maintained because of the interest that the community has towards it.

At project implementation. "Information is knowledge, knowledge is power, sharing knowledge is empowerment" (Rifkin, &Pridmore, 2002).Sharing ideas is done when the organization mobilizes the beneficiaries' in order to know what they think about the project and also provide vital information. Information given by the community members is key to delivering what the community needs as identified in the need's assessment, offering efficient services coordinated around the needs of the community; this enables intervention in case of a problem and, preventative work which promotes wider public protection. Information sharing is important as it increases the organization efficiency and project performance in the community.

An organization to remain competitive in its environment, information sharing is an important ingredient (Moberg et al. 2002 as cited by Hatala, &Lutta, 2009). During information sharing the organization helps the community to identify their problems, find solutions and understand their roles and responsibilities to solve the problem.The cooperativeness and fairness of the organizational procedures have a significant effect on the willingness to share information (Lin, 2006).Information is shared through communities attending village meetings, conducting focus group discussions and interviews of the beneficiaries. Those meetings involve different stakeholders; these include local authorities, medical personals, religious leaders, village elders, children, educated people, and semi and skilled personals who contribute different ideas about the project.

Conclusion

It was evident that community participation is vital to the sustainability of the water projects. Emphasis should always be put on participatory approaches with the aim of promoting sustainability. Project sustainability can only occur if members of the community own the project. The project can only be owned by the members if they are involved from the inception of the project.

References

Arnstein, S. (1969) A ladder of citizen participation. Journal of American Institute of Planners, 35(4), s. 216-224.

Bamberger,M (1986).The Role of Community Participation in Development Planning and Project Management, The World Bank Washington, D.C

Brown, J., Hanson, M.E., Liverman, D., &Merideth, R.(1987). Global Sustainability: Toward Definition, *Environmental Management* 11(6):713-719

DOI: 10.1007/BF01867238.

Collins, K., &Ison, R. (2006). *Dare we jump off Arnstein's ladder?Social learning as a new policy paradigm.*

Connor, D. M. (1988). *A new ladder of citizen participation.* National Civic Review, 77(3), 249-257.

Etikan, I., Musa, S. A., &Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American journal of theoretical and applied statistics*, *5*(1), 1-4.

Gibbons, P. M., Kennedy, C., Burgess, S., & Godfrey, P. (2012). The development of a value improvement model for repetitive processes (VIM) combining lean, six sigma and systems thinking. *International Journal of Lean Six Sigma*, *3*(4), 315-338.

Hatala, J. P., & George Lutta, J. (2009). Managing information sharing within an organizational setting: A social network perspective. Performance Improvement Quarterly, 21(4), 5-33.

Howard-Grabman, L. (2000). Bridging the gap between communities and service providers: developing accountability through community mobilisation approaches. *IDS bulletin*, *31*(1), 88-96.

Lin, C.P., 2006. To share or not to share: Modeling tacit knowledge sharing, its mediators and antecedents. J. Bus. Ethics, 70: 411-428.

Maganga, F.P, Butterworth, J.A., & Moriarty, P (2002). Domestic water supply, competition for water resources and IWRM in Tanzania,*Physics and Chemistry of the Earth Parts A/B/C* 27(11-22):919-926, DOI: 10.1016/S1474-7065(02)00094-3

Mukono District Local Government,(2017). Mukono District Five Year Development Plan 2015-2020,

Naik, P. K. (2016): Water crisis in Africa: myth or reality?, International Journal of Water Resources Development http://dx.doi.org/10.1080/07900627.2016.1188266

Ngowi, A. B., &Mselle, P. C. (1998). Community participation in facility management. *Facilities*, *16*(11), 314-318.

Onkoba, L (2016). Determinants of Sustainability of Community Based Projects in Kenya: The case of Carolina for Kibera Projects, University of Nairobi, Master's Project Report

Rifkin, S., &Pridmore, P,. (2002). Partners in Planning, Information, Participation and Empowerment. Macmillan Education Ltd , London.

Silvius, A. J., & Schipper, R. P. (2014). Sustainability in project management: A literature review and impact analysis. *Social Business*, *4*(1), 63-96.

Tharp, J. (2012). Project management and global sustainability. Paper presented at PMI® Global Congress 2012—EMEA, Marsailles, France. Newtown Square, PA: Project Management Institute.

The European Union (EU), in 1992 adopted its Fifth Environmental Action Programme called 'Towards Sustainability'.

Tritter, J. Q., & McCallum, A. (2006). The snakes and ladders of user involvement: moving beyond Arnstein. Health policy, 76(2), 156-168.

United Nations General Assembly. (1987). Report of the world commission on environment and development: Our common future. Oslo, Norway: United Nations General Assembly, Development and International Co-operation: Environment.

UN, (1992). United Nations Conference on Environment & Development, Rio de Janerio, Brazil, 3 to 14 June 1992

World Health Organization. (2015). WHO World Water Day Report. World Health Organization. http://www.who.int/water_sanitation_health/takingcharge.html

World Health Organization (WHO) and the United Nations Children's Fund (UNICEF), (2017). Progress on Drinking Water, Sanitation and Hygiene: Update and SDG Baselines. Geneva:.Licence: CC BY-NC-SA 3.0 IGO.

Yin, R. K. (2011). *Applications of case study research*. sage

SUB-THEME 6: MATHEMATICS, STATISTICS & DATA SCIENCES; BASIC AND APPLIED SCIENCES

Change point analysis in the generalized Pareto distribution

Mwelu Susan[1], A.G Waititu[1], P.N Mwita [2]

[1]Department of Statistics and Actuarial Sciences, Jomo Kenyatta University of Agriculture and Technology, P.O Box 62000-00200, Nairobi

[2]Department of Mathematics, Statistics and Actuarial Sciences, Machakos University, P.O Box 136-90100, Machakos.

Abstract

The general goal of data statistical analysis is to find a near perfect translation to reality such that minimal information is lost in the approximating model. In this paper change point problem is viewed as a model selection problem where the point in time that model parameters change is estimated. This paper develops a change point estimator of the shape parameter of the generalized Pareto distribution which is shown to be consistent through simulations. The likelihood ratio test statistic based on the Kullback-Leibler divergence is used to detect a change point under the assumption that the model is correctly specified. The maximum likelihood estimation method is used to estimate the change point. The estimator is then used to detect a change point within extreme events with a climatic application in mind.

Keywords: Change point, Kullback-Leibler, Generalized Pareto distribution

Introduction

Time series data can be viewed as data that is recorded sequentially with reference to time. An entire data array can initially be analysed with the goal of finding a statistical model that can adequately describe the underlying data generating process through the estimation of model parameters. Since reality cannot be fully exhibited through a model, we seek to minimize information loss through an approximating model that gives a near perfect translation to reality.

In the study of time series, it is natural to assume time-shift invariance of the data probability distribution i.e. stationarity. However, some properties of time series data such as mean, variance or higher order moments may change with time. The basic assumption would be that estimated model parameters remain unchanged throughout time. Truong et al. (2018) states that may real world data are made up of consecutive regimes that are separated by abrupt changes. Prior to model estimation, the statistical hypothesis of stochastic homogeneity of the data can be checked for the purpose of parameter estimation in each segment of the data separately if any changes are detected. In its simplest form, change-point detection is the name given to the problem of estimating the point at which the statistical properties of a sequence of observations change (Killick & Eckley, 2014). The overall behaviour of observations can change over time due to internal systemic changes in distribution dynamics or due to external factors. Change-point analysis entails finding both the number and the location of such changes. The detection of

change points has been increasingly taken into consideration as opposed to the classical stationary assumptions as change points can drastically alter inferences made from a time series.

Fundamental features in an extreme value analysis are captured by the tail behaviour. When the overall distribution changes, what happens to the mean may be different from what happens to the extremes at either ends of the distribution (Field et al., 2012). This guides the study to the changes in the tail behaviour of any given distribution which is characterized by the extreme values. Extreme values on the other hand can be summarized by the existing extreme value distributions. This means that by imposing a fixed parametric density form, then any changes in distribution parameters can be monitored. Changes observed in extremes could be linked to changes in the mean, variance or shape of the probability distribution or all of the three.

Review of previous research works

EVT focuses on the tail distribution of time series data and provides flexible, simple parametric models for capturing tail related behaviors. By the use of asymptotic limit theorems, models that can be used to make inferences about the tails of a given underlying distribution are derived. Extreme values have been defined in two ways: block maxima whose limiting distribution is the generalized extreme value distribution and threshold exceedances whose limiting distribution is the generalized Pareto.

In the study of time series, it is natural to assume time-shift invariance of the data probability distribution i.e. stationarity. The standard EVT methods assume stationarity (Coles et al., 2001). In contrast, non-stationary processes are characterized by changes through time. In certain aspects such as environmental processes and climatology, the characteristics of the underlying process is often non-stationary and depends on changes in large-scale processes, seasonality or long-term trends (Rust et al., 2009; Cheng et al., 2014; De Paola et al., 2018). The presence of temporal dependence challenges the utility of standard EVT models. This implies that model parameters cease to be constants rather become functions of time, covariates or other underlying processes.

In its simplest form, change-point detection is the name given to the problem of estimating the point at which the statistical properties of a sequence of observations change (Killick & Eckley, 2014). Change-point analysis entails finding both the number and the location of such changes. The detection of change points has been increasingly taken into consideration as opposed to the classical stationary assumptions as change points can drastically alter inferences made from a time series. Generally, it is of interest to segment a time series into homogeneous segments for better informed inferences.

Jarušková and Rencová (2008) investigate change points in temperature extremes based on the assumption that the maxima and minima follow the generalized extreme value distribution. In order to decide whether a series is stationary then the principles of mathematical statistics lead to hypothesis testing. The null hypothesis corresponds to stationarity of the series whereas the alternative corresponds to the type of change that is being sought. Their test statistic based on

the likelihood ratio considered a change in all the three parameters of the GEV but was modified to a trimmed maximum type to ensure that a change cannot occur at the beginning or end points of a time series. Since they required to compute the maximum likelihood estimates before and after all possible change points, asymptotic theory was used and the authors recommend that good parameter estimates are calculated from a sample size of at least fifty observations. They indicate that in practice it is better to choose an alternative hypothesis that corresponds better to the type of the change expected to occur. Practically, it may be difficult to clearly articulate the expected change as it is usually unknown.

According to Dierckx and Teugels (2010) extreme values of a distribution might be of greater importance than the mean values when performing change point analysis as the mean and variance do not often adequately describe the tail of a distribution. Their study is based on the likelihood approach of Csörgö and Horváth (1997) which can be adapted to extreme values. Through simulations, their study revealed that the test was more powerful for large sample sizes and when the position of the change point is not close to the sample end points. Changes in the tail distribution and variance can lead to more extreme events as compared to changes in only in the mean (Dupuis et al., 2015). Their work focused on changes in the tail behaviour based on multiple cross-sectional time series where they sought multi-year seasonal change points.

The distribution of the likelihood ratio statistic cannot be obtained in analytic form for small sample sizes and the ML estimates of the change point does not satisfy regularity conditions required to apply standard asymptotic likelihood ratio theory (Chen et al., 2017) . Instead they used a Bayesian approach to compare the models of no change point versus change point models that considered a change in both the scale and tail index parameters of the GPD. When assessing the accuracy of change point detection as well as model selection, the proposed models exhibited lower accuracy as when compared to cases where the main interest was change point detection regardless of the model selected. Since this points out to the possibility of a change point to be adequately detected regardless of an incorrectly chosen model, then model selection uncertainty becomes important.

Detection of change points is critical to statistical inference as a near perfect translation to reality is sought through model selection and parameter estimation. Stationarity in the strict sense, implies time-invariance of the distribution underlying the process. Stationarity is arguably a very strong assumption in many real-world applications as process characteristics evolve over time. Opposed to the assumption of stationarity, standard extreme value distributions have been modified to account for non-stationarity but this does not always imply that abrupt changes within the underlying process will be accounted for. Change points within a parametric setting can be attributed to change in the parameters of the underlying data distribution. Thus the main problem would be to find the point in time that the changes occur.

In section 3, the test statistic is constructed based on the Kullback-Leibler divergence introduced by Kullback and Leibler (1951) that will test whether the shape and/or scale parameters of the generalized Pareto distribution change over time. Simulation studies are carried out in section 4 with application of the change point estimator to real life data having a climatology context.

Methodology

The generalized Pareto distribution was introduced by Pickands III et al. (1975) to model exceedances over thresholds and is widely used in the analysis of extreme events, modelling of large insurance claims, hydrology, climatology and as a failure time distribution. The GPD can also be used in any situation in which the exponential distribution might be used but in which some robustness is required against heavier tailed or lighter tailed alternatives (Hosking & Wallis, 1987).

Definition 3.1. The Generalized Pareto distribution function is defined by;

$$H(y) = \begin{cases} 1 - \left(1 + \frac{\xi y}{\sigma}\right)^{-\frac{1}{\xi}}, & \xi \neq 0 \\ 1 - \exp\left(-\frac{y}{\sigma}\right), & \xi = 0 \end{cases} \quad (1)$$

Where,

$$y \in \begin{cases} [0, \infty), & \xi \geq 0 \\ \left[0, -\frac{\sigma}{\xi}\right], & \xi < 0 \end{cases}$$

More specifically, given that $X \sim GP(\sigma, \xi)$ then the probability density function is;

$$h(y) = \begin{cases} 1 - \left(1 + \frac{\xi y}{\sigma}\right)^{-\frac{1}{\xi}}, & \xi \neq 0 \\ 1 - \exp\left(-\frac{y}{\sigma}\right), & \xi = 0 \end{cases} \quad (2)$$

The parameter ξ is the extreme value index and its sign is the dominant factor in describing the tail of the underlying distribution. The larger the ξ the heavier the tail. σ is referred to as the scale parameter and characterizes the spread of the distribution.

The GP distribution contains a number of specific distributions under its parametrization. When $\xi > 0$ the corresponding distribution is the usual heavy tailed Pareto distribution. If $\xi < 0$ the corresponding distribution is a type II Pareto distribution whereas $\xi = 0$ yields the exponential distribution.

Single change point estimation

Consider a non-stationary process $X = \{x_1, \ldots, x_n\}$. A change point is said to occur when there exists a time $\tau \in \{2, \ldots, n-1\}$ such that the statistical properties of $\{x_1, \ldots, x_\tau\}$. and $\{x_{\tau+1}, \ldots, x_n\}$. are different. Then the hypothesis of no change in model parameter(s) versus change in model parameter(s) at an unknown time τ would be stated as:

$$H_0 : \theta_1 = \theta_2 = \ldots = \theta_n \; versus$$
$$H_1 : \theta_1 = \cdots = \theta_\tau \neq \theta_{\tau+1} = \ldots = \theta_n \quad (3)$$

At a given level of significance, if the null hypothesis is rejected, then the process X is said to be locally piecewise-stationary and can be approximated by a sequence of stationary processes that may share certain features such as the general functional form of the distribution F. Assuming that the time of change τ is unknown and there are $K (1 < K < n)$ admissible change points, then the test statistic $T_\tau = T_{max} = \max k \in K \, T_k$. Then the estimated time of change τ would be the value of k that maximizes the test statistic T_k. This would naturally mean that the null hypothesis is rejected if T_τ is large.

The hypothesis being tested is as in equation 4

$$H_0 : X_t \sim GP(\sigma, \xi)$$

Against

$$H_1 : X_t \sim GP(\sigma_1, \xi_1) \; t \leq \tau$$
$$: X_t \sim GP(\sigma_2, \xi_2) \; t > \tau \quad (4)$$

Where $\xi_1 \neq \xi_2$ and $\sigma_1 \neq \sigma_2$ are unknown before and after the change point τ

Information measures provide descriptions of the long term behavior of random processes (Garrido, 2009). For this reason, measures of distance between probability distributions are central to the problems of inference and discrimination. Statistical inference starts with a set of observations $\{x_1, \ldots, x_n\}$ which are assumed to have been generated by an unknown model, say $p(x)$. By means of estimation methods an approximated model, say $q(x)$, is obtained. The overall aim would be to have $q(x)$ as similar as possible to $p(x)$. Then probabilistic distances (divergences) would be computed to assess how 'close' the two probability distributions are from one another.

Definition: Let P and Q be two finite distributions on X with probability density functions $p(x)$ and $q(x)$ respectively. The Kullback-Leibler divergence of p relative to$q$, a measure of information lost when $p(x)$ is used to approximate $q(x)$ is defined by (Kullback & Leibler, 1951)

$$I(p||q) = \int_x p(x) \log \frac{p(x)}{q(x)} dx$$
$$= \int_x p(x) \log p(x) dx - \int_x p(x) \log q(x) dx \quad (5)$$
$$= E_{p(x)}[\log p(x)] - E_{p(x)}[\log q(x)]$$

where E_{p_i} denotes the expectation operator over the distribution p_i. x represents the random vector with density p and q. Despite not being a true distance, this expectation provides relevant information on how close q is from p. Kullback and Leibler (1951) coined the term "directed divergence" to distinguish it from the divergence defined by 6 which is a symmetric measure as opposed to 5 which is asymmetric and fails to satisfy the triangular inequality since $I(p||q) \neq I(q||p)$.

$$D(p||q) = I(p||q) + I(q||p) \tag{6}$$

The KL information is applicable for both continuous and discrete distributions. It is also known as relative entropy, informational divergence, or information for discrimination. Being a one dimensional measure, it is easy to comprehend and thus forms a deep theoretical basis for data-based model selection as it takes into account the entire range of the distribution.

Consider two GP densities $f_1(x)$ and $f_2(x)$ with density function as in 2 with scale and shape parameters $\xi_1 \neq \xi_2$ and $\sigma_1 \neq \sigma_2$ respectively. The KLD can be expressed as a function of the two distribution

$$\begin{aligned} I(f_1||f_2) &= \int_x f_1(x) \log \frac{f_1(x)}{f_2(x)} dx \\ &= \int_x f_1(x) \log f_1(x) dx - \int_x f_1(x) \log f_2(x) dx \\ &= E_{f_1(x)}[\log f_1(x)] - E_{f_1(x)}[\log f_2(x)] \end{aligned} \tag{7}$$

(8)

$$($$ $f_2(x)$

$$= E_{f_2(x)}[\log f_2(x)] - E_{f_2(x)}[\log f_1(x)]$$

Equation 9 gives one of the properties of the GP distribution (Embrechts et al., 2013)

$$E\left[\log\left(1+\frac{\xi y}{\sigma}\right)\right] = \xi^k k!, \quad k \in N \tag{9}$$

An application of property 9, numerical computations and methods of integration equation 7 can be reduced to

$$\begin{aligned} & log\left(\frac{1}{\sigma_1}\right) - \left(\frac{1}{\xi_1}+1\right) E\left[log\left(1+\frac{\xi_1}{\sigma_1}x\right)\right] \\ & \qquad - \log\left(\frac{1}{\sigma_2}\right) - \left(\frac{1}{\xi_2}+1\right) E\left[log\left(1+\frac{\xi_2}{\sigma_2}x\right)\right] \\ & = log\left(\frac{1}{\sigma_1}\right) - \left(\frac{1}{\xi_1}+1\right)\xi_1 - \log\left(\frac{1}{\sigma_2}\right) - \left(\frac{1}{\xi_2}+1\right)\int_x \log\left(1+\frac{\xi_2}{\sigma_2}x\right) f_{1(x)}dx \\ & = \log\left(\frac{1}{\sigma_1}\right) - log\left(\frac{1}{\sigma_2}\right) - (1+\xi_1) \\ & \qquad - \left(\frac{1}{\xi_2}+1\right)\frac{\sigma_1}{\sigma_2}\xi_1 \int_x \left(1+\frac{\xi_1}{\sigma_1}x\right)^{-\frac{1}{\xi_1}} \left(\frac{1}{\xi_2}+1\right)^{-1} dx \end{aligned} \tag{10}$$

The KL divergence as in 10 is a function of the parameters of the two densities $f_1(x)$ and $f_2(x)$. The maximum likelihood estimation method is adapted to estimate the parameters as they have desirable characteristics such as consistency, efficiency and asymptotic normality.

Suppose that $\{x_1, \ldots x_{\tau,}, x_{\tau+1}, \ldots, x_n\}$ follow a GP distribution with parameters $\theta_i = (\sigma_i, \xi_i)$, $i = 1,2$.

Then the log-likelihood functions are as in equation 11 for the likelihood estimators $(\sigma_\tau^-, \xi_\tau^-)$ and $(\sigma_\tau^+, \xi_\tau^+)$ for the data sets $x_1, \ldots x_{\tau,}$ and $x_{\tau+1}, \ldots, x_n$ respectively. The log-likelihood functions are maximized with respect to the parameters to obtain the estimates before and after the change point τ.

$$\tag{11}$$

$$L_\tau^+(\hat{\theta}) = -(n-\tau)\log\hat{\sigma}_\tau^+\left(\frac{1}{\hat{\xi}_\tau^+}+1\right)\sum_{i=\tau+1}^{n}\log\left(1+\frac{\hat{\xi}_\tau^+}{\hat{\sigma}_\tau^+}x_i\right)$$

Although asymptotically efficient, the MLEs are computationally difficult and can have convergence problems (Hosking & Wallis, 1987). The ML estimates sometimes cannot be obtained for the generalized Pareto distribution as a result of nonexistence of a local maximum of the likelihood function. For instance, the ML estimates do not exist for $\xi \geq 1$ because the likelihood function has no local maximum. For $\xi \leq -0.5$, the ML estimates do not exist asymptotically since $var(x) = \infty$ (Zhang, 2007). For $\xi > -0.5$, the maximum regularity conditions are achieved and thus the maximum likelihood estimates are asymptotically normally distributed, consistent and asymptotically efficient.

Results and findings

Consider a simulation from the GP density with parameters (1, 0.1) and (3, 0.2) for the scale and shape respectively with $n = 500$ and $\tau = 250$. The first 250 data come from the GP (1, 0.1) and the next 250 come from the GP (3, 0.2). These values are taken to represent excesses from two different densities with varying parameters. Setting the shape parameter at $\xi_1 = 0.1$ then ξ_2 varies across the values 0.2, 0.3 and 0.4. The change point as estimated by equation 6 is given at the time when the maximum value of the divergence is observed.

Some of the simulation results are shown in figure 2. For the simulation studies the values of $\tau \in \left(\frac{n}{4}, \frac{n}{2}, \frac{3n}{4}\right)$ are varied corresponding considering different locations of the change point for different sample sizes (200, 500, 1000). The divergence between the two samples is estimated and the detected change point results presented in table 1.

		$\xi_2 = 0.2$	$\xi_2 = 0.3$	$\xi_2 = 0.4$
n	τ	$\hat{\tau}$	$\hat{\tau}$	$\hat{\tau}$
500	150	167	162	142
	250	234	237	239
	350	369	356	353
1000	250	171	174	180
	500	428	424	431
	750	720	724	728

2000	500	310	303	300
	1000	821	795	786

Table 1: Estimation by simulation with 500 replications

n	τ	$\xi_2 = 0.2$	$\xi_2 = 0.3$	$\xi_2 = 0.4$
500	150	3125.85	3146.48	3182.77
	250	8324.46	8130.28	7672.63
1000	250	50275.75	30837.72	30312.39
	500	50963.03	42619.13	41780.05
2000	500	171739.4	177772.9	179237.1
	1000	176082.5	195395.4	200240.9

Table 2: Mean squared errors (MSE)

Table 2 gives the mean squared errors used to assess the performance of the estimator considering three generalized Pareto distributions with different sample sizes. Regardless of the location of the change point, the overall performance of the estimator improves as the change in the shape parameter becomes larger for smaller samples. This can be seen from the trend in the values of the mean squared errors. As the sample size gets larger the estimator's sensitivity to small changes in the shape parameter improves. This implies that very large sample sizes are required to detect very small changes in non-negative shape parameters.

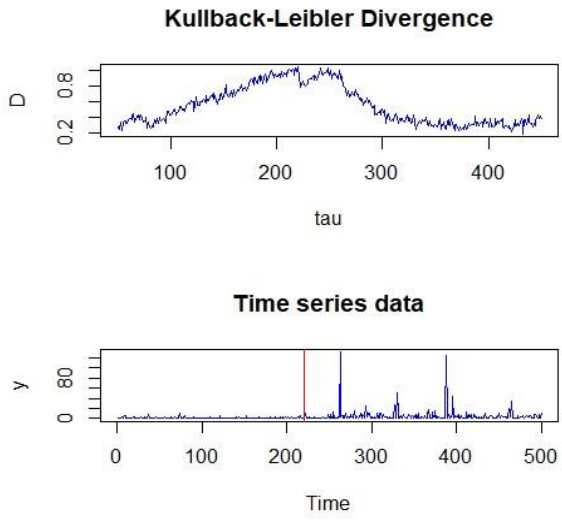


Figure 1: $n = 500, \tau = 250, \hat{\tau} = 221$

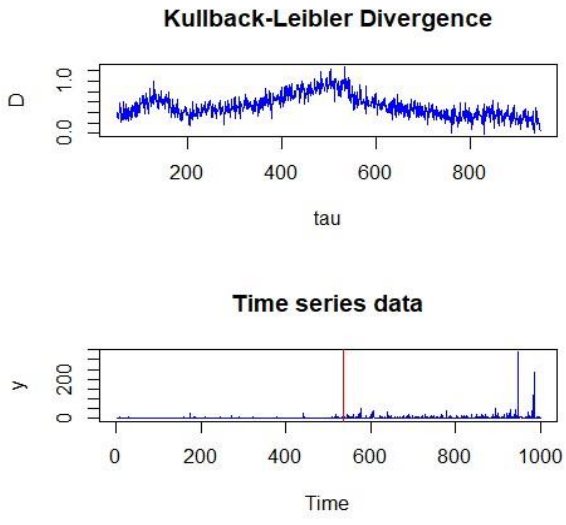


Figure 2: $n = 1000, \tau = 500, \hat{\tau} = 535$

4.1 Application to data

Before fitting the GP density function to data, it is first necessary to choose a threshold. It is important to choose a sufficiently high threshold in order that the theoretical justification applies thereby reducing bias. However, the higher the threshold, the fewer available data remain. Thus, it is important to choose the threshold low enough in order to reduce the variance of the estimates. The Fort Collins precipitation data as shown in figure 3 is used. The data contains daily precipitation amount records over the period 1900 to 1999. A threshold value of 0.4 is selected and extremes classified as the values above this. It is assumed that the values are independently and identically distributed. The exceedances are considered to follow the generalized Pareto distribution. The KLD values are computed and shown in figure 4

The change point estimator detects a change at point $\hat{\tau}$= 979 (March, 14 1996). On July 28, 1997, an extreme flood disaster hit Fort Collins, Colorado with the heaviest rains ever documented in an urbanized area of the state. It was one of the major urban floods of recent years in the United States and was labelled a "500- year event" by the media, causing major impacts on the city and its people (Grigg et al., 1999). The change point could thus be accounted for by this extreme flooding event. Figure 5 shows the extreme precipitation

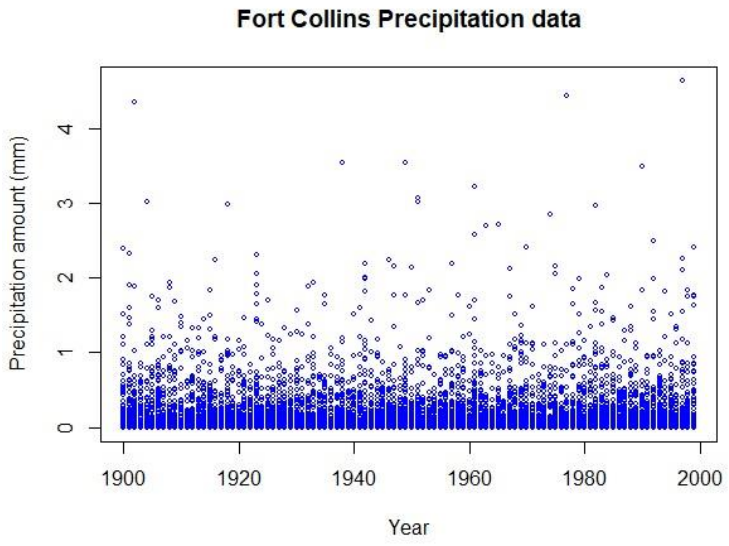


Figure 3: Fort Collins precipitation time series

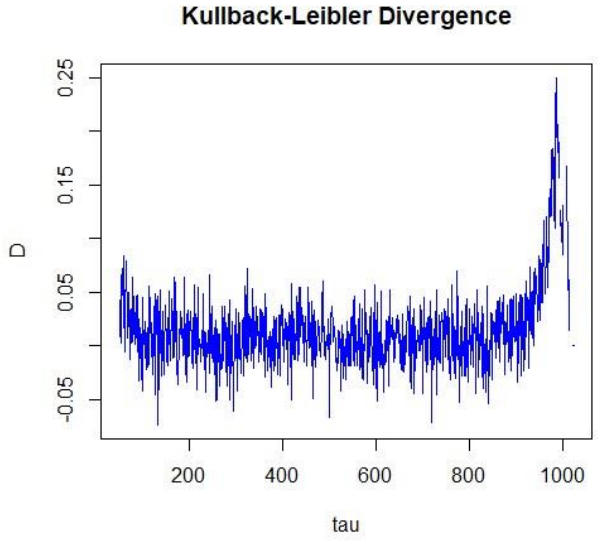


Figure 4: Kullback- Leibler divergence

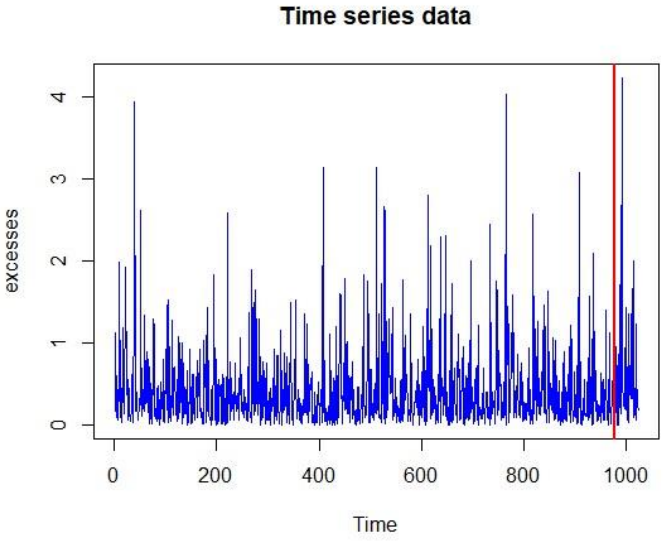


Figure 5: Excesses change point estimate

data with a superimposed line (red) indicating the point in time when the change point was detected. Looking at the values of the estimated parameters of the GP before and after the change point an increase in the scale parameter is accompanied by a decrease in the shape.

Discussion and conclusion

The Kullback-Leibler divergence has been used to distinguish between two distributions belonging to the same family. A change point is then defined as the point in time where the distribution parameters change characterized by maximum divergence. This change can be attributed to many factors including internal and systemic changes. Since fundamental features of extreme values can be captured by the tail behavior described by the generalized Pareto distribution, then the method can be used explicitly to examine the parameter changes. The method has shown difficulties that are present when estimating small changes in the shape parameter given small sample sizes. This then implies that very large samples are crucial in estimating small changes since the performance and sensitivity of the estimator improves with larger samples. Hence, the estimator is seen to be consistent with respect to the magnitude of change. The method is tested within a simulation setting as well as real life example and works quite well.

References

Chen, S., Li, Y., Kim, J., & Kim, S. W. (2017). Bayesian change point analysis for extreme daily precipitation. *International Journal of Climatology*, *37*(7), 3123–3137.

Cheng, L., AghaKouchak, A., Gilleland, E., & Katz, R. W. (2014). Non-stationary extreme value analysis in a changing climate. *Climatic change*, *127*(2), 353–369.

Coles, S., Bawa, J., Trenner, L., & Dorazio, P. (2001). *An introduction to statistical modeling of extreme values* (Vol. 208). Springer.

Csörgö, M., & Horváth, L. (1997). *Limit theorems in change-point analysis* (Vol. 18). John

Wiley & Sons Inc.

De Paola, F., Giugni, M., Pugliese, F., Annis, A., & Nardi, F. (2018). Gev parameter estimation and stationary vs. non-stationary analysis of extreme rainfall in african test cities. *Hydrology*, *5*(2), 28.

Dierckx, G., & Teugels, J. L. (2010). Change point analysis of extreme values. *Environmetrics*, *21*(7-8), 661–686.

Dupuis, D., Sun, Y., & Wang, H. J. (2015). Detecting change-points in extremes. *Statistics and Its Interface*.

Embrechts, P., Klüppelberg, C., & Mikosch, T. (2013). *Modelling extremal events: for insurance and finance* (Vol. 33). Springer Science & Business Media.

Field, C. B., Barros, V., Stocker, T., Qin, D., Dokken, D., Ebi, K., ... others (2012). Ipcc, 2012: Managing the risks of extreme events and disasters to advance climate change adaptation. a special report of working groups i and ii of the intergovernmental panel on climate change. *Cambridge University Press, Cambridge, UK, and New York, NY,*

USA, *30*(11), 7575–7613.

Garrido, A. (2009). About some properties of the kullback-leibler divergence. *Advanced*

Modeling and Optimization, *11*, 4.

Grigg, N. S., Doesken, N. J., Frick, D. M., Grimm, M., Hilmes, M., McKee, T. B., & Oltjenbruns, K. A. (1999). Fort collins flood 1997: Comprehensive view of an extreme event. *Journal of water resources planning and management*, *125*(5), 255–262.

Hosking, J. R., & Wallis, J. R. (1987). Parameter and quantile estimation for the generalized pareto distribution. *Technometrics*, *29*(3), 339–349.

Jarušková, D., & Rencová, M. (2008). Analysis of annual maximal and minimal temperatures for some european cities by change point methods. *Environmetrics: The official journal of the International Environmetrics Society*, *19*(3), 221–233.

Killick, R., & Eckley, I. (2014). changepoint: An r package for changepoint analysis. *Journal of statistical software*, *58*(3), 1–19.

Kullback, S., & Leibler, R. A. (1951). On information and sufficiency. *The annals of mathematical statistics*, *22*(1), 79–86.

Pickands III, J., et al. (1975). Statistical inference using extreme order statistics. *the Annals of Statistics*, *3*(1), 119–131.

Rust, H., Maraun, D., & Osborn, T. (2009). Modelling seasonality in extreme precipitation.

The European Physical Journal Special Topics, *174*(1), 99–111.

Truong, C., Oudre, L., & Vayatis, N. (2018). A review of change point detection methods. *arXiv preprint arXiv:1801.00718*.

Zhang, J. (2007). Likelihood moment estimation for the generalized pareto distribution.

Australian & New Zealand Journal of Statistics, *49*(1), 69–77.

Modeling Stock Returns Volatility Using Regime Switching Models

Kalovwe, Sebastian Kaweto [1], Dr Mwaniki,Joseph Ivivi [2] and Prof. Simwa,Richard Onyino [3]

[1]School of Mathematics, University of Nairobi, P.o box 30197-00100, Nairobi-Kenya

Email: skaweto@gmail.com

Tel: +254-721857673/+254736251804

[2]School of Mathematics, University of Nairobi, P.o box 30197-00100, Nairobi-Kenya

Email: jmwaniki@uonbi.ac.ke

Tel: +254-711349438

[3]Department of Mathematics, Machakos University P.o box 136-90100, Machakos-Kenya

Email: rsimwa@uonbi.ac.ke

Tel: +254-722771902

Abstract

This paper seeks to model the dynamic relationship between stock market returns, volatility and trading volume in both developed and emerging stock markets. Modeling stock returns volatility has a tremendous reflection of the stock market microstructure behavior. We model this relationship using GARCH model, which previously has been used and reproduced most stylized facts of financial time series data, and compare its results with those of Regime-Switching and Markov-Switching GARCH. The results indicate evidence of volatility clustering, leverage effects and leptokurtic distribution for the index returns. Moreover, we find that all the three stock markets are characterized by return series process staying in low volatility regime for a long time than in high volatility regime. Markov-Switching GARCH (1, 1) model is reported to be a better model than GARCH (1, 1).

Keywords: Volatility, Stock Returns, GARCH, Regime Switching, Markov-Switching GARCH

1 INTRODUCTION

In the previous financial modeling studies, the connection between stock returns, volatility and volume has been widely examined in both developed and emerging stock markets. This relationship is paramount since it provides insights into the understanding of the microstructure of financial markets. Volatility can be defined as a statistical measure of dispersion of returns for a given security or market index which can be measured by either using the standard deviation or variance of the return series from a given market index. A higher value of standard deviation implies a greater dispersion of returns and high risk associated with the investment. The performance of stock market has strong dependence on volatility and thus as volatility declines the stock market rises and vice versa. This means that when volatility increases, risk increases and returns decrease. On the other hand, Abbontante [1] defines trading volume as the total number of shares traded each day. Trading volume can be used to measure the value of stock price movement. That is, trading volume is an important technical indicator that is used to confirm a trend or a trend reversal. It gives investors idea of the price action of a security and whether they should buy or sell the security. If trading volume increases prices generally move in the same direction. We therefore note that the understanding of connection between stock returns, volatility and volume should be given a considerable attention in financial modeling. A

study by Wiley and Daigler [17] contend that the relationship between price and volume is attributed to the role of information in the price formation. On the other hand, Karpoff [11] argue that price-volume empirical relationship is paramount because of the fact that it gives insights in the understanding of the many theories that compete to widely spread ideas about information flow into the market.

Moreover, Attari et.al [3] in their research uncovers that investors are encouraged by higher returns to invest and consequently there is capital inflow while in the volatile environments the returns are not certain and it is difficult to predict the investment. The study of Attari et.al [3] and Hseih [10] reveals that emerging stock markets associates with highly volatile stock return due to low stock market volume. Girard and Biswas [8] in their study on trading volume and stock return volatility in developed versus emerging stock markets reports negative relation between the two. According to Al-Samman and Al-Jafari [2], trading volume is considered as an important technical indicator in measuring the strength of a market for the reason that it contains about stock behaviour. The contemporaneous and dynamic relationship between trading volume and stock returns has been a cause for empirical studies. Lee and Rui [13] revealed that returns granger cause trading volume in the developed markets (US, UK and Japan). In their study, De Medeiros and Doornik [7] report a contemporaneous and dynamic relationship between returns, volatility and trading volume by using Brazilian market data. A positive correlation between trading volume and volume was reported by Mahajan and Singhn [14]. Moreover, studies by Christie [5] reveal a negative correlation between volume and volatility. Crouch [6] studied the connection between daily trading volume, absolute changes of the stock market and individual stocks and found a positive relationship between them. Rogalski [16] utilized month to month stock information and found a positive contemporaneous relationship between trading volume and absolute returns.

More recently, a look into by Komain [12] aimed to inspect the dynamic connection between stock return, trading volume, and volatility in the Thai Stock market reports that trading volume assumes a prevailing job in the dynamic connections. Specifically, trading volume causes both return and return volatility when the US subprime emergencies are considered. More generally, literature reveals that there is contemporaneous connection between trading volume and return in the Thai securities exchange.

In general, despite the significant efforts that have been made, empirically and theoretically, on the phenomenon of stock returns, volatility and volume relationship on different stock markets, mixed results have been reported. However, most of the findings have confirmed existence of contemporaneous relationship between stock returns, volatility and trading volume. We note that, despite a fair amount of empirical evidence that exists on the connection between stock returns, volatility and trading volume for developed and emerging financial markets, there exists few studies that have investigated the case of Nairobi Securities Exchange (NSE) (an emerging market) compared to a developed stock market. Our study therefore seeks to investigate the kind of relationship between stock returns, volatility and trading volume in both emerging and developed financial markets by applying GARCH and Regime Switching models.

The rest of this paper is organized as follows; Section 2 provides an overview of the GARCH, Regime Switching models and Markov-Switching GARCH models used in the study. Section 3 presents the data used and its descriptive statistics and the general discussion of the study findings. Finally, section 4 concludes the paper.

2 METHODOLOGY

2.1 GARCH Models

The generalized autoregressive conditional heteroscedasticity (GARCH) models, which have been widely used in financial and economic modeling and analysis, are characterized by their ability to capture volatility clustering among other stylized facts and to account for non-uniform variance in time-series data. Bollerslev [4] proposed these models as a valuable extension of ARCH model. By defining a log return series r_t, we assume that the mean equation of the process can be sufficiently described by an ARMA model. Let $a_t = r_t - \mu_t$ be the mean-corrected log return. Then a_t follows a GARCH (p, q) model if

$$a_t = \alpha_t \varepsilon_t \ , \qquad \sigma_t^2 = \alpha_0 + \sum_{i=1}^{p} \alpha_i a_{t-i}^2 + \sum_{j=1}^{q} \beta_j \sigma_{t-j}^2 \qquad [1]$$

where q is the degree of GARCH; p is the degree of the ARCH process, ε_t is a sequence of i.i.d random variable with mean 0 and variance 1, $\alpha_0 > 0, \alpha_i \geq 0, \beta_j \geq 0$ and $\sum_{i=1}^{\max(p,q)} (\alpha_i + \beta_j) < 1$ We note that $\alpha_i = 0$ for $i > p$, and $\beta_j = 0$ for $j > q$ and the constraint $\alpha_i + \beta_j < 1$ imply that the unconditional variance of a_t is finite, whereas its conditional variance a_t^2 evolves over time. Equation [1] reduces to a pure ARCH (p) model if $q = 0$. GARCH (1, 1) is the basic and most widespread model and it is expressed as

$$a_t = \alpha_t \varepsilon_t, \quad \sigma_t^2 = \alpha_0 + \alpha_1 a_{t-1}^2 + \beta_1 \sigma_{t-1}^2 \qquad [2]$$

In this model, α_0 is the non-changing variance that corresponds to the long run average, α_1 represents the first order ARCH term which broadcasts information pertaining volatility from an earlier period, and β_1 is the first order GARCH term which is the new information that was not available at the time the previous forecast was made. If $\alpha_1 + \beta_1 > 1$, it implies that the shocks to volatility do not die off over time. This is to mean that the magnitude of these parameters determines the extent of volatility persistence. The closer the sum of α_1 and β_1 to 1, the more the shocks to volatility does not die off.

2.2 Regime Switching Models

The Regime Switching model was developed by Hamilton [9] and is also referred to as the Markov Switching model. It is among the most popular nonlinear time series models in literature that have been used to model stock data. It involves multiple structures that characterize the time series behaviors in different regimes. The model is able to capture more complex dynamic patterns if switching between these structures is permitted as well as it allows coefficients of the

conditional mean and variance to vary according to some finite-valued stochastic process with states or regimes $S_t, S_t \in S = (1, \ldots \ldots r)$.The regime changes aim at capturing changes in the underlying financial and economic mechanism through the observed time period.

We presume that a return r_t follows a simple two-state Markov switching model with different risk premiums and different GARCH dynamics expressed as

$$r_t = \begin{cases} \alpha_{10} + \alpha_{11} h_{t-1} + e_t, \;\; e_t \sim iid\, N(0, \sigma^2), \;\; if\; S = 1 \\ \alpha_{20} + \alpha_{21} h_{t-1} + e_t, \;\; e_t \sim iid\, N(0, \sigma^2), if\; S = 2 \end{cases} \quad [3]$$

where h_{t-1} is the stock market return at time $t-1$, α_{10} and α_{11} are the parameter estimates in the first regime and α_{20} and α_{21} are the parameters in the second regime. The probability of transition from one state to another is governed by

$$P(S_t = 2 \,/S_{t-1} = 1) = \; q_1 \,, P(S_t = 1 \,/S_{t-1} = 2) = \; q_2 \quad [4]$$

where $0 < q_i < 1$. A small q_i means that the return series has a tendency to stay in the ith state with expected duration $\frac{1}{q_i}$.

2.3 Markov-Switching GARCH Models

We shall note our variable of interest at time t by r_t.We assume that r_t has zero mean and has no serial correlation, that is, we assume the following moment conditions: $E\left[r_t\right] = 0$ and $E\left[r_t, r_{t-1}\right] = 0$ for $i \neq 0$ and all $t > 0$. According to McNeil et.al [15], this assumption is realistic for high frequency returns for which the (conditional) mean is often assumed to be zero. We allow for regime-switching in the conditional variance process. Denote by I_{t-1} the information set observed up to time $t-1$, that is, $I_{t-1} = [r_t, i > 0]$.The general Markov-Switching GARCH specification is expressed as: $r_t \left| (s_t, I_{t-1}) \sim D\left(0, h_{k,t}\right), \in_t \right.$ where $D\left(0, h_{k,t}\right)$, $\in_t$ is a continuous distribution with mean zero, time-varying variance $h_{k,t}$ and additional shape parameters gathered in the vector $\in_t$. The integer-valued stochastic variable S_t, defined on the discrete space $1,2, \ldots\ldots, k$, characterizes the Markov-swiching GARCH model. We define the standardized innovations as $\eta_{k,t} = (r_t / h_{k,t})^{1/2} \sim D(0,1, \in_k)$. According to Bollerslev [4], the GARCH model is given by

$$h_{k,t} = \alpha_{0,k} + \alpha_{1,k} r_{t-1}^2 + \beta_k h_{k,t-1} \quad [5]$$

for $k = 1, \ldots\ldots K$. In this case, we have $\theta_k = (\alpha_{0,k}, \alpha_{1,k}, \beta_k)^T$. In order to ensure non-negativity (positivity), we demand that $\alpha_{0,k} > 0, \alpha_{1,k} \geq 0$ and $\beta_k \geq 0$.Covariance-stationarity in each regime is obtained by requiring $(\alpha_{1,k} + \beta_k) < 1$.

3 Results and Discussion

3.1 Empirical Data

In our analysis we focus on the daily, weekly and monthly closing prices and trading volume as reported in FTSE100 index in London, S&P500 index in New-York and NSE20 share index in Nairobi. All the returns and volume are calculated as the first difference of the log of the daily, weekly and monthly closing price and volume.

3.2 Descriptive statistics

The basic statistical properties of the data are presented in table 1. The mean index returns are positive for all the index return series and close to zero. The positive mean of index returns is an indication that investors in these markets have earned a positive rate of return on their investment. The mean of volume for all series is positive except for the FTSE100 daily and NSE20 weekly indices. We observe that the mean of returns and volume are close to zero, however, as the data changes from daily to monthly, the means slightly increases. We further report that the standard deviations of monthly return series are higher in most of the time series than those for weekly and daily return series. There is negative skewness in most of the time series except for the NSE20 daily and weekly index returns and S&P500 and NSE20 weekly index volume which implies that the distribution of all the return series except NSE20 daily and weekly index returns and S&P500 and NSE20 weekly volume have long tail to the left. The distribution of all the return series and volume is leptokurtic as implied by the positive values of the kurtosis coefficients. Most return series have heavy tails as exhibited by the skewness and kurtosis coefficients which are statistically different from those of normal distribution which are 0 and 3 respectively. The kurtosis and the Jarque-Bera (JB) statistic decrease as the time scale increases from daily to monthly observations. The assumption of normality is clearly rejected by the values for JB statistic and this indicates presence of Heteroscedasticity.

Table 1: Descriptive statistics for daily, weekly and monthly stock returns and volume

Market	Time Series	Obs	Nobs	Mean	Std Dev	Skewness	Ex.Kurt	J-B test
FTSE100 index	Returns	D	4348	5.00e-4	0.012	-0.159	6.757	83000
		W	886	2.43e-4	0.024	-1.111	12.556	6035.2
		M	203	9.83e-4	0.040	-0.715	0.889	24.84
	Volume	D	4348	-2.1e-4	0.351	-0.011	13.418	32,652
		W	886	1.1e-4	0.025	-1.183	12.908	3535
		M	203	3.9e-4	0.042	-0.695	0.715	1,299

S&P500 index	Returns	D	4275	1.72e-4	0.012	-0.220	9.389	15757
		W	918	8.43e-4	0.024	-0.928	8.091	2651.3
		M	203	3.31e-3	0.042	-0.861	1.888	57.16
	Volume	D	4275	1.03e-3	0.782	0.093	2.224	14,507
		W	918	3.92e-3	0.880	-0.007	1.601	2341
		M	203	0.01033	1.036	-0.232	1.286	2.05
NSE20 index	Returns	D	4271	1.56e-4	0.009	0.393	11.322	22949
		W	879	7.56e-4	0.026	0.418	5.872	1296.9
		M	200	3.36e-3	0.060	-0.467	2.185	49.06
	Volume	D	4271	1.8e-4	0.1891	-0.096	9.017	888.1
		W	879	-1.1e-3	0.2511	0.093	7.797	95.08
		M	200	4.2e-3	0.1600	-0.039	0.452	16.54

D=daily, W=weekly, M=monthly observations and Nobs=Number of observations

3.3 Empirical Findings and Discussion

Figure 1 to 3 presents a time series plot of the FTSE100, S&P500 and NSE20 adjusted closing prices and volume for the three frequencies (daily, weekly and monthly observations). The plots reports clearly that the series have trend which is an indication that the means and variances of the time series are non-constant and therefore we can conclude that the data is non-stationary. Moreover, volatility clustering, that is, low volatility is followed by low volatility and high volatility is followed by high volatility, is evidently implied by the plots of index returns volatilities in Figures 4 to 6 for the three frequencies.

We estimate GARCH (1, 1) model assuming normality. Table 2 presents the results for parameter estimates for the daily, weekly and monthly index returns series. The condition $\alpha_1 + \beta_1 < 1$ and $\alpha_0 > 0, \alpha_1 > 0 \; and \; \beta_1 > 0$, which is significant for mean reverting (volatility persistence) process is met by the results. This implies that conditional volatilities are mean reverting for all the time series and frequencies and that the GARCH (1, 1) model is weakly stationary. Further, we note that, in most of the cases monthly conditional volatilities of index returns tend to revert quickly towards the mean as compared to weekly and daily conditional volatilities. Moreover, the first three coefficients α_0 (constant), ARCH term (α_1) and GARCH term (β_1) are highly significant for the three indices returns for all time scale observations with the exception that α_0 is not significant for monthly observations of FTSE100,S&P500 and NSE20 indices and μ is not significant for FTSE100(monthly) and NSE20(daily, weekly and monthly) indices. The significance of these parameters is an indication that lagged conditional variance and squared disturbance has an impact on conditional variance which means volatility news from the previous periods has the power to explain current volatility.

Table 4 to 6 presents the parameter estimates and transition probabilities for Regime Switching model for FTSE100, S&P500 and NSE20 index returns. As for the case of daily index returns, the parameter estimates are significant in both regimes except for FTSE100 in regime one which is not significant whereas in weekly index returns, only the parameter estimates for FTSE100 index are significant and all the parameters in S&P500 and NSE20 stock markets are not significant. Lastly, the results for monthly index returns indicate that the parameters are only significant in regime one for FTSE100 and S&P500. We also note that the probability that return series will transit from regime 1 to 2 is very low. However, once in one regime the process tends to remain there for a long time. The probability of being in regime 1 is higher than that of staying in regime 2 for all the daily time series whereas for weekly return series regime 1 has the highest probability of staying in regime 1 than in regime 2 for FTSE100 and S&P500 index returns. as for monthly return series, only FTSE100 has the highest volatility of staying in regime 1 than in regime 2. This means that the return series process for emerging market stays in high volatility regime for long than in low volatility regime contrary to developed stock markets.

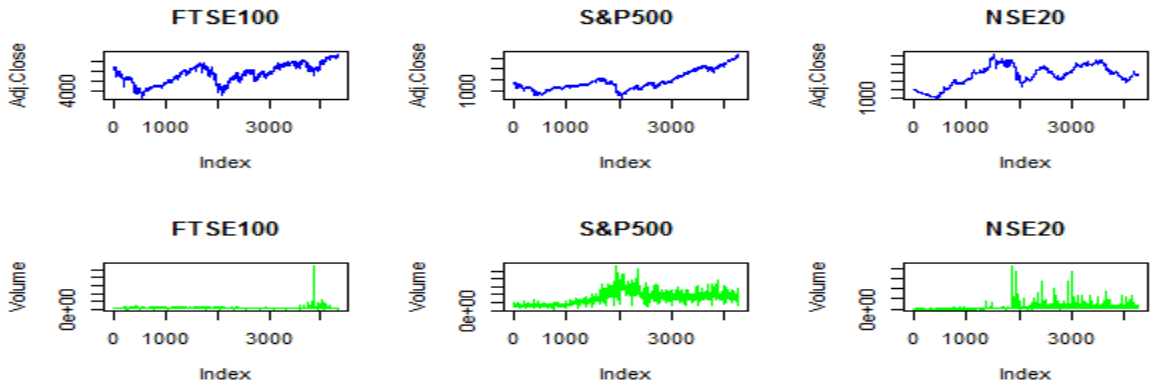


FIGURE 7: DAILY INDEX OBSERVATIONS AND VOLUME

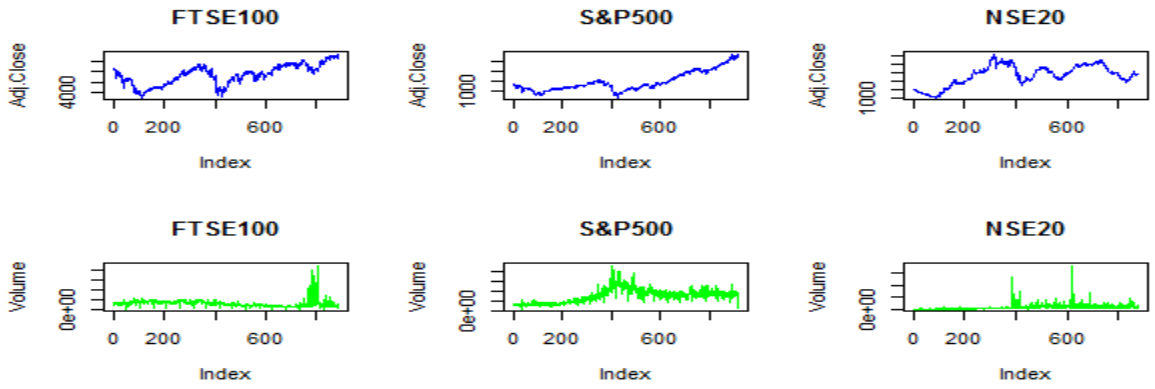


FIGURE 8: WEEKLY INDEX OBSERVATIONS AND VOLUME

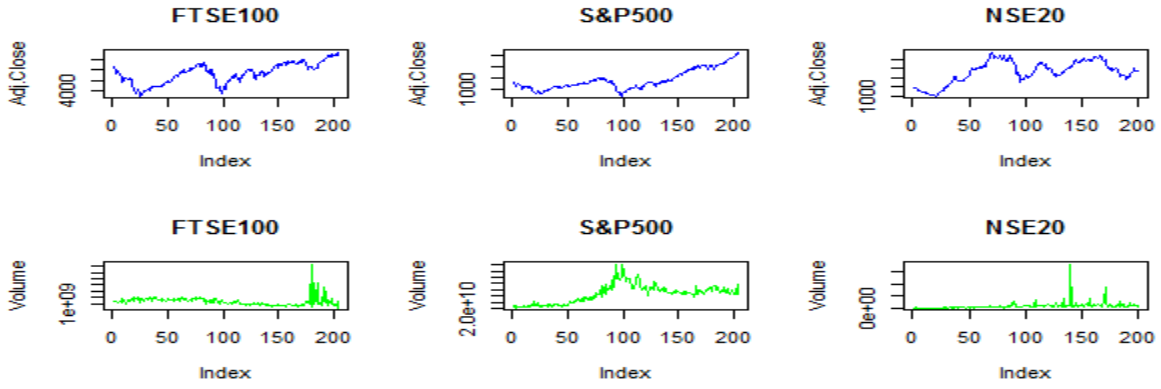


FIGURE 9: MONTHLY INDEX OBSERVATIONS AND VOLUME

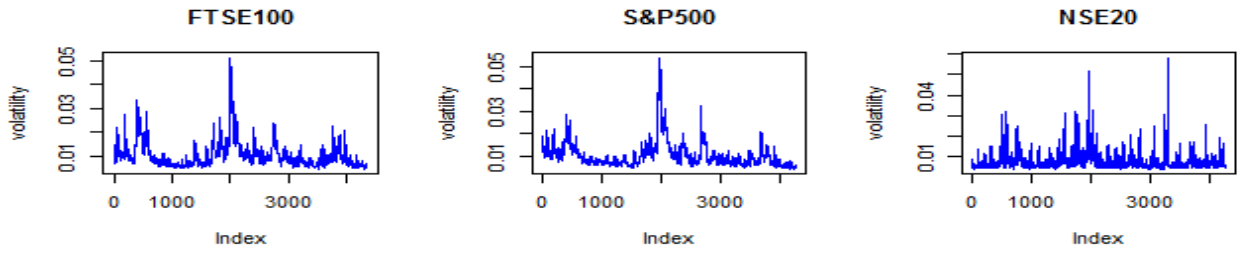


FIGURE 10: DAILY FTSE100, S&P500 AND NSE20 INDEX RETURNS VOLATILITY

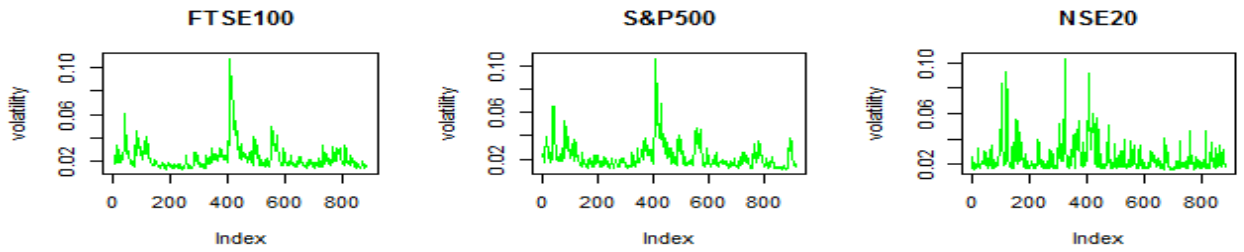


FIGURE 11: WEEKLY FTSE100, S&P500 AND NSE20 INDEX RETURNS VOLATILITY

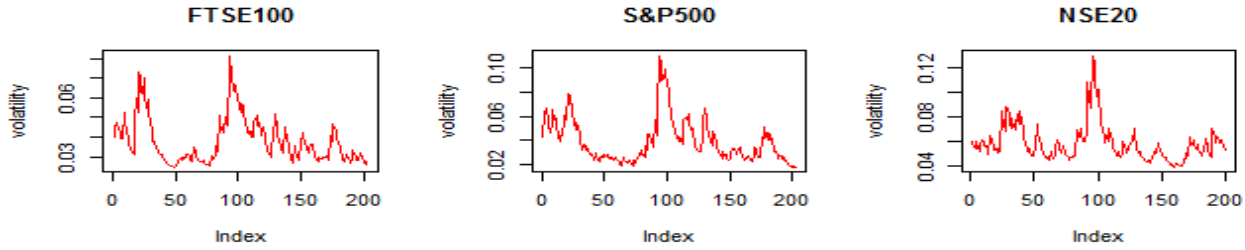


FIGURE 12: MONTHLY FTSE100, S&P500 AND NSE20 INDEX RETURNS VOLATILITY

Table 2: GARCH (1, 1) for returns

	FTSE100 index returns			S&P500 index returns			NSE20 index returns		
Parameter	Daily	Weekly	Monthly	Daily	Weekly	Monthly	Daily	Weekly	Monthly
μ	3.811e-4 0.001**	1.470e-3 0.016 *	4.242e-3 0.066	5.254e-4 9.6e-6***	2.371e-3 1.6e-5***	7.90e-3 8.5e-5***	1.488e-4 0.136	4.046e-4 0.595	0.003 0.406
α_0	1.661e-6 2.6e-7***	2.911e-5 0.005 **	1.224e-4 0.125	1.627e-6 4.35e-9 ***	2.781e-5 0.001***	5.79e-5 0.167	4.607e-6 4e-15 ***	1.30e-4 2.9e-6***	0.0003 0.145
α_1	1.102e-1 <2e-16***	1.907e-1 1.5e-6 ***	1.826e-1 0.007**	9.749e-2 <2e-16***	2.240e-1 1.2e-9***	2.45e-1 1.0e-3***	2.68e-1 <2e-16***	3.44e-1 2.4e-7***	0.157 0.049*
β_1	8.778e-1 <2e-16***	7.738e-1 <2e-16***	7.396e-1 1.1e-15***	8.883e-1 <2e-16***	7.379e-1 <2e-16***	7.32e-1 <2e-16***	6.92e-1 <2e-16***	4.833e-1 9 e-10***	0.755 8.3e-13***
$\alpha_1 + \beta_1$	0.988	0.9645	0.9222	0.98579	0.9619	0.977	0.960	0.8273	0.912
Logl	14077	2152	382	13928	2280	385	15066	2072	287
JB	191.3 0***	724.1 0***	16.18 0.000***	569.2 0***	125.56 0***	12.30 0.002***	7089 0***	274.64 0***	9.711 0.008***
Q(10)	5.556 0.851	9.204 0.513	5.030 0.889	23.675 0.009	6.194 0.799	6.599 0.763	527.81 0***	67.78 1.19e-10	26.928 0.003
Q(15)	11.872 0.689	15.24 0.434	8.217 0.915	32.227 0.006	7.653 0.937	8.551 0.900	547 0***	81.68 3.435	29.50 0.014
Q(20)	15.478 0.748	19.792 0.471	15.994 0.717	38.362 0.008	13.372 0.861	25.719 0.175	560.381 0***	94.141 1.39e-11	34.791 0.021
LM test	12.017 0.444	15.520 0.214	8.575 0.739	17.279 0.139	11.675 0.472	8.270 0.764	10.585 0.565	12.189 0.431	17.100 0.146
AIC	-6.473	-4.850	-3.731	-6.514	-4.959	-3.755	-7.053	-4.707	-2.840
BIC	-6.467	-4.828	-3.665	-6.508	-4.938	-3.689	-7.047	-4.685	-2.774

Note: *, **, and *** indicate significance at 5%, 1% and 0.1% respectively.

Q (10), Q (15) and Q (20) are Ljung-Box tests at lag 10, 15 and 20 respectively

Logl is log likelihood, JB is Jarque-Bera test, AIC is the Akaike Information Criterion, BIC is the Bayesian Information Criterion

Table 3: GARCH (1, 1) for Trading volume

Note: *, **, and *** indicate significance at 5%, 1% and 0.1% respectively.

Q (10), Q (15) and Q (20) are Ljung-Box tests at lag 10, 15 and 20 respectively

Logl is log likelihood, JB is Jarque-Bera test, AIC is the Akaike Information Criterion, BIC is the Bayesian Information Criterion

	FTSE100 Index Volume			S&P500 Index Volume			NSE20 Index Volume		
Parameter	Daily	Weekly	Monthly	Daily	Weekly	Monthly	Daily	Weekly	Monthly
μ	-0.0021 0.577	-0.0075 0.404	-0.005166 0.73976	-4.3e-4 0.95802	-0.0108 0.129	-4.3e-4 0.95802	8.5e-3 0.867	0.01462 0.52937	8.455e-3 0.867
α_0	0.0070 9.8e-12**	0.0369 <2e-16***	0.0024 0.3221	0.0129 3.7e-5***	0.0322 1.2e-6***	0.0129 3.7e-5***	5.73e-1 2e-16***	0.0446 0.1109	5.7e-1 2e-16***
α_1	0.1820 <2e-16***	0.5077 1e-12***	0.2442 0.002**	0.4259 0.0015**	0.2832 7.1e-6***	0.42605 0.0015**	0.4036 5.4e-5***	0.1467 0.0053**	5.0e-1 5.4e-5***
β_1	0.7715 <2e-16***	0.3939 <2e-16***	0.7953 <2e-16***	0.0823 0.4886	0.2030 0.124	0.0823 0.4886	1e-8 -	0.8034 <2e-16***	1e-8 -
$\alpha_1 + \beta_1$	0.9535	0.3939	1.0395	0.5082	0.4862	0.5084	0.4036	0.9501	0.500
Logl	-943.9	-321	-43.679	97.629	25.84	97.63	-275.2	-1081	-275
JB	7295 0***	8707.2 0 ***	291.67 0***	0.0045 0.997	897.82 0***	0.0045 0.9977	1.996 0.3686	213.5 0***	1.996 0.3686
Q(10)	545.2 0 ***	52.15 1.07e-7***	61.35 2e-9***	63.53 7.7e-10***	113.98 0 ***	63.52 7.7e-10***	46.59 1.12e-6***	142.4 0 ***	46.59 1.1e-6***
Q(15)	670.18 0***	82.428 2.5e-11***	106.19 8.9e-16***	111.0 1.1e-16***	123.95 0***	11 5 1.1e-16***	53.47 3.2e-6***	152.88 0 ***	53.47 3.22e-6***
Q(20)	781.3138 0 ***	98.48 2.4e-12***	141.32 0***	127.74 0***	144.87 0 ***	127.74 0 ***	55.14 3.9e-5***	165.9 0 ***	55.14 3.9e-5***
LM test	28.823 0.0041***	2.4947 0.9981	12.483 0.4077	6.614 0.882	17.06 0.147	6.614 0.882	17.533 0.1306	11.66 0.4734	17.533 0.1306
AIC	0.4360	0.7336	0.4698	-0.9224	-0.0476	-0.9225	2.7920	2.470	2.792
BIC	0.4419	0.755	0.5351	-0.8572	-0.0266	-0.8572	2.8580	2.4918	2.8580

Table 4: Regime switching model FTSE100, S&P500 and NSE20 daily index returns

		FTSE100		S&P500		NSE20	
Regime		Estimate	P-value	Estimate	P-value	Estimate	P-value
1	α_{10}	0.0005	5.733e-07***	0.0007	2.56e-12 ***	0.0001	0.3173
	α_{11}	-0.0089	0.6579	-0.0524	0.005817 **	0.2905	<2e-16 ***
2	α_{20}	-0.0010	0.04550 *	-0.0012	0.0455003 *	0.0003	0.6682
	α_{21}	-0.0579	0.04219 *	-0.0981	0.0006034***	0.3742	<2e-16 ***
		R1	R 2	R 1	R 2	R 1	R 2
		R1 0.9902	0.0232	R 1 0.9903	0.0232	R 1 0.9689	0.1478
		R2 0.0098	0.9768	R 2 0.0097	0.9768	R2 0.0311	0.8522

Table 5: Regime switching model FTSE100, S&P500 and NSE20 Weekly index returns

		FTSE100		S&P500		NSE20	
Regime		Estimate	P-value	Estimate	P-value	Estimate	P-value
1	α_{10}	0.0035	5.434e-09 ***	0.0007	0.8155	-0.0070	0.05185
	α_{11}	-0.1217	0.005046 **	0.0852	0.2380	-0.1052	0.18299
2	α_{20}	0.0021	0.0027 **	-0.0045	0.05041	0.0006	0.3173
	α_{21}	-0.0707	0.1121	-0.0486	0.42255	0.2123	2.15e-06***
		R 1	R 2	R 1	R2	R 1	R2
		R1 0.8874	0.0302	R 1 0.9793	0.0430	R 1 0.8113	0.0643
		R 2 0.1126	0.9698	R 2 0.0207	0.9570	R2 0.1887	0.9357

Table 6: Regime switching model for FTSE100, S&P500 and NSE20 Monthly index returns

		FTSE100		S&P500		NSE20	
Regime		Estimate	P-value	Estimate	P-value	Estimate	P-value
1	α_{10}	0.0125	1.906e-07 ***	0.0134	2.36e-08 ***	-0.0050	0.5215
	α_{11}	-0.3922	9.354e-06***	-0.2174	0.02938 *	1.4178	0.1946
2	α_{20}	-0.0100	0.1356	-0.0033	0.56266	0.0043	0.1112
	α_{21}	0.0772	0.5072	0.1883	0.06279	0.0396	0.5348
		R 1	R 2	R 1	R 2	R 1	R 2
		R 1 0.9476	0.0679	R 1 0.9665	0.0279	R 1 0.0169	0.1997
		R 2 0.0524	0.9321	R 2 0.0335	0.9723	R 2 0.9831	0.8003

Tables 7, 8 and 9 presents the MSGARCH (1, 1) parameters estimates for FTSE100,S&P500 and NSE20 daily, weekly and monthly index returns. We note that all the parameters are statistically significant an they signify that the volatility process evolution is heterogeneous across the two regimes. In fact, we note that the two regimes report different unconditional volatility levels as well as different volatility persistence. For instance, the first regime for daily FTSE100, S&P500 and NSE20 indices reports $\alpha_{1,1}+\beta_1 \approx 0.9914$, $\alpha_{1,1}+\beta_1 \approx 0.9815$ and $\alpha_{1,1}+\beta_1 \approx 0.9536$ while the second regime reports $\alpha_{2,2}+\beta_2 \approx 0.9662$, $\alpha_{1,1}+\beta_1 \approx 0.9959$ and $\alpha_{1,1}+\beta_1 \approx 0.6492$ respectively. The volatility persistence is generally high in the second regime for the three indices except in the FTSE100 (daily and monthly) and NSE20 (daily) indices returns. The significance of this property is that the first regime is characterized by low unconditional volatility and low persistence of the volatility process while the second regime is characterized by high unconditional volatility and high persistence of the volatility process. Evidently, regime one would be perceived as "steady market conditions" with low volatility levels and while regime two as "unstable market conditions" with high volatility levels and strong persistence. This is also confirmed by the transition probabilities which reports that process has the tendency to spend more time in regime one (low volatility).

The Markov chain transition probabilities indicate how the return series process moves from regime 1(low volatility) to regime 2 (high volatility). We notice that the probabilities of transiting from regime 1 to regime 2 are very low and consequently the probabilities of staying at the same state are very high. This means that when the process is at one regime, the probability of changing regime is very low. In general, all the probabilities spend more time at regime 1 than in state 2 except for FTSE100 and NSE20 weekly index returns and S&P500 and NSE20 monthly index returns which reports contrary results.

Table 7: MSGARCH (1, 1) model for FTSE100, S&P500 and NSE20 Daily index returns

Parameter	FTSE100		S&P500		NSE20	
	Estimate	P-value	Estimate	P-value	Estimate	P-value
$\alpha_{0,1}$	0.0000	<1e-16	0.0000	<1e-16	0.0000	3.360e-03
$\alpha_{1,1}$	0.0332	<1e-16	0.0678	<1e-16	0.0070	1.145e-01
β_1	0.9582	<1e-16	0.9137	<1e-16	0.9466	<1e-16
xi_1	0.9232	<1e-16	0.9084	<1e-16	0.9960	<1e-16
$\alpha_{2,1}$	0.0000	<1e-16	0.0000	<1e-16	0.0001	3.127e-04
$\alpha_{2,2}$	0.2433	<1e-16	0.2268	<1e-16	0.2896	7.236e-03
β_2	0.7229	<1e-16	0.7691	<1e-16	0.3596	3.235e-03
xi_2	0.7937	<1e-16	0.7683	<1e-16	1.0403	<1e-16
$\alpha_{11}+\beta_1$	0.9914		0.9815		0.9536	
$\alpha_{2,2}+\beta_2$	0.9662		0.9959		0.6492	
Transition probabilities		R1 R2		R1 R2		R1 R2
	R1	0.9839 0.0161	R1	0.7275 0.2725	R1	0.9625 0.0375
	R2	0.0367 0.9633	R2	0.9737 0.0263	R2	0.1254 0.8746
Logl	14110.6898		14013.3058		15270.0962	
AIC	-28201.3795		-28006.6115		-30520.1925	
BIC	-28137.6048		-27943.0061		-30456.5964	

Table 8: MSGARCH (1, 1) model for FTSE100, S&P500 and NSE20 weekly index returns

par	FTSE100		S&P500		NSE20	
	Estimate	P-value	Estimate	P-value	Estimate	P-value
$\alpha_{0,1}$	0.0000	<1e-16	0.0000	3.203e-01	0.0001	4.749e-02
$\alpha_{1,1}$	0.0875	<1e-16	0.0318	4.391e-02	0.0861	2.607e-01
β_1	0.8466	<1e-16	0.9372	<1e-16	0.6108	2.702e-05
xi_1	0.8206	<1e-16	0.9973	<1e-16	1.0041	<1e-16
$\alpha_{2,1}$	0.0021	<1e-16	0.0001	3.621e-03	0.0002	1.771e-01
$\alpha_{2,2}$	0.8883	<1e-16	0.3239	1.406e-01	0.1671	2.904e-01
β_2	0.1113	<1e-16	0.6565	<1e-16	0.8199	<1e-16
xi_$2\alpha_{1,1}+\beta_1$	0.0664	<1e-16	0.6510	<1e-16	1.0352	<1e-16
$\alpha_{2,2}+\beta_2$	0.9341		0.969		0.6969	
	0.9996		0.9804		0.987	
Transition probabilities	R1	R2	R1	R2	R1	R2
	R1 0.9525	0.0475	R1 0.3341	0.6659	R1 0.8795	0.1205
	R2 0.9999	0.0001	R2 0.6192	0.3808	R2 0.3221	0.6779
Logl	2194.9417		2302.9038		2118.0534	
AIC	-4369.8834		-4585.8075		-4216.1068	
BIC	-4322.0162		-4537.5855		-4168.319	

Table 9: MSGARCH (1, 1) model for FTSE100, S&P500 and NSE20 Monthly index returns

par	FTSE100		S&P500		NSE20	
	Estimate	P-value	Estimate	P-value	Estimate	P-value
$\alpha_{0,1}$	0.0000	3.492e-01	0.0001	1.783e-01	0.0015	2.254e-08
$\alpha_{1,1}$	0.0193	3.374e-01	0.2031	2.153e-01	0.0000	4.949e-01
β_1	0.9591	<1e-16	0.7470	<1e-16	0.0046	7.940e-02
xi_1	0.8495	2.118e-13	0.6694	1.041e-08	0.6517	2.737e-06
$\alpha_{2,1}$	0.0001	9.826e-03	0.0001	2.341e-01	0.0002	3.043e-02
$\alpha_{2,2}$	0.2226	3.788e-02	0.2030	2.643e-01	0.0675	3.470e-02
β_2	0.7549	<1e-16	0.7473	<1e-16	0.9305	<1e-16
xi_2	0.3972	3.172e-11	0.6694	3.615e-06	0.3369	3.357e-07
$\alpha_{1,1}+\beta_1$	0.9784		0.9501		0.0046	
$\alpha_{2,2}+\beta_2$	0.9775		0.9503		0.998	
Transition probabilities	R1 R2		R1 R2		R1 R2	
	R1 0.9930 0.0070		R1 0.9821 0.0179		R1 0.8579 0.1421	
	R2 0.0062 0.9938		R2 0.0241 0.9759		R2 0.2522 0.7478	
Logl	392.9791		386.1737		296.1348	
AIC	-765.9583		-752.3474		-572.2696	
BIC	-732.826		-719.2154		-539.2864	

Table 10 presents the correlation coefficients between index returns and volume. We find that a negative relationship exists between stock index returns and trading volume in developed stock markets (FTSE100 and S&P500 indices) while the relationship is positive for emerging stock market(NSE20 index).

Table 10: Correlation between indices return and volume

	FTSE index	NSE20 index	S&P500 index
Daily	-0.050	0.008	-0.036
Weekly	-0.070	0.068	-0.121
Monthly	-0.198	0.138	-0.202

4. Conclusion

In this paper, the dynamic relationship between stock returns, volatility and trading volume in both developed and emerging stock markets is investigated. The results we find in this paper provide evidence that the behavior of the three stock indices returns and volume has common characteristics of many daily, weekly and monthly financial time series. The data exhibits a considerable kurtosis, which can be related to the time- dependence in conditional variance and also the distribution of all the time series (returns and volume) is relatively asymmetric. As a result of these two characteristics, all the time series data for returns and volume, shows a significant departure from normality and existence of conditional heteroscedasticity. All the series exhibits asymmetric behavior in the conditional variance which is related to leverage effects by many authors. The study finds strong evidence of volatility clustering, leverage effects and leptokurtic distribution for the indices returns and volume. The regime switching and MSGARCH models reveal that the two series oscillate between two regimes, that is, regime one(low volatility) and regime two (high volatility). Regime one is characterized by low unconditional volatility and low persistence of volatility while regime two is characterized by high unconditional volatility and high persistence of the volatility process. Moreover, we find negative relationship between stock returns and volume in developed stock markets (FTSE100 and S&P500 indices) and a positive relationship in emerging stock market. Finally, we observe that MSGARCH(1,1) is a better model compared to GARCH(1,1) as revealed by the log-likelihood, Akaike Information Criterion(AIC) and Bayesian Information Criterion(BIC) values.

Acknowledgement

Comments from the editor and anonymous referees are highly acknowledged.

REFERENCES

Abbontante, P. (2010). Trading volume of Stock Indices: A test of technical analysis. *American Journal of Economics and Business Administration*, 2,287-292.

Al-Samman, H. & Al-Jafari, M.K. (2015).Trading volume and stock return volatility: Evidence from industrial firms of Oman. *Asian Social Science*, 11 (24), 139-145.

Attari, M.I.J., Rafiq, S & Awan, H.M.(2012).The dynamic relationship between stock volatility and trading volume. *Asian Economic Financial Review*, 2(8), 1085-1097.

Bollerslev, T. (1986). A generalized Autoregressive Conditional Heroscedasticity. *Journal of Econometrics* 31, 307-327.

Christie, A. (1982). The stochastic behavior of common stock variances: Value, leverage, and interest rate effect. *Journal of financial economics*, 10,407-432.

Crouch, R. L. (1970). The volume of transactions and price changes on the New York stock exchange. *Financial Analysts Journal*, 26, 104-109.

De Medeiros, O.R & Van Doornik, B.F. (2006).The Empirical Relationship between Stock Returns and Trading Volume in the Brazilian Stock Market. *A working paper series,University of Brasilia.*

Girard, E., Biswas, R. (2007).Trading volume and market volatility: Developed versus emerging stock markets. *The Financial Review*, 42,429-459.

Hamilton, J.D. (1989). A new approach to the economic analysis of non-stationary time series and the business cycle, *Econometrica*, 57,357-384.

Hseih,H.C.S.(2014).The causal relationship between stock returns, trading volume and volatility. *International Journal of Managerial Finance*, 10(2), 218-240.

Karpoff, J.M. (1987).The relation between price changes and trading volume: A survey, *Journal of Financial and Quantitative Analysis*, 22,109-126.

Komain, J. (2016). Dynamic relationship between stock return, trading volume, and volatility in the stock exchange of Thailand: Does US subprime crisis matter? MPRA Paper No. 73791, *University Library of Munich*, Germany.

Lee, B & Rui, O.M. (2002). The dynamic relationship between Stock Returns and Trading Volume: Domestic and Cross-Country Evidence. *Journal of Banking and Finance*, 26, 51-78.

Mahajan, S & Singh, B. (2009). The Empirical Investigation of Relation between Return, Volume and Volatility Dynamics in Indian Stock Markets, *Eurasian Journal of Business and Economics,* 2(4), 113-137.

McNeil, A.J, Frey, R & Embrechts, P. (2015).Quantitative Risk Management: Concepts, Techniques and tools. 2nd Edition. *Princeton University Press*. ISBN 9780691166278.

Rogalski, R.J. (1978). The dependence of prices and volume. *The Review of Economics and Statistics*, 36, 268-274.

Wiley, K & Daigler, T. (1999). A bivariate GARCH Approach to the Futures Volume-Volatility *Article presented at the Eastern Finance Association Meetings*, Florida.

Control Volume Analysis of Unsteady Mhd Mixed Convection Nanofluid Flow as A Result of Stretching Surface with Suction

Virginia M. Kitetu

Department of Mathematics and Actuarial Science

Catholic University of Eastern Africa

Email Address virginiamwelu@yahoo.com

Thomas T. M. Onyango

Department of Industrial and Engineering mathematics

Technical University of Kenya

Jackson K. Kwanza

Pure and Applied mathematics

Jomo Kenyatta University of Agriculture and Technology

Abstract

Many heat transfer processes in engineering problems in areas such as nuclear reactors and electronics, as well as in biomedicine and food industry require the knowledge of nanofluids. Consequently, investigations leading to understanding of the role played by nanofluids in heat transfer enhancement in these processes is vital. Currently, numerous studies are being conducted on nanofluids for the benefits associated with low energy costs and less negative environmental impact in industry and society. In the studies, water is commonly used as base for nanofluids in heat transfer applications due to its ability and availability for heat transport. In most of these investigations influence of nanoparticles have been analyzed to determine enhancement of energy transfer on stretched sheets. In this research, magnetohydrodynamic mixed convection flow of a nanofluid over a stretching sheet with water equally as the base fluid and either Copper or Silver as nanoparticles is examined anddiscussed. The physical problem is modeled using systems of unsteady nonlinear differential equations (DE) subject to prescribed boundary and initial conditions, which are then studied using Finite volume approach. These DE comprise of the classical continuity, momentum, concentration and energy equations, which are subsequently non dimensionalized and discretized in rectangular domain. The effect of nanoparticle volume fraction values on velocity, temperature and concentration profiles are discussed.

Key words: Nanofluid, straight stretching surface, mixed convection, finite volume method.

INTRODUCTION

In recent years, extensive research has been conducted on manufacturing materials whose grain sizes are measured in nanometers. These materials have thermal, electrical, and chemical properties, hence can be applied this emerging nanotechnology to enhance thermal energy in engineering. Nanometer-sized particles can be suspended in industrial heat transfer fluids such as water, ethylene glycol, or oil to produce a new class of engineered fluids with high thermal conductivity.

Thermal conductivities of most solid materials are higher than those of liquids, therefore thermal conductivities of particle fluid mixtures are expected to increase. Fluids with higher thermal conductivities would have potentials for many thermal management applications. Due to the very small size of the suspended particles, nanoparticle fluid mixtures could be suitable as heat transfer fluids in many existing heat transfer devices, including those miniature devices in which sizes of components and flow passages are small. Nanoparticles also act as a lubricating medium when they are in contact with other solid surfaces.

Nanofluid is a very active field of study especially within the engineering community and it is experiencing rapid development in research and applications worldwide, as a result of interesting features such as increased thermal conductivity. Low thermal conductivity of convectional fluids is improved when solid particles are added [6].

In this study, an unsteady MHD mixed convection boundary layer nanofluid flow as a result of stretching surface is conducted using Finite Volume Method (FVM). FVM has emerged as a powerful alternative to other numerical methods such spectral relaxation method, Rungekutta method, and backward facing step method, finite-difference method, scaling transformations, direct numerical simulation, Finite Element method, homotopy analysis method, marker-and-cell method and perturbation method have been used to solve the linear partial differential, particularly in case where better accuracy is required due to difficulties such as stress concentration or where the domain extends to infinity.

Researchers have studied properties of nanofluid, thermal conductivity of nanofluid, flow on a stretching surface and a few on finite volume approach.[12] discussed Teerapong Borirak experimental investigation of titanium nanofluids on the heat pipe thermal efficiency. The enhancement heat transfer of the heat transfer devices was done by changing the fluid transport properties and flow features of working fluids. The heat pipe was fabricated from the straight copper tube with the outer diameter of 15mm and length of 600 mm. The heat pipe with the de-ionic water, alcohol, and nanofluids) were tested. They used titanium nanoparticles with diameter of 21 nm which the mixtures of alcohol and nanoparticles were prepared using an ultrasonic homogenizer. Results showed the nanoparticles have a significant effect on the enhancement of thermal efficiency of heat pipe. [5], illustrated the frequent and wide occurrence of non-Newtonian fluid behavior in a diverse range of applications, both in nature and in technology. He used materials as foams, suspensions, polymer solutions and melts. Each type of non-Newtonian fluid behavior were illustrated via experimental data on real materials and results showed that nanofluid are good in transferring heat. Properties of Gold-water using molecular dynamics was explored by [7]. His study treats the case of a gold–water nanofluid at different particle volume fractions between o.o1and 0.15 volumes. He used water confined between gold nanolayers for him comprehend physical phenomena at the interface of gold and water using different plates. He treated nanofluid as ideal mixture which was proved correct. Heat transfer enhancement by using nanofluids in forced convection flows was analyzed by [14].

Uniformly heated tube and a system of parallel, coaxial and heated disks was made use of. Numerical results, as obtained for water and Ethylene Glycol mixtures showed the inclusion of nanoparticles into the base fluids produced a considerable augmentation of the heat transfer coefficient that clearly increased with an increase of the particle concentration. Ethylene glycol nanofluid offered a better heat transfer enhancement than water. [10], examined an assessment of the effectiveness of nanofluids for single-phase and two-phase heat transfer in micro-channels. Experiments were performed to explore the micro-channel cooling benefits of water-based nanofluids containing small concentrations of Aluminium oxide. The high thermal conductivity of nanoparticles was shown to enhance the single-phase heat transfer coefficient, especially for laminar flow. Higher heat transfer coefficients were achieved mostly in the entrance region of micro-channels. However, the enhancement was weaker in the fully developed region, proving that nanoparticles have an appreciable effect on thermal boundary layer development. A room temperature enquiry consisting of water and nanofluids consisting of Silver-Aluminium as well as Silver-Copper nanoparticles was conducted by [5]. It was found that the suspensions of Silver-Aluminium nanoparticles showed enhancement in thermal conductivity slightly more than Silver-Copper nanoparticle suspensions. Also, the suspensions of carbon nanotubes in different fluids were found to possess increasing enhancement. A study on estimation of heat transfer coefficient and friction factor in the transition flow with low volume concentration of Aluminium oxide nanofluid flowing in a circular tube and with twisted tape was examined by [13]. They evaluated heat transfer coefficient and friction factor for flow in a tube and with twisted tape inserts in the transition range of flow with Aluminium oxide nanofluid. Findings showed considerable enhancement of convective heat transfer with Aluminium oxide nanofluids compared to flow with water. [1], researched on melting effect on unsteady hydromagnetic Flow of a nanofluid past a stretching Sheet. Unsteady, laminar, boundary-layer flow with heat and mass transfer of a nanofluid along a horizontal stretching plate in the presence of a transverse magnetic field, melting and heat generation or absorption effects was explored. The model used for the nanofluid incorporates the effects of Brownian motion and thermophoresis. The governing partial differential equations were transformed into a set of non-similar equations and solved numerically by an efficient implicit, iterative, finite-difference method. Numerical results for the steady-state velocity, temperature and nanoparticles volume fraction profiles as well as the time histories of the skin-friction coefficient, Nusselt number and the Sherwood number were presented graphically and discussed. A study on effect of partial slip boundary condition on the flow and heat transfer of nanofluids past stretching sheet prescribed constant wall temperature was appraised by [2]. They analyzed the development of the slip effects on the boundary layer flow and heat transfer over a stretching surface in the presence of nanoparticle fractions. In the modeling of nanofluid the dynamic effects including the Brownian motion and thermophoresis are taken into account. In the case of constant wall temperature a similarity solution was presented. The solution depends on a Prandtl number, slip factor, Brownian motion number, Lewis number, and thermophoresis number. The dependency of the local Nusselt and local Sherwood numbers on these five parameters was numerically investigated. The results showed the flow velocity and the surface shear stress on the stretching sheet and also reduced Nusselt number and reduced Sherwood number were strongly influenced by the slip parameter. Unsteady flow of a nanofluid in the stagnation point region of a time-dependent rotating sphere was investigated by [3] .The boundary layer equations were normalized via similarity variables and solved numerically. The nanofluid was treated as a two-component mixture that incorporated the effects of Brownian diffusion and thermophoresis together as two ways of slip velocity in laminar flows. [9], analyzed MHD flow of nanofluids over an exponentially stretching sheet in a porous medium with convective boundary conditions. An incompressible fluid fills the porous space and study was made for the nanoparticles namely Copper, silver, Alumina and Titanium Oxide and water as

the base fluid. The non-linear partial differential equations (PDE) governing the flow were reduced to an ordinary differential equation (ODE) by similarity transformations. The obtained equations were solved for the development of series solutions and convergence of the obtained series solutions was analyzed. An inquiry on heat transfer augmentation in a differentially heated square cavity using copper–water nanofluid was carried out by [4]. [11], researched on nanofluid flow over a stretching surface in presence of chemical reaction and thermal radiation. They focused on a steady MHD boundary layer flow of an electrically conducting nanofluid over vertical permeable stretching surface with variable stream conditions. The group theoretic method was used to simplify the governing partial differential equations. The reduced governing equations are solved using a fourth order Runge-Kutta method and Shooting techniques to predict the heat and mass transfer characteristics of the nanofluid flow. Numerical results converged.

From the foregoing literature review, what many of the researches carried out shows that MHD nanofluid flow to a stretching surface has not been explored much and the few who have ventured into stretching surface did not pay attention to a straight surface. Also different methods have been used by researchers to solve problems but in my case I will use FVM since it is convergent and bound.

DESCRIPTION AND FORMULATION

Description of problem

In the current study, consider unsteady laminar MHD mixed convective nanofluid flow as a result of straight stretching surface situated at x axis with stretching velocity $u = bx$, where b is a constant. Let suction velocity be $v = v_w$, the temperature at the wall $T = T_w$and nanoparticle concentration at the stretching surface are $C = C_w$. The temperature of the free stream nanofluid is $T = T_\infty$ and and the ambient concentration is C_∞. The x is along the stretching surface and y direction is orthogonal to the stretching surface. The flow experiences magnetic force.

The boundary and initial conditions are $u = 0, v = 0, T = T_w, C = C_w \; at \; t < 0$.

The properties of nanofluid are defined as follows, [8]

$$\mu_{nf} = \frac{\mu_f}{(1-\Phi)^{2.5}}, k_{nf} = k_f\left(\frac{k_s + k_f + 2\Phi(k_s - k_f)}{k_s + 2k_f + \Phi(k_s - k_f)}\right), (\rho c_p)_{nf}$$
$$= (1-\Phi)(\rho c_p)_f + \Phi(\rho c_p)_s, \rho_{nf} = (1-\Phi)\rho_f + \Phi\rho_s, \Phi_0$$
$$= (1-\Phi)^{2.5}\left(1 - \Phi + \Phi\left(\frac{\rho_s}{\rho_f}\right)\right), \Phi_a = \left(1 - \Phi + \Phi\frac{(\rho c_p)_s}{(\rho c_p)_f}\right)$$

where the subscripts f denote base fluid while s represent the nanoparticle. In this study Φ represent nanoparticle volume fraction. The thermal properties of base fluid and nanoparticle are in the table below.

Table1: Thermal physical properties of pure water, copper and silver nanoparticles

Physical properties	Base fluid (water)	Copper	Silver (Ag)
c_p(j/kgk)	4179	385	235
$\rho(kg/m^3)$	997.1	8933	10500
$k(w/mk)$	0.613	401	429
$\alpha \times 10^7(m^2/s)$	1.47	1163.1	1738.6
$\beta \times 10^5(k^{-1})$	21	1.67	1.89

Governing equations

Velocity, temperature and concentration in the boundary layer are governed by continuity, momentum, thermal energy and concentration equations listed below.

$$\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y}=0. \quad (1)$$

$$\frac{\partial u}{\partial t}+u\frac{\partial u}{\partial x}+v\frac{\partial u}{\partial y}=-\frac{1}{\rho_{nf}}\frac{\partial p}{\partial x}+\vartheta_{nf}\frac{\partial^2 u}{\partial y^2}+g_a B_T(T-T_\infty)+g_a B_C(C-C_\infty)-\sigma {B_0}^2 u. \quad (2)$$

$$\frac{\partial T}{\partial t}+u\frac{\partial T}{\partial x}+v\frac{\partial T}{\partial y}=\alpha_{nf}\frac{\partial^2 T}{\partial y^2}+\frac{\rho_f D_m k_T}{C_s \rho_{nf}(c_p)_{nf}}\frac{\partial^2 C}{\partial y^2}+\frac{Q}{\rho_{nf}(c_p)_{nf}}(T-T_\infty). \quad (3)$$

$$\frac{\partial C}{\partial t}+u\frac{\partial C}{\partial x}+v\frac{\partial C}{\partial y}=D_m\frac{\partial^2 C}{\partial y^2}+\frac{D_m k_m}{T_m}\frac{\partial^2 T}{\partial y^2}-R(C-C_\infty). \quad (4)$$

Where u, v, T and C denote velocity component along x axis, velocity component along y axis, temperature and concentration respectively. In the free stream momentum (2) reduces to

$$\frac{1}{\rho_{nf}}\frac{\partial p}{\partial x}=-U_\infty\frac{dU_\infty}{dx}-\sigma\frac{B_0^2}{\rho_{nf}}U_\infty . \quad (5)$$

Substituting equation (5) into equation (2) momentum equation simplifies to

$$\frac{\partial u}{\partial t}+u\frac{\partial u}{\partial x}+v\frac{\partial u}{\partial y}=\vartheta_{nf}\frac{\partial^2 u}{\partial y^2}+U_\infty\frac{dU_\infty}{dx}+(U_\infty-u)\sigma\frac{B_0^2}{\rho_{nf}}+g\beta_T(T-T_\infty)+g_a\beta_C(C-C_\infty). \quad (6)$$

In order to satisfy continuity equation a stream function given by Haroun *et al* (2015)

$$\varphi=\sqrt{b_\infty \vartheta_f}\varepsilon x f(\varepsilon,n), \quad (7)$$

is introduced and

$$u=\frac{\partial \varphi}{\partial y}, v=-\frac{\partial \varphi}{\partial x}. \quad (8)$$

Non-dimensionalizing governing equations

Equations (1, 3, 4 and 6) are nondimensionalized using dimensionless variables; namely dimensionless length along y direction n, dimensionless time ε, dimensionless stream function $f(\varepsilon, n)$, dimensionless temperature $\theta(\varepsilon, n)$ and dimensionless concentration

$$y = n\sqrt{\frac{\vartheta_f \varepsilon}{b_\infty}},\ \ \varepsilon = 1 - e^{b_\infty t},\ \ f(\varepsilon, n) = \frac{1}{\sqrt{a_\infty \vartheta_f \varepsilon x}},\ \ \frac{\theta(n)}{g(\varepsilon)} = \frac{T - T_\infty}{T_w - T_\infty}$$
$$\frac{\emptyset(n)}{g(\varepsilon)} = \frac{C - C_\infty}{C_w - C_\infty} \tag{9}$$

Using equations (8) and (10) the governing equations (3), (4) and (6) reduces to

$$f''' + \Phi_0\left[(1-\varepsilon)\frac{n}{2}f'' + \varepsilon\left(-f'^2 + ff'' + 1 + Ha^2(1-f') + Gr_T\frac{\theta}{g(\varepsilon)} + Gr_C\frac{\emptyset}{g(\varepsilon)}\right)\right] = \Phi_0\varepsilon(1-\varepsilon)\frac{\partial}{\partial\varepsilon}f' \tag{10}$$

$$\theta'' + \frac{k_f}{k_{nf}}pr\Phi_a\left\{\frac{n}{2}(1-\varepsilon)\theta' + \varepsilon[f\theta' + \sigma\theta] + \frac{D_f}{\Phi_a}\emptyset''\right\} = -\frac{k_f}{k_{nf}}pr\Phi_a\varepsilon(1-\varepsilon)\frac{\theta g_\varepsilon}{g}. \tag{11}$$

$$\emptyset'' + Sc\left[\frac{n}{2}(1-\varepsilon)\emptyset' + \varepsilon(f\emptyset' - \gamma\emptyset) + Sr\theta''\right] = -Sc\varepsilon(1-\varepsilon)\frac{\emptyset}{g}g_\varepsilon. \tag{12}$$

The non-dimensionalized boundary conditions and initial conditions are respectively

$$f(\varepsilon, 0) = f_w, f'(\varepsilon, 0) = \lambda, \theta(\varepsilon, 0) = \varepsilon, \emptyset(\varepsilon, 0) = \varepsilon\ at\ n = 0, \varepsilon \geq 0 \tag{13}$$

$$f'(\varepsilon, \infty) = 1, \theta(\varepsilon, \infty) = 0, \emptyset(\varepsilon, \infty) = 0, as\ n \to \infty, \varepsilon \geq 0 \tag{14}$$

Equations (11), (12) and (13) can be simplified further by assuming initially the flow is steady and unsteadiness parameter, $g(\varepsilon) = \varepsilon$. This results to

$$\frac{d^3f}{dn^3} + \Phi_0\frac{n}{2}\frac{d^2f}{dn^2} + \Phi_0[Gr_T\theta + Gr_C\emptyset] = 0. \tag{15}$$

$$\frac{d^2\theta}{dn^2} + \frac{1}{2}\frac{k_f}{k_{nf}}Pr\Phi_a n\frac{d\theta}{dn} + \frac{k_f}{k_{nf}}PrD_f\frac{d^2\emptyset}{dn^2} = -\Phi_a\frac{k_f}{k_{nf}}Pr\ \theta. \tag{16}$$

$$\frac{d^2\emptyset}{dn^2} + \frac{1}{2}Scn\frac{d\emptyset}{dn} + ScSr\frac{d^2\theta}{dn^2} = -Sc\emptyset. \tag{17}$$

where $\Phi_0\ and\ \Phi_a$ are constants.

From the non dimensionalizing the following dimensionless parameters were obtained:

$$Pr = \frac{\vartheta_{nf}}{\alpha_{nf}}, Gr_T = \frac{g\beta_T(T_w - T_\infty)}{b_\infty^2 x}, Gr_c = \frac{D_m K_T(C_w - C_\infty)}{b_\infty^2 x}, Ha^2 = \frac{\sigma {B_0}^2}{b_\infty \rho_{nf}}, \sigma = \frac{Q}{b_\infty (\rho c_p)_{nf}}, D_f = \frac{D_m k_T(C_w - C_\infty)}{C_s (c_p)_f \vartheta_f (T_w - T_\infty)}, sc = \frac{\vartheta_{nf}}{D_m}, \gamma = \frac{R}{b_\infty}, sr = \frac{D_m k_T(T_w - T_\infty)}{T_m \vartheta_f (C_w - C_\infty)}$$

Equations (15), (16) and (17) are discretized using (FVM). FVM employs integration over a control volume. FVM is the best because it is stable, consistent, convergent, conservative and bound. The discretized equation are obtained using the computational grid below.

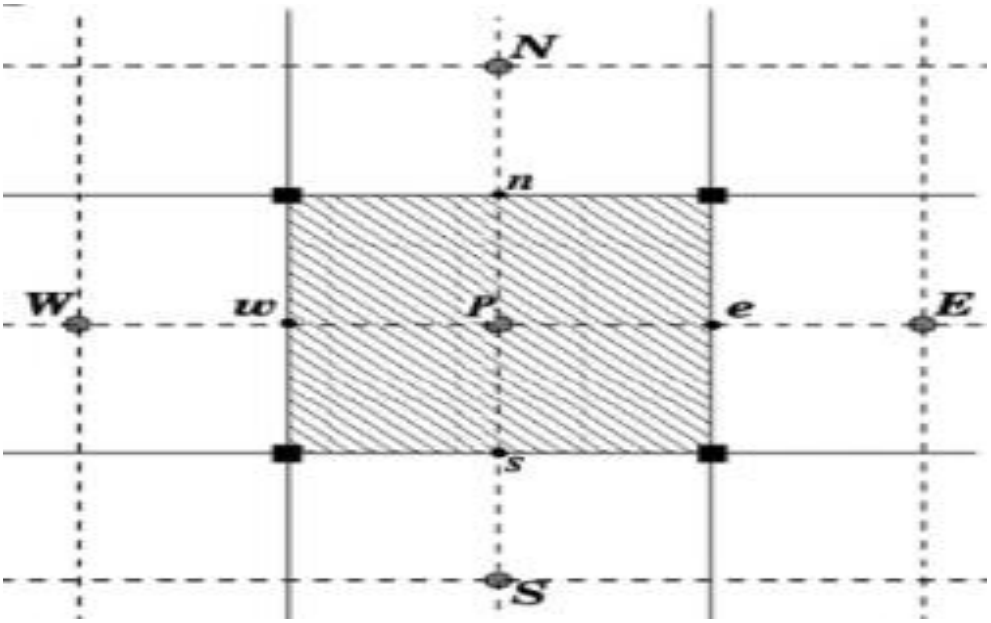


Figure 1: Computational grid.

FVM linearize and decoupled system of differential equations (15),(16) and (17) into

$$\left[\frac{1}{\Delta n} - \frac{1}{8}\Phi_0(n_i + n_{i-1})\right] f'_{i-1} + \left[\frac{-2}{\Delta n} + \frac{1}{8}\Phi_0(n_{i+1} - n_{i-1}) - \frac{1}{2}\Phi_0 \Delta n\right] f'_i + \left[\frac{1}{\Delta n} + \frac{1}{8}\Phi_0(n_i + n_{i+1})\right] f'_{i+1} = -\Phi_0[Gr_T\theta_i + Gr_C \emptyset_i]\Delta n \quad (18)$$

$$\left(\frac{1}{\Delta n} - \frac{1}{8}\frac{k_f}{k_{nf}} pr\Phi_a(n_i + n_{i-1})\right)\theta_{i-1} + \left(\frac{-2}{\Delta n} + \frac{1}{8}\frac{k_f}{k_{nf}} pr\Phi_a(-3n_{i+1} - n_{i-1} + 4n_i) + 8\right)\theta_i + \left(\frac{1}{\Delta n} + \frac{1}{8}\frac{k_f}{k_{nf}} pr\Phi_a(n_{i+1} + n_i)\right)\theta_{i+1} = -\frac{k_f}{k_{nf}} prD_f\left(\frac{\emptyset_{i+1}}{\Delta n} - \frac{2\emptyset_i}{\Delta n} + \frac{\emptyset_{i-1}}{\Delta n}\right) \quad (19)$$

$$\left(\frac{1}{\Delta n}-\frac{1}{8}Sc(n_i+n_{i-1})\right)\emptyset_{i-1}+\left(\frac{-2}{\Delta n}+\frac{1}{8}Sc(-3n_{i+1}-n_{i-1}+4n_i+8)\right)\emptyset_i+\left(\frac{1}{\Delta n}+\frac{1}{8}Sc(n_{i+1}+n_i)\right)\emptyset_{i+1}=-\frac{ScSr}{\Delta n}(\theta_{i+1}-2\theta_i+\theta_{i-1}) \quad (20)$$

RESULTS AND DISCUSSION

In this study non dimensioned and discretized the governing equations have been done. Also to comprehend the flow problem physically numerical computations are done by varying the volume fraction, Φ and results are illustrated graphically. The variation is to determine the effect of volume fraction to velocity, temperature and concentration profiles. Copper and silver are used as the nanoparticle and water as base fluid. The graphs were plotted using Table1, $\Phi = 0.2, 0.4, 0.6, Df = 0.01, \lambda = 0.5, Gr_T = 0.01, Gr_C = 0.01, Pr = 7, Ha = 2, \delta = 0.1, sc = 1, sr = 1, , \gamma = 0.1\ and\ \varepsilon = 0.$ From the graphs it is true that velocity decrease when nanoparticle volume fraction is increased, temperature increase with increase of nanoparticle volume fraction, while the concentration decrease.

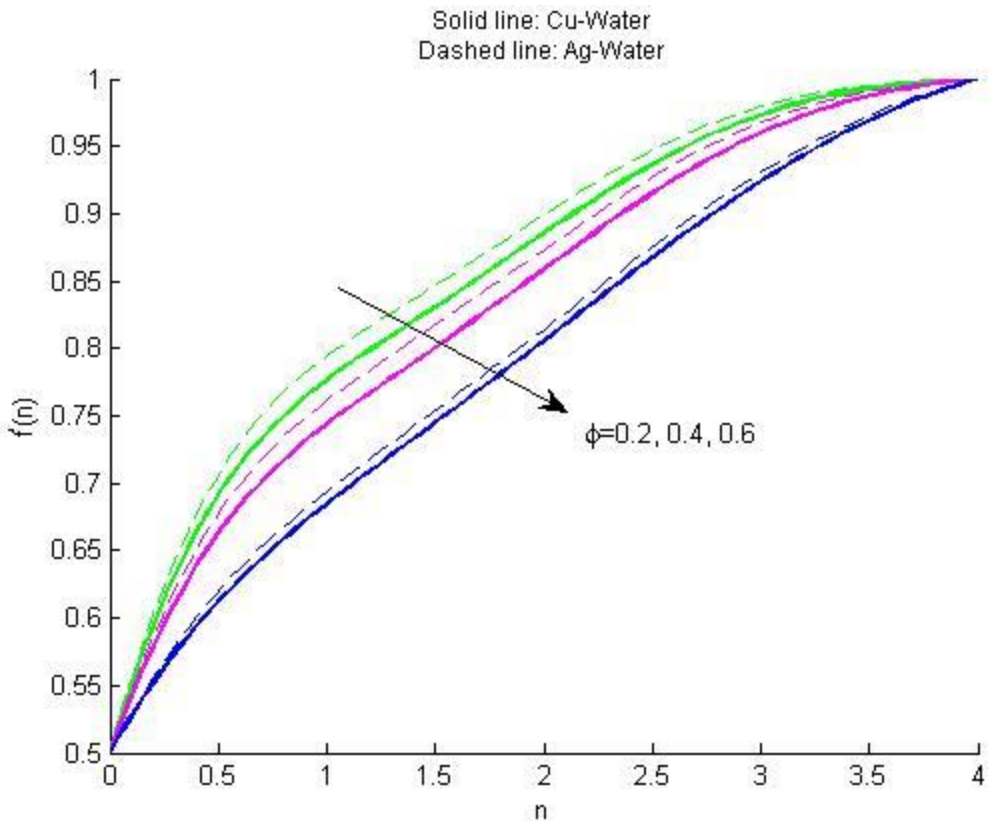


Figure1: Effect of variation of nanoparticle volume fraction on velocity

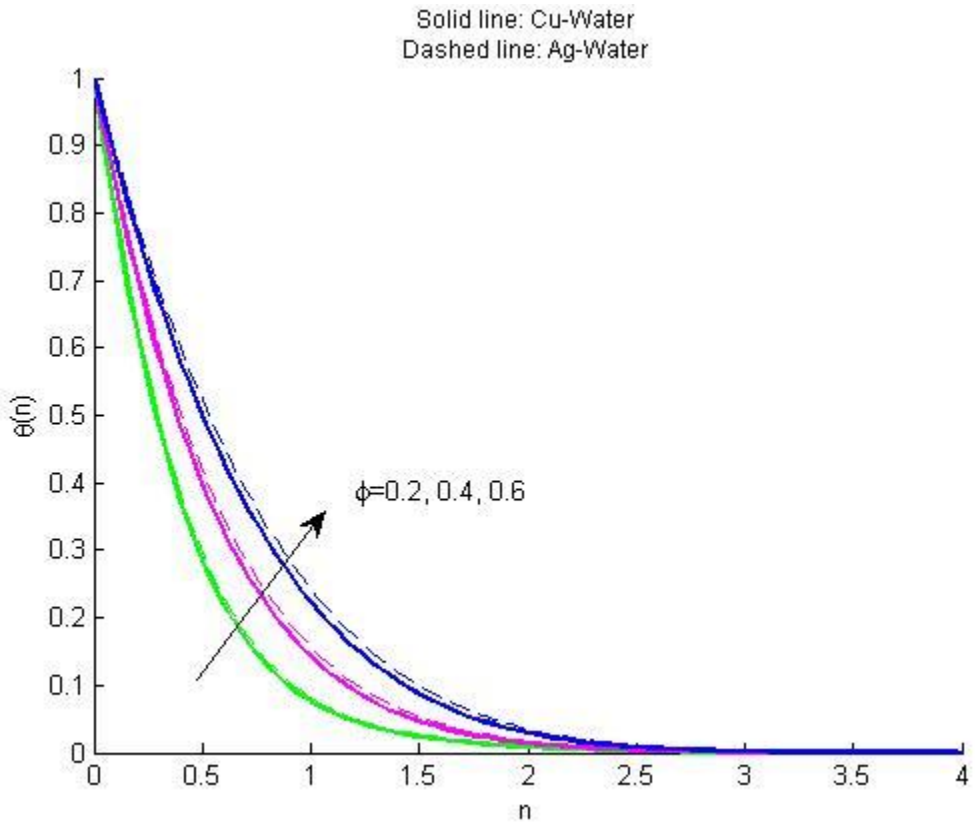


Figure2: Effect of variation of nanoparticle volume fraction on temperature

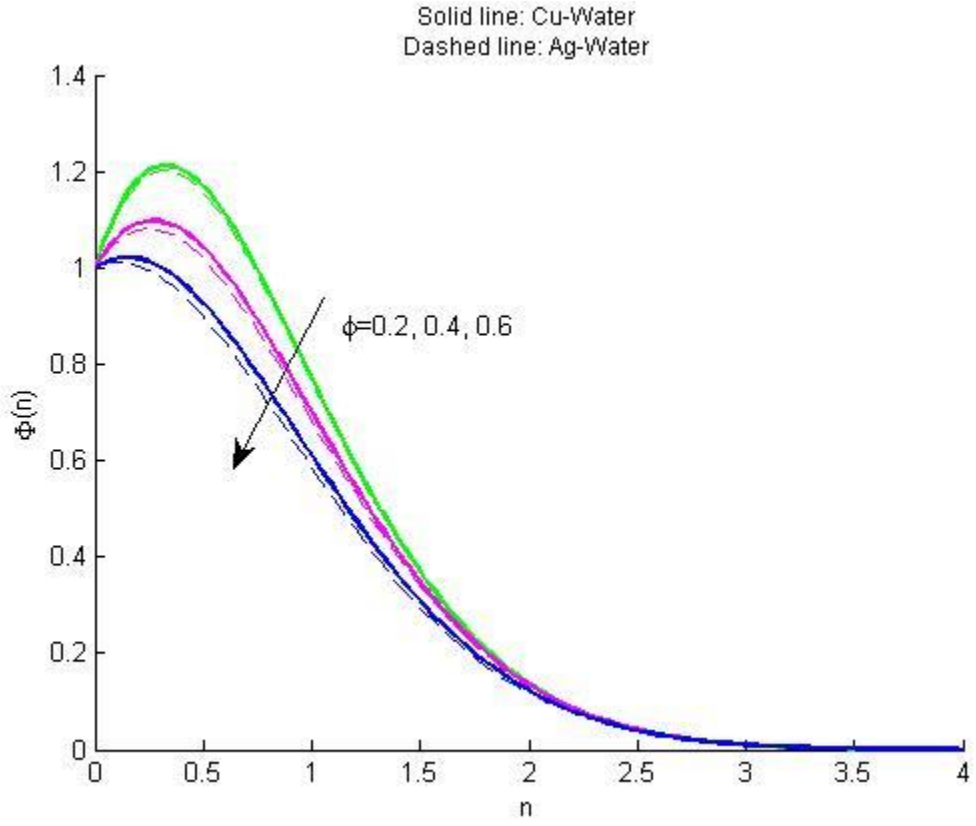


Figure2: Effect of variation of nanoparticle volume fraction on concentration

CONCLUSION

Non dimensiolization of equation governing the flow has been achieved. FVM algorithm for solving the governing equation has been developed. FVM has transformed the coupled momentum, energy and concentration equations to system of linear equations. Nanoparticle volume fraction significantly affect nanofluid velocity, temperature and concentration.

Abbreviation

b: Positive constant

v_w: suction velocity

T_w: Surface temperature

C_w: Surface concentration

T_∞: Ambient temperature

C_∞: Ambient concentration

u: Fluid velocity component along x direction

v: Fluid velocity component along y

ρ_{nf}: Nanofluid density

p: Fluid pressure

ϑ_{nf}: Nanofluid kinematic viscosity

g: Unsteadiness parameter

g_a Gravitational acceleration

B_C: Volumetric solutal expansion coefficient

σ: Electrical conductivity

B_0: Magnetic field

T: Fluid temperature

α_{nf}: Nanofluid thermal diffusivity

ρ_f: Fluid density

D_m: Concentration mass diffusivity

C_s: Concentration susceptibility

$(c_p)_{nf}$: Nanofluid specific heat capacity at constant pressure

C: Fluid concentration

Q: Volumetric rate of heat generation

k_m: mean fluid

R: Chemical reaction parameter

T_m: mean fluid.

References

Ali, J. C., Rashady, A. M., and Elisa, A. M. (2011). Melting Effect on Unsteady Hydromagnetic Flow of a Nanofluid Past a Stretching Sheet. *International journal of chemical reactor engineering. V*ol. 9, PP. 113.

Aminreza, Rashid, P., and Mohammad, G. (2012). Effect of partial slip boundary condition on the flow and heat transfer of nanofluids past stretching sheet prescribed constant wall temperature. *International Journal of Thermal Sciences*. Vol. 54, pp. 253-261.

Amir, M. (2013). The Unsteady Flow of a Nanofluid in the Stagnation Point Region of a Time-dependent Rotating Sphere. *Journal of thermal science.* Vol. 20, No. 10, pp. 20-30.

Apurba, K. S., Swarnendu, S., and Niladri, C. (2008). Study of heat transfer augmentation in a differentially heated square cavity using copper–water nanofluid. *International Journal of thermal Sciences.* Vol. 47, pp. 1113–1122.

Chhabra, R. P. (2010). Non- Newtonian Fluids. *Journal of chemical engineering.* Vol.4, no.9, pp. 4-9.

Elena, V. *et al* (2010). Nanofluids for Heat Transfer: An Engineering Approach. *Journal of Mechanical and Industrial Engineering.* Vol. 1, no 4, pp. 55-70.

Gianluca, P. (2012). Properties of $A_u - H_2O$ Nanofluids using molecular dynamics. Journal of Aerospace and Mechanical Engineering.

Haroun, N. A., Sibanda, P., Mondal, S., & Motsa, S. S. (2015). On unsteady MHD mixed convection in a nanofluid due to a stretching/shrinking surface with suction/injection using the spectral relaxation method. *Boundary value problems journal*, *2015*(1), 24.

Hayata, T. *et al (*2014). MHD flow of nanofluids over an exponentially stretching sheet in a porous medium with convective boundary conditions. *Chin. Phys. B*, vol. 23, no. 5,DOI: 10.1088/1674-1056/23/5/054701.

Jaeseon, L. and Issam, M. (2007). Assessment of the effectiveness of nanofluids for single-phase and two-phase heat transfer in micro-channels. *International Journal of Heat and Mass Transfer*. Vol. 50, pp. 452–463.

Kalidas, D., Amit, S. and Prabir K. K (2017). Nanofluid Flow over a Stretching Surface in Presence of Chemical Reaction Band Thermal Radiation: An Application of Lie Group TransformationNanofluid. *Journal of Siberian Federal University: Mathematics and Physics,* Vol. 10.no. 2, pp 146-157.

Paisarn, N. and Pichai, A. (2008). Teerapong Borirak Experimental investigation of titanium nanofluids on the heat pipe thermal efficiency. Journal of *International Communications in Heat and Mass Transfer*. Vol. 35, pp. 1316–1319.

Sharma, K. V., Syam, S. L., and Sarma, P. K. (2009). Estimation of heat transfer coefficient and friction factor in the transition flow with low volume concentration of Al_2O_3 nanofluid flowing in a circular tube and with twisted tape insert. *International Communications in Heat and Mass Transfer*. Vol. 36, pp. 503–507.

Sidi, *et al* (2005). Heat transfer enhancement by using nanofluids in forced convection flows. *International Journal of Heat and Fluid Flow*. Vol. 26, pp. 530–546.

Nonparametric Prediction Interval for Conditional Expected Shortfall Admitting a Location-Scale Model using Bootstrap Method

Emmanuel Torsen[1], Peter N. Mwita[2] and Joseph K. Mung'atu[3]

[1]Department of Mathematics, Pan African University, Institute of Basic Sciences, Technology, and Innovation, Kenya

E-mail address: torsen.emmanuel@students.jkuat.ac.ke

[2]Department of Mathematics, Machakos University, Kenya E-mail address: petermwita@mks.ac.ke

[3]Department of Statistics and Actuarial Sciences, Jomo Kenyatta University of Agriculture and Technology, Kenya E-mail address: j.mungatu@fsc.jkuat.ac.ke

Abstract

In financial risk management, the expected shortfall is a popular risk measure which is often considered as an alternative to Value-at-Risk. It is defined as the conditional expected loss given that the loss is greater than a given Value-at-Risk (quantile). In this paper at hand, we have proposed a new method to compute nonparametric prediction bands for Conditional Expected Shortfall for returns that admits a location-scale model. Where the location (mean) function and scale (variance) function are smooth, the error term is unknown and assumed to be uncorrelated to the independent variable (lagged returns). The prediction bands yield a relatively small width, indicating good performance as depicted in the literature. Hence, the prediction bands are good especially when the returns are assumed to have a location-scale model.

Keywords: *Bootstrap, Expected Shortfall, Location-Scale Model, Nonparametric Prediction Intervals, Value-at-Risk*

Category: Statistics and Data Science

1 Introduction

Expected Shortfall (ES) is often used in portfolio risk measurement, risk capital allocation and performance attribution. Value-at-Risk (VaR) is defined as the conditional quantile of the portfolio loss distribution for a given horizon (it could be a day or a week) and for a given coverage rate (for instance 0.01 or 0.05), and the ES is simply defined as the expected loss beyond the VaR. Thus, VaR and ES measures are clear expressions about the left tail of the return distribution.

The concept of bootstrapping hangs on the idea that the probability distribution function of the data set available is unknown.

Therefore, the problem of constructing nonparametric prediction bands for Conditional Expected Shortfall (CES) where the returns are assumed to have a location-scale model with heteroscedasticity, and also distribution of the error term is assumed unknown using bootstrap method is of interest in this paper.

2 The Nonparametric Predictive Intervals(NPIs) for Conditional Expected Shortfall

Definition 1: α − *mixing* (Strong mixing)

Let $\mathcal{F}_k^l$ be the σ − *algebra* of events generated by $\{Y_i, k \leq i \leq l\}$ for $l > k$. The α − *mixing* coefficient introduced by [4] is defined as

$$\alpha(k) = \sup_{A \in F_{-\infty}^{i}, B \in F_{i+k}^{\infty}} |P(AB) - P(A)P(B)|.$$

The series is said to be α − *mixing* if

$$\lim_{k \to \infty} \alpha(k) = 0.$$

The dependence described by the α − *mixing* is the weakest as it is implied by other types of mixing.

In this paper, we assumed that the sequence $\{Y_t\}$ satisfies a certain weak dependence condition, the concept of strong mixing coefficients by [4] as defined above. We further assumed that returns considered here, Y_t, admit a location-scale representation given as

$$Y_t = m(X_t) + \sqrt{h(X_t)}\epsilon_t \qquad (1)$$

where m and $h > 0$ are nonparametric functions defined on the range of X_t , ϵ_t is independent of X_t, and $_t$ is an independent and identically distributed (iid) innovation process with $E(\epsilon_t) = 0$, $\mathbb{V}ar(\epsilon_t) = 1$ and the unknown distribution function F.

From equation (1) we have

$$CVaR(X)_\tau := Q_{Y|X}(\tau | x) = m(X_t) + {}^{p}h(X_t)q(\tau) \qquad (2)$$

where $Q_{Y|X}(\tau | x)$ is the conditional τ−quantile associated with $F(y|x)$ and $q(\tau) = F_\epsilon^{-1}(\tau)$

is the τ−quantile associated with the error distribution F. The estimator of (2) and its properties has been studied in [6], and

$$CES(X)_\tau \equiv \mathbb{E}(Y_t / Y_t > Q_{Y|X}(\tau|x), X_t = x) = m(X_t) + \sqrt{h(X_t)}\mathbb{E}(\epsilon_t | \epsilon_t > q(\tau)) \quad (3)$$

Estimation of $m(X)$ and $h(X)$ in equations (2) and (3) was studied by [1] and [2]. For estimation of the error term, see our paper for more [7] details.

With estimators of the mean function $m(X)$, the variance function $h(X)$ and the unknown error distribution, the estimator for Conditional Value-at-Risk (CVaR), discussed in [6] is given as

$$CVaR\backslash(x)_\tau := \hat{Q}_{Y|X}(\tau|x) = \hat{m}(x) + \hat{h}^{1/2}(x)\hat{q}(\tau) \quad (4)$$

therefore, the estimator for Conditional Expected Shortfall is

$$\widehat{CES}(x)_\tau := \mathbb{E}(Y_t/Y_t > \hat{Q}_{Y|X}(\tau|x), X_t = x) = \hat{m}(x) + \hat{h}^{1/2}(x)\mathbb{E}(\epsilon_t|\epsilon_t > \hat{q}(\tau)) \quad (5)$$

The mean and variance of the estimator (5) as discussed in [5] are as follows:

$$\mathbb{E}\left(\widehat{CES}(x)_\tau\right) = m(x) + \mathbb{E}(\epsilon_t|\epsilon_t > q(\tau))h(x) + \frac{b^2}{2}\mu_2(k)\left[m''(x) + \mathbb{E}(\epsilon_t|\epsilon_t > q(\tau))h''(x)^2\right] = Bias$$

(6)

So that,

$$Bias\left(\widehat{CES}(x)_\tau\right) \approxeq \frac{b^2}{2}\mu_2(k)\left[m''(x) + \mathbb{E}(\epsilon_t|\epsilon_t > q(\tau))h''(x)^2\right] = B(x)_\tau \quad (7)$$

and

$$Var\left(\widehat{CES}(x)_\tau\right) \approxeq \frac{R(k)}{nbf(x)}\left[\sigma^2(x) + \mathbb{E}(\epsilon_t|\epsilon_t > q(\tau))^2 h^2(x)\lambda^2(x)\right] = Var(x)_\tau \quad (8)$$

$\Longrightarrow CES[(x)_\tau \rightarrow^{-d} CES(X)_\tau$, and by central limit theorem we have:

$$\sqrt{nb}\left[\widehat{CES}(x)_\tau - CES(X)_\tau - B(x)_\tau\right] \xrightarrow{d} \mathcal{N}\left(0, Var(x)_\tau\right) \quad (9)$$

2.1 Pivotal quantity (Pivot)

Def: Let $X = (X_1,\ldots,X_n)$ be random variables with unknown joint distribution F, and let $\theta(F)$ denote a real-valued parameter. A random variable $Q(X,\theta(F))$ is a pivot if the distribution of $Q(X,\theta(F))$ is independent of all parameters. That is, $X \sim F(x|\theta(F))$, then $Q(X,\theta(F))$ has the same distribution $\forall_{\theta(F)}$, see [8].

Consider the function estimator $CES[(x)_\tau$ in (5), the asymptotic distribution of a pivotal quantity are used to construct confidence intervals (CIs). Let us defined $Q\left(CES(X)_\tau, \widehat{CES}(x)_\tau\right)$ to be the pivotal statistic given as

$$Q\left(CES(X)_\tau, \widehat{CES}(x)_\tau\right) = \frac{\widehat{CES}(x)_\tau - CES(X)_\tau}{\sqrt{Var(x)_\tau}} \quad (10)$$

where $Var(x)_\tau$ is the variance of the function estimator defined in (8).

2.2 Bootstrap Method

This strategy consists of estimating the distribution of the pivotal quantity given below

$$Q\left(CES(X)_\tau, \widehat{CES}(x)_\tau\right) = \frac{\widehat{CES}(x)_\tau - CES(X)_\tau}{\sqrt{\sigma^2(x) + \widehat{Var}(x)_\tau}} \quad (11)$$

using the bootstrap method. The distribution of (8) was approximated by the distribution of the bootstrapped statistics

$$\mathcal{T}\left(\widehat{CES}(x)_\tau, \widehat{CES}^*(x)\right) = \frac{\widehat{CES}^*(x) - \widehat{CES}(x)_\tau}{\sqrt{\sigma^2(x) + \widehat{Var}^*(x)_\tau}} \quad (12)$$

where $*$ denotes the bootstrap counterparts of the the estimates. Hence, we have the following Nonparametric Prediction Intervals with $(1-\tau)$ asymptotic coverage probability.

h q * q * i

$$CES[(x)_\tau - \sigma^2(x) + Var_a(x)_\tau q^(a),\ CES[(x)_\tau + \sigma^2(x) + Var_a(x)_\tau q^(b) \quad (13)$$

The Algorithm (Bootstrap)

Generate n data sets from the unknown probability model of the data generation process in (14), with independently identically distributed random errors form some unknown probability distribution function (pdf) F.

Calculate $m^(x)$ and $h^(x)$.

Generate the sequence of $\{\hat{\epsilon}_t\}_{t=1}^n$, where Standardized Nonparametric Residuals (SNR)

$$\hat{\epsilon}_t = \begin{cases} \dfrac{Y_t - \hat{m}(x)}{\sqrt{\hat{h}(x)}} \\ 0, \end{cases}$$

, if $h^(x) >$ 0

if $h^(x) \leq 0$

and hence compute $\hat{q}(\tau) = \hat{F}_\epsilon^{-1}(\tau)$ and E$(\epsilon_t | \epsilon_t > \hat{q}(\tau))$

Compute for each process the $CES[^*(x)_j, j = 1,2,...,m$

Compute the average function, $\overline{\widehat{CES}}^{*}_{m}(x)$ given by:

$$\overline{\widehat{CES}}^{*}_{m}(x) = \frac{\widehat{CES}_1(x) + \widehat{CES}_2(x) + \cdots + \widehat{CES}_m(x)}{m}$$

and the standard error between the curves is:

$$SE = \sqrt{\frac{1}{m \times n} \sum_{i=1}^{n} \sum_{j=1}^{m} \left(\widehat{CES}^{*}(x_i)_j - \overline{\widehat{CES}}^{*}_{m}(x_i) \right)^2}$$

The lower and upper bounds of the NPIs at level τ are therefore given by

$$LB = \overline{\widehat{CES}}^{*}_{m}(x) - Q * \frac{SE}{\sqrt{m}}$$
$$UB = \overline{\widehat{CES}}^{*}_{m}(x) + Q * \frac{SE}{\sqrt{m}}$$

where $Q = z_{1-\frac{\tau}{2}}$ is the $(1 - \frac{\tau}{2})^{th}$ quantile for the standard normal distribution. For instance, $z_{1-\frac{\tau}{2}} = 1.96$ for $\tau = 0.05$.

3 Simulation Study

To examine the performance of our estimators, we conducted a simulation study considering the following data generating location-scale model

$$X_t = m(X_{t-1}) + h(t)^{1/2}\epsilon_t, \quad t = 1, 2, ..., n \quad (14)$$

where $m(X_{t-1}) = sin(0.5X_{t-1})$, $\epsilon_t \sim t(\nu = 3), h(t) = h_i(X_{t-1}) + \theta h(X_{t-1}), \quad i = 1, 2$ and $h_1(X_{t-1}) = 1 + 0.01X^2_{t-1} + 0.5sin(X_{t-1}), h_1(X_{t-1}) = 1 - 0.9exp\big(-2X^2_{t-1}\big)$

X_t and $h(t)$ are set to zero (0) initially, then X_t is generated recursively from (10) above.

The data generating process was used by [3] and also used by [7].

Nonparametric Prediction Intervals for CES

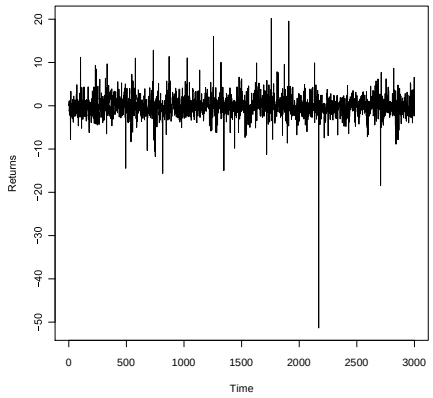


Figure 1: Plot of the simulated daily returns showing its evolution.

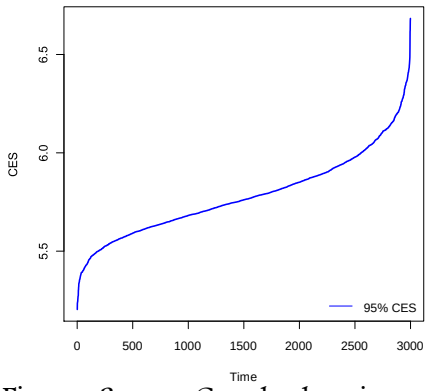


Figure 3: Graph showing the 95% ordered Conditional Expected Shortfall.

Daily Returns plot (Simulated)

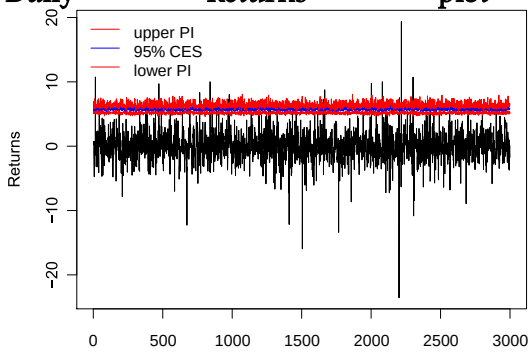
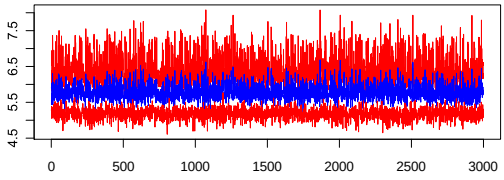


Figure 2: Graph showing the 95% Conditional Expected Shortfall in blue color, while the Upper and Lower Prediction Intervals in red color.

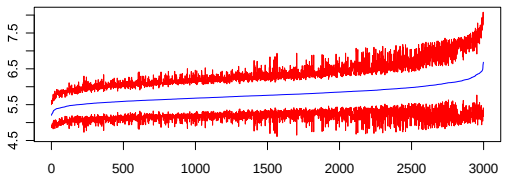
NPIs 95% CES

Ordered 95% CES



Time

Sorted 95% CES



Time

NPIs for

Figure 4: The red lines in the first and second panel shows the upper and lower prediction intervals, and the blue lines in both cases shows the 95% CES.

The time series plot of the simulated daily returns generated from the data generating process (14) is presented in Figure 1. Looking at Figure 2 and Figure 4, the Nonparametric Prediction Intervals by bootstrap method for Conditional Expected Shortfall performs well. Clearly, the 95% CES is contained within the prediction bands. Plotting the ordered 95% CES in Figure 3, it shows the distribution of 95% CES over time. We can see that the width of the bands is considerably

small affirming its good performance, conforming with what is obtainable in the literature on prediction intervals.

4 Conclusion

We proposed Nonparametric Prediction Bands for a conditional Expected Shortfall using bootstrap method. Our approach is based on returns on assets or portfolio that have a location-scale model. Simulation study was conducted and the prediction bands was found to perform very good.

Acknowledgements

The first author wishes to thank African Union and Pan African University, Institute for Basic Sciences Technology and Innovation, Kenya for their funding and support for this research.

Disclosure statement

The authors declare that there is no conflict of interest regarding the publication of this paper

References

Fan, J. (1992). Design-adaptive nonparametric regression, *Journal of the American statistical Association*, 87(420), 998-1004.

Fan, J. and Yao, Q. (1998). Efficient estimation of conditional variance functions in stochastic regression, *Biometrika*, 85(3), 645-660.

Martins-Filho, C., Yao, F. and Torero, M. (2018). Nonparametric estimation of conditional value-at-risk and expected shortfall based on extreme value theory, *Econometric Theory*, 34(1), 23-67.

Rosenblatt, M. (1956). A central limit theorem and a strong mixing condition, *Proceedings of the National Academy of Sciences*, 42(1), 43-47.

Torsen, E., Mwita, P.N. and Munga'atu, J.K. (2019a). Nonparametric estimation of Conditional Expected Shortfall admitting a location-scale model *Under Review*.

Torsen, E., Mwita, P.N. and Munga'atu, J.K. (2019b). A three-step nonparametric estimation of conditional value-at-risk admitting a location-scale model, *Under Review*.

Torsen, E., Mwita, P.N. and Munga'atu, J.K. (2018). Nonparametric estimation of the error functional of a location-scale model, *Journal of Statistical and Econometric Methods*, 7(4), 1-18.

Torsen, E. and Seknewna, L.L. (2019). Bootstrapping Nonparametric Prediction Interval for Conditional Value-at-Risk with Heteroscedasticity, *Under Review*.

Threshold Determination For Maximum Product Of Spacing Methodology With Ties For Extreme Events

Peter G. Murage[93], Joseph K Mung'atu[94] and Evelyne Odero[95]

PhD student; Email: gitmurage@gmail.com; Mobile: 0710507266

Department of Statistics and Actuarial Science JKUAT; Email: j.mungatu@fsc.jkuat.ac.ke, Mobile: 0720824708

Department of Mathematics-MMUST; Email: oedero@mmust.ac.ke, Mobile: 0713145508

Abstract

Extreme events are defined as values of the event below or above a certain value called threshold. A well-chosen threshold helps to identify the extreme levels. Several methods have been used to determine threshold so as to analyze and model extreme events. Maximum Product of spacing is one of these methods. However, there is a problem encountered while modeling data through this method in that the method breaks down when there is a tie in the exceedances. This study improved MPS method in order to determine an optimal threshold for extreme values in a data set containing ties, estimated the GPD parameters with the optimal threshold derived and then applied the method to determine the GPD parameters for a real market data that could be containing ties. The study applied a method to determine optimal threshold based on improved maximum product of spacing method and used Generalized Pareto Distribution (GPD) and Peak over threshold (POT) methods as the basis of identifying extreme. The peaks-over-threshold (POT) models are models for all large observations which exceed a high threshold. The POT models are generally considered to be the most useful for practical applications. The study used the method developed to deal with the ties to model the market volume data. This study will help the Statisticians in different sectors of our economy to model extreme events involving ties. To Statisticians, the structure of the extreme levels which exist in the tails of the ordinary distributions is very important in analyzing, predicting and forecasting the likelihood of an occurrence of extreme event.

KEY WORDS: Generalized Pareto distribution, Peak Over Threshold, Improved MPS.

Introduction

Certain values in the tails of any distribution represent extreme events and they are pointers to eventuality. The values in the tails are rare, few, but can have great impact on the conclusion arrived at by the analysts. Different sectors of our life experience Extreme events and here we mention just but a few. According to (Butterfield, 2009) Extreme low production in agriculture results to famine if the agriculture depends on rainfall. This means that the amount of rain experienced in that region was too low that crops dried up or very high rainfall that it destroyed all crops that had been planted. (Prudhome, 1999) studying extreme rainfall in mountainous region and (Geremy, 2012) studying extreme rainfall in west Africa did observe that, how low or high the amount of rainfall depends on the threshold attached to the rainfall in that region. In insurance industries Box [10] while discussing tools in finance and insurance, noted that extreme high claims by the customers that can be very dangerous for the company while extreme low claims by the customers can be very beneficial for the company's profit.

This means that there is a critical level that the insurance company would wish it is not surpassed and if it is, according to (Embretchet, 1997) it must be prepared for this eventuality. Very high emissions of the waste products from the manufacturing industries are detrimental to the environment and ozone layer. However, countries must continue to industrialize or expand their industries for economic prosperity. Certain level of emissions must not be exceeded otherwise the environment and ozone layer would be destroyed. The critical value for which if exceeded an eventuality occurs is called threshold. The events beyond this threshold are called extreme events and they happen to be at the tails of the distribution. Extreme value theory (EVT) proposed by (Fisher, 1928) is a tool which attempts to provide us with the best possible estimate of the tail area of the distribution. In work on the importance of tail dependence in Bivariate frequency analysis, there are two principal kinds of model for extreme values. The oldest group of models is the block maxima models; these are models for the largest observations collected from large samples of identically distributed observations. For example, if we record daily or hourly losses and profits from trading a particular instrument or group of instruments, the block maxima or minima method provides a model which may be appropriate for the quarterly or annual maximum of such values. According to (Balkema, 1974) and (Pickands, 1975) the block maxima/minima methods are fitted with the generalized extreme value (GEV) distribution.

A more modern group of models is the peaks-over-threshold (POT) models; these are models for all large observations which exceed a high threshold. The POT models are generally considered to be the most useful for practical applications, due to a number of reasons. First, by taking all exceedances over a suitably high threshold into account, they use the data more efficiently. Second, they are easily extended to situations where one wants to study how the extreme levels of a variable Y depend on some other variable X for instance, Y may be the level of tropospheric ozone on a particular day and X a vector of meteorological variables for that day. This kind of problem is almost impossible to handle through the annual maximum method. In order to identify the extreme values, one must understand how the sample data collected is analyzed to determine the extreme cases. This involves determination of the threshold and the exceedances. These exceedances are then modeled to understand the behavior of the data in the tails. Many methods of determining an optimal threshold have been developed.

The most common one is the graphical method proposed by (Hill, 1975) This method is however subjective and requires experts to determine the threshold. The most successful method is the Maximum Product of Spacing (MPS) proposed by (Cheng, 1983). This method however encounters a problem whenever the exceedances have a tie. To study this problem, the study

used simulated data containing ties and real data from Nairobi Securities exchange (NSE). Events in the area outside three standard deviation in a normal distribution are termed extreme events. Our study was based on these extreme events. Extreme events can be either beneficial or destructive. One of the greatest challenges to a risk manager according to (Yuejian, 2002) is to implement risk management tools which allow for modeling rare but damaging events, and permit the measurement of their consequences. Extreme value theory (EVT) plays a vital role in these activities. (Coles, 2001) in his book on extreme modeling of extreme values emphasized that, Extreme value theory relates to the asymptotic behavior of extreme observations of a random variable. It provides the fundamentals for the statistical modeling of rare events, and is used to compute tail risk measures.

Methodology

Improved MPS Methodology

The MPS allows efficient estimators in non-regular cases where MLE may not exist. This is especially relevant to the GEV distribution in which the MLE does not exist when $\varepsilon < -1$, Smith [38]. Let $x_1, x_2, ..., x_n$ be a random sample of independent observations from a continuous distribution F_{θ_0} belonging to $F_{\theta,}\ \theta \in \Theta$ Applying the probability transform $F_0(.)$ to the order $x_{1,n} \le x_{2,n} \le ... \le x_{n,n}$ yields $0 \equiv F_\theta(x_{0,n}) \le F_\theta(x_{1,n}) \le ... \le FF_{\theta_0}\ (x_{n+1,n}) \equiv 1$. We define the spacing's as the gaps between the values of the distribution function at adjacent ordered points

$D_i(\theta) = F_\theta(x_i) - F_\theta(x_{i-1})$, where $i = 1, 2, ..., n+1$ The maximum spacing estimator of θ_0 is defined as value $\hat{\theta} = \arg\max_{\theta \in \Theta} S_n(\theta)$ that maximizes the logarithm of the geometric mean of sample spacing's.

$$S_n(\theta) = \ln \sqrt[n+1]{(D_1(\theta).D_2(\theta)...D_{n+1}(\theta))} \qquad (1)$$

$$= \frac{1}{n+1}\sum_{i=1}^{n+1} \ln D_i(\theta)$$

The maximum spacing estimator as defined is sensitive to closely spaced observations and especially the ties. That is, for any $x_{i+m} = x_{i+m} = ... = x_i$

Then

$$D_{i+m}(\theta) = D_{i+m=1}(\theta) = ... = D_i(\theta)$$

This therefore collapses the method. The modified MPS method proposed here is to use grouped data frequency table. Let $x_1, x_2, ..., x_n$ occur $f_1, f_2, ..., f_n$ times

respectively. The geometric mean is given by

$$G = \left(x_1^{f_1} . x_2^{f_2} .... x_n^{f_n} \right)^{\frac{1}{N}}$$

$$= \left[\prod_{i=1}^{n} x_i^{f_i} \right]^{\frac{1}{N}}$$

$$\ln G = \frac{1}{N} \sum_{i=1}^{n} f_i \ln x_i \qquad (2)$$

This leads to the modified MPS method as

$$S_n(\theta) = \ln \sqrt[n+1]{\left(D_1^{f_1}(\theta) D_2^{f_2}(\theta) ... D_{n+1}^{f_{n+1}}(\theta) \right)}$$

$$= \frac{1}{n+1} \sum_{i=1}^{n+1} f_i \ln D_i(\theta) \qquad (3)$$

If $f_1 = f_2 = ... = f_{n+1} = 1$ then we go back to the standard MPS. The Spacing's are such that $\sum_{i-1}^{n} D_i(\theta) = 1$: Under MPS, the $D_i(\theta)$ are defined as:

$$\begin{aligned} D_1(\theta) &= F\left(x_{1;n}, \theta \right) \\ D_i(\theta) &= F\left(x_{i;n}, \theta \right) - F\left(x_{i-1;n}, \theta \right) \\ D_{n+1}(\theta) &= 1 - F\left(x_{n;n}, \theta \right) \end{aligned} \qquad (4)$$

Therefore, Equation 3 can be partitioned as:

$$S_n\left(x_i; \theta, \varepsilon, \sigma \right) = \frac{1}{n+1} \left\{ f_1 \ln D_1(\theta) + \sum_{i=2}^{n} f_i \ln D_i(\theta) + f_{n+1} \ln D_{n+1}(\theta) \right\} \qquad (5)$$

To estimate the parameters of a Generalized Pareto distribution, we use the equation

$$G\left(x; \theta, \varepsilon, \sigma \right) = \begin{cases} 1 - \left[1 + \varepsilon \left(\frac{x - \theta}{\sigma} \right) \right]^{-\frac{1}{\varepsilon}}, & \varepsilon \neq 0 \\ 1 - \exp\left[-\frac{x - \theta}{\sigma} \right], & \varepsilon = 0 \end{cases} \qquad (6)$$

Equation 6 was substituted in equation 5

Case 1: $\varepsilon \neq 0$

We define,

$$D_1(\theta) = 1 - \left[1 + \varepsilon\left(\frac{x_1 - \theta}{\sigma}\right)\right]^{-\frac{1}{\varepsilon}}$$

$$D_i(\theta) = \left(1 - \left[\left[1 + \varepsilon\left(\frac{x_i - \theta}{\sigma}\right)\right]^{-\frac{1}{\varepsilon}}\right]\right) - \left(1 - \left[1 + \varepsilon\left(\frac{x_{i-1} - \theta}{\sigma}\right)\right]^{-\frac{1}{\varepsilon}}\right)$$

$$D_{n+1}(\theta) = 1 - \left(1 - \left[1 + \varepsilon\left(\frac{x_n - \theta}{\sigma}\right)\right]^{-\frac{1}{\varepsilon}}\right) \quad (7)$$

Which leads to:

$$S_n(x_i;\theta,\varepsilon,\sigma) = \frac{1}{n+1}\left\{f_1 \ln\left(1 - \left[1 + \varepsilon\left(\frac{x_1 - \theta}{\sigma}\right)\right]^{-\frac{1}{\varepsilon}}\right) + \sum_{i=2}^{n} f_i \ln\left(\left[1 + \varepsilon\left(\frac{x_{i-1} - \theta}{\sigma}\right)\right]^{-\frac{1}{\varepsilon}} - \left[1 + \varepsilon\left(\frac{x_i - \theta}{\sigma}\right)\right]^{-\frac{1}{\varepsilon}}\right) + f_{n+1} \ln\left[1 + \varepsilon\left(\frac{x_n - \theta}{\sigma}\right)\right]^{-\frac{1}{\varepsilon}}\right\}$$

(8)

If we let ,

$$K_1 = \ln\left(1 - \left[1 + \varepsilon\left(\frac{x_1 - \theta}{\sigma}\right)\right]^{-\frac{1}{\varepsilon}}\right)$$

$$K_2 = \ln\left\{\left[1 + \varepsilon\left(\frac{x_{i-1} - \theta}{\sigma}\right)\right]^{-\frac{1}{\varepsilon}} - \left[1 + \varepsilon\left(\frac{x_i - \theta}{\sigma}\right)\right]^{-\frac{1}{\varepsilon}}\right\}$$

$$K_3 = \ln\left[1 + \varepsilon\left(\frac{x_n - \theta}{\sigma}\right)\right]^{-\frac{1}{\varepsilon}} \quad (9)$$

Through partial differentiation of equation 9 and substituting in equation 8, we get

$$S_{\theta}^{'} = \frac{1}{n+1}\left\{ f_1 \frac{\partial K_1}{\partial \theta} + \sum_{i=2}^{n} f_i \frac{\partial K_2}{\partial \theta} + f_{n+1} \frac{\partial K_3}{\partial \theta} \right\}$$
$$S_{\sigma}^{'} = \frac{1}{n+1}\left\{ f_1 \frac{\partial K_1}{\partial \sigma} + \sum_{i=2}^{n} f_i \frac{\partial K_2}{\partial \sigma} + f_{n+1} \frac{\partial K_3}{\partial \sigma} \right\}$$
$$S_{\varepsilon}^{'} = \frac{1}{n+1}\left\{ f_1 \frac{\partial K_1}{\partial \varepsilon} + \sum_{i=2}^{n} f_i \frac{\partial K_2}{\partial \varepsilon} + f_{n+1} \frac{\partial K_3}{\partial \varepsilon} \right\} \quad (10)$$

Which we optimize by setting them to zero to get the GPD parameter estimates $\hat{\theta}, \hat{\sigma}$ *and* $\hat{\varepsilon}$

Case2: $\varepsilon = 0$

We define

$$D_1(\theta) = 1 - \exp\left[-\left(\frac{x_1 - \theta}{\sigma} \right) \right]$$
$$D_i(\theta) = \exp\left[-\left(\frac{x_{i-1} - \theta}{\sigma} \right) \right] - \exp\left[-\left(\frac{x_i - \theta}{\sigma} \right) \right]$$
$$D_{n+1}(\theta) = \exp\left[-\left(\frac{x_n - \theta}{\sigma} \right) \right] \quad (11)$$

$$S_n(x_i;\theta,\varepsilon,\sigma) = \frac{1}{n+1}\left\{ f_1 \ln\left(1 - \exp\left[-\left(\frac{x_1 - \theta}{\sigma} \right) \right] \right) + \sum_{i=2}^{n} f_i \ln\left(\exp\left[-\left(\frac{x_{i-1} - \theta}{\sigma} \right) \right] - \exp\left[-\left(\frac{x_i - \theta}{\sigma} \right) \right] \right) - f_{n+1}\left(\frac{x_n - \theta}{\sigma} \right) \right\} \quad (12)$$

We define

$$K_1 = \ln\left(1 - \exp\left[-\left(\frac{x_1 - \theta}{\sigma} \right) \right] \right)$$
$$K_2 = \ln\left\{ \exp\left[-\left(\frac{x_{i-1} - \theta}{\sigma} \right) \right] - \exp\left[-\left(\frac{x_i - \theta}{\sigma} \right) \right] \right\}$$
$$K_3 = \left(\frac{x_n - \theta}{\sigma} \right) \quad (13)$$

Through partially differentiating equation 10 and substituting in equation 12, we obtained

$$S'_{\theta^*} = \frac{1}{n+1}\left\{ f_1 \frac{\partial K_1^*}{\partial \theta} + \sum_{i=2}^{n} f_i \frac{\partial K_2^*}{\partial \theta} + f_{n+1} \frac{\partial K_3^*}{\partial \theta} \right\}$$

$$S'_{\sigma^*} = \frac{1}{n+1}\left\{ f_1 \frac{\partial K_1^*}{\partial \sigma} + \sum_{i=2}^{n} f_i \frac{\partial K_2^*}{\partial \sigma} + f_{n+1} \frac{\partial K_3^*}{\partial \sigma} \right\} \quad (14)$$

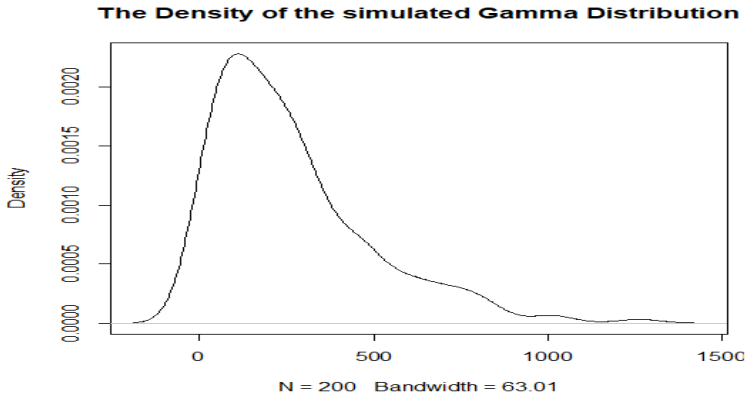
Equation 14 was then set to zero in order to optimize and obtain gpd parameters

Results and discussion

We developed an R-code for the standard and improved MPS model where the method of optimization was SANN.

We simulated data from a gamma distribution with the parameters shape=2.6, scale=1:1000. Repetitions were later introduced in the order of 0, 20, 40 and 60. The repeated values gave rise to situations of ties. Gamma distribution is known to have fairly heavy tails. To determine our threshold, we simulated a set of data constituting of 300 values. 100 values did not have a repetition while 100 values had each a repetition making them to have a frequency of 2 each. This set of data was used in the improved MPS model . After the simulation, this set of data was reorganized in such a way that the 300 values had a frequency of 1 each regardless of whether it was repeated or not. This set of data was used in the standard MPS model. The normal equations derived above were used as the model for the improved MPS methodology. For our improved three parameter MPS method, each tie formed a frequency f_i . When the values have not tied, the frequency f_i is 1. The frequency of the first value is f_1 while that of the last value is f_{n+1}. The simulated data was used to optimize the model equation 10 for the three parameter and equation 14 for the two parameter. The threshold, scale and shape of the GPD parameters were therefore determined through the optimization of model 10 and 14 using the simulated data.

The simulated values had a distribution with the density shown in the figure 1



.

Figure 1:Gamma density

The density is skewed towards right figure 1. Meaning that the distribution had some extreme values. The performance of the standard and improved MPS model was then compared using the obtained values from the optimized results.

The table gives the results of the performance of the two parameter model for the standard and improved MPS model.

Table 1 .Two Parameter model

	Location	scale
improved	736.476	13.72969
standard	725.5767	16.31062

From Table 1, the threshold of the improved model was higher than the threshold of obtained through the standard model. The scale of the improved model was lower than the scale of the standard model.

The same data was used to compare the performance of the three parameter improved and standard models and the results are as in Table 2

Table 2: Three parameter

	location	scale	shape
improved	738.1303	9.483573	-0.84884
standard	726.3707	13.33941	-5.49648

In Table 2, the threshold obtained from the improved MPS model was 738.130 as compared to that of the standard MPS model which was 726.370. The improved MPS model performed better than the standard model. The scale parameter of the improved model was 9.48373 while that of the standard MPS model was 13.33941. The scale parameter of the standard MPS model was higher than that of the improved model. The shape parameter of the improved model was 0.8488 and that of the standard model was 5.49648. The standard MPS model had a higher shape parameter compared to that of improved model.

To investigate how the parameters were behaving, we created repetitions within our simulated data of 300 values. The repetitions were in the order of 0 repetitions, 20 repetitions, 40 repetitions and 60 repetitions. The results are shown in Table 3 for two parameter model and Table 4 for the three parameter model.

Table 3	location			
Repetitions	0	20	40	60
Improved	1111.954	1129.368	1133.003	1139.156
Standard	1111.473	1118.298	1120.145	1121.647

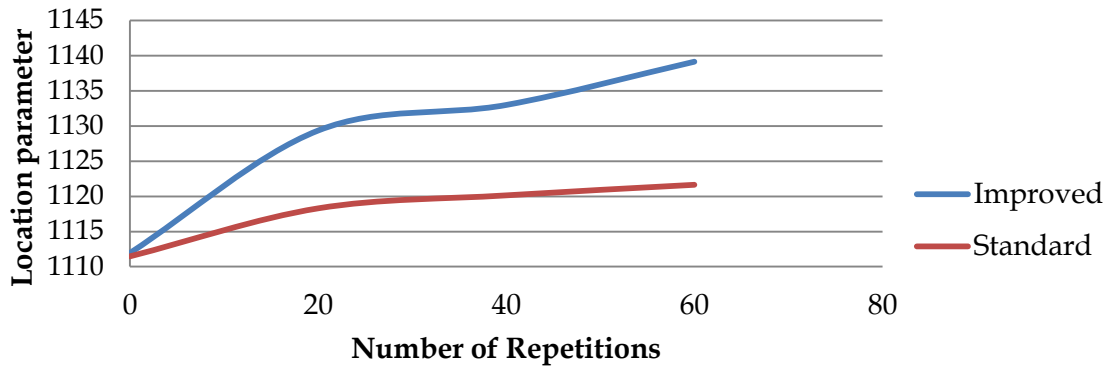


Figure.1: Location parameter and Repetitions

In Table 3 and figure 1, both locations were improving as the number of repetitions increased but the improved model indicated a higher increase in the location as the number of repetitions increases. As compared to standard model.

Table4:scale

Repetitions	0	20	40	60
Improved	4.097801	7.830554	5.119941	4.395648
Standard	9.993496	9.99465	2.056949	3.373637

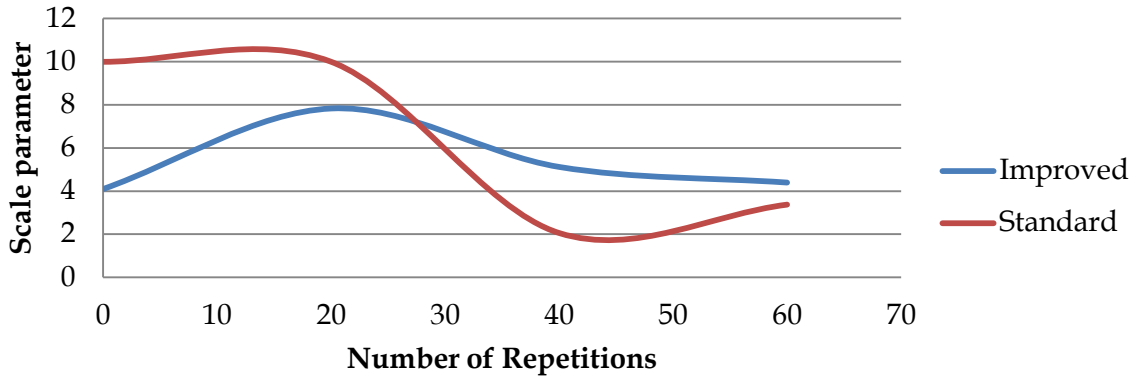


Figure. 2; Scale parameter and Repetitions

In Table 4 and figure 2 , the scale of the standard model indicates a decrease up to the 40th repetition and then shows some increase.

The three parameter MPS model exhibited the behavior shown in figure 3, figure 4 and figure 5

Table5	location			
	0	20	40	60
Improved	1111.954	1129.3679	1133.003	1139.156
Standard	1111.473	1118.29819	1120.145	1121.647

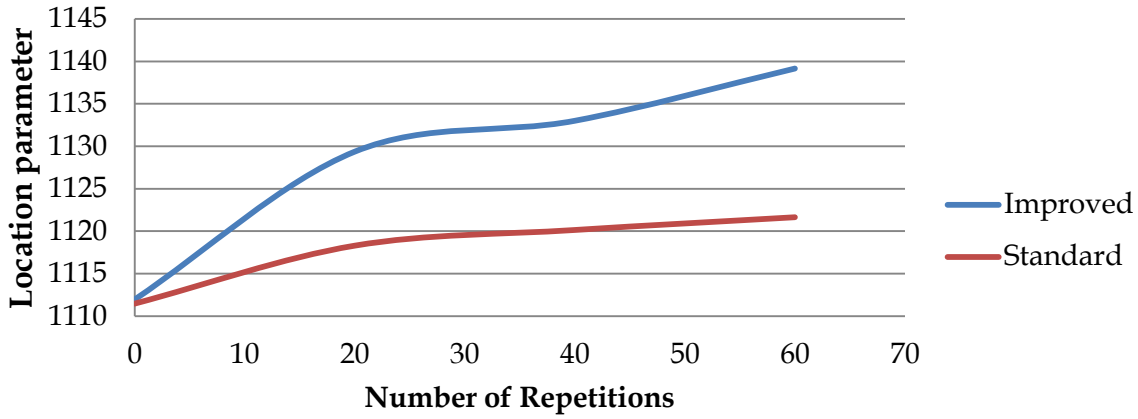


Figure.3: Location parameter and Repetitions

Both location parameters showed an improvement as repetitions increases but the improved MPS model in Table 5 and figure 3 indicated a higher increase. Meaning that it had a more optimal threshold than the standard model.

Table 6	scale			
	0	20	40	60
Improved	15.4904	2.0094715	8.335507	21.42994
Standard	17.44149	12.0415209	4.716338	3.950339

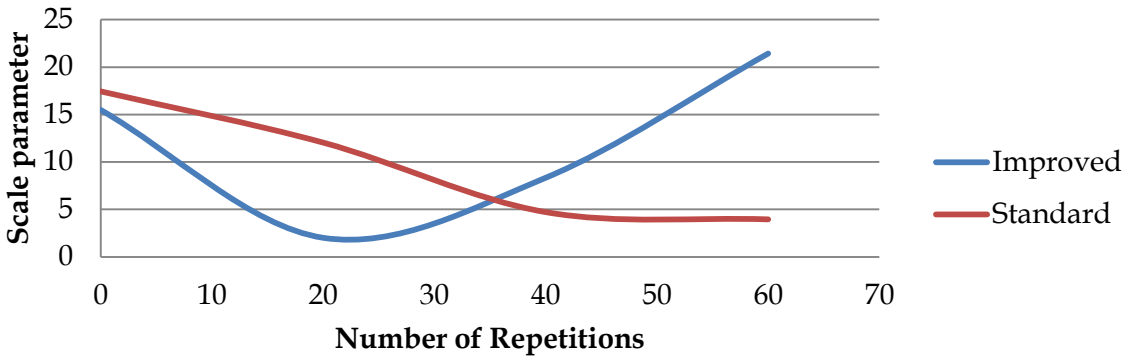


Figure.4:Scale parameter and Repetitions

The scale parameter of the standard model in Table 6 and figure 4 indicate a decrease all through until the 40th repetition when it indicates some stability. The improved model initially indicated a decrease up to the 20th repetition where it started increasing as the repetitions increased. The two models had the same scale at the 35th repetition.

Table7	shape			
	0	20	40	60
Improved	0.05365	1.586433	5.54892	-4.74385
Standard	-0.05918	-0.0409754	-1.90142	-6.59819

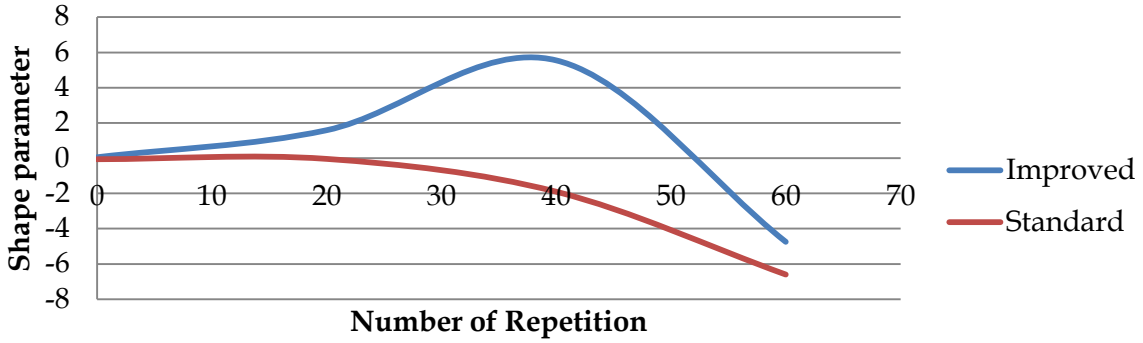


Figure.5: Shape parameter and Repetitions

In Table 7 and figure 5, at 0 repetition, both MPS model had the same shape. The standard model then showed a decrease of the size of the shape as repetitions increased. The improved model indicated a slow upward trend up to the 40th repetition after which it indicated a downward trend.

A real market data was used to investigate whether the data we simulated has some similar behavior with market data. A data was sought from NSE in the sector of Investment service called Nairobi securities exchange limited. The density of this data was plotted and compared to that of Gamma distribution. The data was then analyzed through both the standard MPS and the improved MPS model. Both two parameter and three parameter models were used.

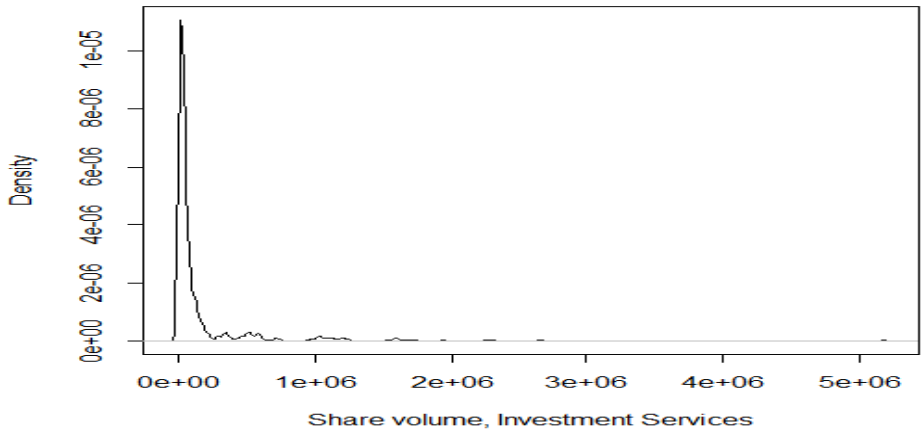


Figure. 6: Density of investment service Figure 6 shows that there were many trading volumes concentrated between 0 and about 400000. However, there were several other values that were extreme. This figure is very much similar to figure 1. Meaning that real data are skewed and sometimes contains heavy tails.

Table 8: MLE and MPLE Estimates-NSE

	Two parameter		Three parameter	
Estimate	Standard	Improved	Standard	Improved
Threshold	573942.1463	1025881.322	573933.6022	1025908.743
Number above threshold	30	21	30	21
Proportion above	0.0508	0.0515	0.0508	0.0515
Scale Estimate	8.14E+05	6.06E+05	8.14E+05	6.06E+05
Scale standard error	5933.39	2.07E+05	2.12E+05	2.07E+05
Shape Estimate	7.76E-03	2.24E-01	2.09E-02	2.24E-01
Shape standard error	0.108	2.67E-01	1.86E-01	2.67E-01
Asymptotic var cov for scale	3.52E+07	4.28E+10	4.51E+10	4.28E+10
Asymptotic var cov for shape	1.17E-02	7.14E-02	3.47E-02	7.14E-02
Deviance	876.5707	599.1953	876.5713	5.99E+02
Penalized Deviance	8.77E+02	599.668	876.5999	599.6657
AIC	880.5707	603.1953	8.81E+02	603.1929
Penalized AIC	603.1953	603.668	880.5999	603.6657

From Table 8, the threshold for the two parameter standard model was 573942.146 while that of the improved model was 1025881.322. The improved model was better. The three parameter standard model had a threshold of 573933.602 while the improved model had a threshold of 1025908.743. The threshold in the improved MPS model is better than that of the standard MPS model. The Proportions above these threshold indicates that the cases of standard models had more exceedances than the improved model. The AIC criterion used to select the competing models indicates that the improved model was better than the standard model in both cases of two and three parameter model

Conclusion

The results of this study indicate that The improved MPS model performed well in determining a more optimal threshold than the standard MPS model. When the threshold improves, it is expected that the values above this threshold will reduce. This will in turn impact on the scale parameter and shape parameter. Depending on how many the exceedances are, the scale may decrease or increase. The case of standard model is to drop the values that exhibit ties and only one value is left among the ones that had tied. The improved model does not drop of the values even if they have a tie. It takes care of them through the frequencies. In both models, the sample size will reduce but in case of improved model, all the values will still be taken care of by frequencies. The case of standard model drops the values out of the sample otherwise, it would fail. Many practical situations particularly in trading sector, exhibits the situations of ties. Therefore, in order to model such a data, the improved model is the best tool to help in preparing for full impact of any extreme event. This study therefore attains its objective by improving MPS methodology so that it takes care of all situations whether they contain ties or not. Further study need to be done to establish the actual at about 35th repetition, there was a drop in the threshold and that at this point both scale and the shape had a changing behavior.

References

Balkema, A. (1974). *Residual Life Time at a great age.* London: JMASM.

Beirlant, J. T. (1996). Excess Function and Estimation of the extreme values index. *Bernoulli*, 293-318.

Box, G. a. (1951). Experimental Attainment of optimum conditions. *J.R Statistic Society*, 1-45.

Butterfield, R. (2009). Dfid Economic Impacts of climate change in Kenya,Rwanda and Burundi. *ICPAC*, 1-45.

Cheng, R. a. (1983). Estimating parameters in a continuous univariate distribution with a shifted origin. *Royal Statistical Society*, 394-403.

Coles, S. (2001). *Introduction to Statistical modeling of extreme values.* London: Springer-Verlag.

Embretchet, P. M. (1997). *Modelling extremal events for insurance and Finance.* New York: Springer.

Fisher, R. a. (1928). *Limiting forms of the frequency distributions of the largest and smallest member.* Cambridge: Cambridge Philosophical Society.

Geremy, P. V. (2012). Extreme rainfall in west Africa region modeling. *American Geographical Union*, 1029.

Hill, B. (1975). Asimple general approach to inference about the tail of a distribution. *Annals of Statistics*, 341.

Pickands, J. (1975). Statistical Inference Using Order Statistics. *Annals of Statistics*, 3:119.

Prudhome, C. D. (1999). Mapping extreme rainafall inmountanious region using geostatistcal techniques. *Jpornal of Climatology*.

Yuejian, Z. a. (2002). *Extreme weather events and their probabilisticprediction.* Washngton DC:

Change Point Estimation in Volatility of a Time series using a Kolmogorov Smirnov Type Test Statistic

Josephine Njeri Ngure[1] and Anthony Gichuhi Waititu[2]

[1]Pan African University Institute for Basic Sciences, Technology, and Innovation, P.O BOX 62000-00200, ngurejosephine@gmail.com

[2]Department of Statistics and Actuarial Sciences, JKUAT, P.O BOX 62000-00200, awaititu@jkuat.ac.ke

Abstract

Detection of structural change in volatility of a time series is very important for understanding volatility dynamics and the stylized facts observed in financial time series. By applying the Nadaraya Watson kernel estimator of the mean function, estimated residuals are obtained. In this work, a Kolmogorov Smirnov type test statistic for change point estimation is developed and applied to conditional variances obtained from the squared residuals. The consistency of the change point estimator is shown through simulations. The developed estimator is then applied to KES/USD exchange rate data set to estimate a single change point.

Keywords: Volatility, Change point, Kolmogorov-Smirnov, ICSS, GARCH

Section 1: introduction

When doing change point analysis, the major point of interest is to decide if the observations follow one model or if there is at least one-time point when the model is believed to have changed. This therefore results in two sub-fields of change point analysis; change point detection and change point estimation. Change point analysis normally assumes that it is possible to segment the data into regimes and that the data structure is homogeneous within each regime. Of importance is that the change is assumed to be abrupt (as though each occurs completely between two observations) and not gradual or smooth. Although in many settings multiple change-points could be of paramount interest, we shall only seek to detect change point through the assumption of At Most One change point approach. Change point analysis can be performed in either the offline setting or online setting or by estimating single change point versus multiple change point among other scenarios. We define change point detection as the problem of finding abrupt changes in data when a property of the time series changes. For each observed time series, the instant where these structural changes occur are called change points. The time moment when the model has changed is called change point. Other synonyms for change point include but not limited to segmentation, structural breaks, break points, regime switching, and detecting disorder. Unlike change point detection, change point estimation tries to model and interpret known changes in the time series rather than identifying that a change has occurred. Change point estimation (estimates) focus on describing the nature and degree of the known change. Change points can be found in a wide range of literature including quality control, economics, medicine, environment, and even linguistics. Detection of large "homogeneous" segments of data enables one to identify "hidden" regularities in a time series behavior and to create a mathematical model for each segment of homogeneity. One choses change point with the intention of maximizing the separation between two segmentation. Thus, the goal of change point detection and estimation is to recover these segments as accurately as possible.

Subsection 1.1: Statement of the problem

A good change point estimation method in conditional variance (volatility) should be sensitive to the skewness of the observations (which does not happen when ranking is done) e.g. when

dealing with financial data. With returns, there are times of uniquely high returns and others of uniquely low returns and thus rank bases test statistics makes the data robust to outliers. This is because, by ranking the observations, there is mitigation of the impact of extremely high or low returns (outliers). Reason being that regardless of how extreme an outlier is, it often receives the same rank as if it were slightly larger than the second largest observation. This is because all ranks are equally far apart from each other violating the stylized facts of returns. Hence, we adopt a non-ranking method of the observations. Thus, we aim to propose a theory of estimating the change point in volatility of a financial time series with USD/KES exchange rate dataset application in mind. In this work, the regression function (conditional mean function) and the conditional variance function are unknown hence we impose few or no restrictions to our data set. The inference based on non-parametric models is usually robust against misspecification of the underlying regression model and thus non-parametric models effectively avoid the problem of misspecification normally found in parametric approaches, which may yield inconsistent estimators. We thus take a non-parametric approach for our results to be robust with respect to model specifications.

Section 2: LITERATURE REVIEW

The first published article concerning change points analysis was done by (Page, 1954) who considered testing for a potential single change point for data from a common parametric distribution motivated by a quality control setting in manufacturing. Since then, change point analysis has developed rapidly with considerations on either multiple change point detection and estimation, different types of data and other assumptions being put into consideration.

(Chen G. a., 2005) proposed a procedure that was able to combine the least squares approach which does not require specific forms of the marginal or the transitional density functions (i.e the regression and conditional variance functions) to estimate the change points in the conditional variance {volatility} of a non-parametric model of time series in which the regression and the conditional variance were unknown. Further, the asymptotic properties of the estimators and test statistics were established. The location of the change point(s) was not been specified a priori like some other studies from previous scholars had assumed. Finally, the proposed test was consistent and more powerful than the non-parametric ones already existing tests in literature. Finally, the practicality of the methods was by application to the Hong Kong stock market index (HSI) series.

Change point analysis by (Gichuhi, 2008) in Bernoulli random variables based on neural networks motivated by a regression setting was the focus of the researcher. The parameters of the model were estimated using neural network method with the evidence that parameter estimates were only identifiable up to a given family of transformations and further derived the consistency and asymptotic normality of the network parameter estimates. A neural network based likelihood ratio test statistic to detect a change point in a given set of data was determined. The limiting distribution of the change point estimator was established. The results showed that the sample size, change point location and the size of change had an influence on change point detection. Through simulation, percentile bootstrap method showed superiority to profile log-likelihood ratio method in determining the change point confidence intervals.

Modeling of financial volatility in the presence of abrupt changes is a research done by (Ross, 2013) where the author incorporated the ICSS GARCH algorithm to detect changes in volatility of financial returns. Although the algorithm was simple to implement, its parameters were based on the assumption of the financial returns following a Gaussian distribution and thus can

produce very many spurious jump points if this assumption is violated. By applying ICSS to heavy tailed series, poor results were found since extreme observations were misinterpreted as regime shifts. This indicated that the ICSS algorithm was only applicable to detect change points to weekly returns and using the algorithm to daily returns could generate too many spurious false positives for it to be useful because of the number of extreme values. Thus, due to this problem of ICSS GARCH algorithm, the author replaced the ICSS segmentation step with a technique which was purely based on non-parametric statistics which makes no assumptions on the true returns distribution and which in turn allows one to ignore the Gaussian assumptions and allows for its deployment on the daily returns which he coined NPCPM-GARCH. The author further analyzes several stock indices for change points in volatility mainly the Dow Jones Industrial Average, the German DAX, the VIX volatility index and the Japanese Nikkei 225. He further compared his results with those obtained from ICSS GARCH and found that his method gave a better fit to the data sets when measured using a standard criteria i.e at the same level of significance. The research showed that the ICSS algorithm was not able to ignore the assumption of Gaussian, which contradicted with the stylized facts of returns leading to the detection of very many change points some of which did not correspond to genuine long-term changes in volatility (false positives). This prompted the researcher to adopt the Mood test statistic in a sequential setting and which was found to work and detect true change points with non-Gaussian data.

Section 3: NON-PARAMETRIC TIME SERIES MODELLING

For a given time series $X_t; t = 1,2, \dots T$ non-parametric methods are used to analyze the features of interest. Conditional variances or conditional quartiles are required if interval forecasts or estimates of future volatility are desired as shall be necessary in this work. Suppose we let $X_t = \log(\frac{S_t}{S_{t-1}})$ be the return process in period t for $t = 1,2, \dots T$ and $X_{t-1}, X_{t-2}, \dots, X_{t-d}$ be the return processes at any time periods less than t, S_t is the price process of the stock in period t for $t = 1,2, \dots T$. We assume that there is a non-parametric and non-linear relationship between the current return values and the previous return values, modeled by a non-parametric autoregressive process of this form

$$X_t = m(X_{t-1}, X_{t-2}, \dots, X_{t-d}) + u_t \qquad t = 1,2, \dots, T \qquad (1)$$

where u_t a series of innovations (random shocks) which is independent of $X_{t-1}, \dots, X_{t-d}$ satisfying

$$\mathbb{E}(u_t | X_{t-1}, X_{t-2}, \dots, X_{t-d}) = 0 \qquad (2)$$

$m(.)$ is the conditional mean (smooth) function in period t given past time periods $X_{t-1}, X_{t-2}, \dots, X_{t-d}$ and it is the minimum mean squared error (MSE) 1-step predictor of X_t. The approximation precision of $m(.)$, increases with the sample size. Since in many situations point forecasting is too limited an objective, and the future volatility and higher order moments are of interest in addition to the conditional mean, we therefore let the following representation of the innovations u_t to hold

$$u_t = \sigma(X_{t-1}, X_{t-2}, \dots, X_{t-d}) z_t \qquad (3)$$

and thus extend equation 1 above to a more general non-parametric conditional heteroskedastic model as in equation 4 below

$$X_t = m(X_{t-1}, X_{t-2}, \dots, X_{t-d}) + \sigma(X_{t-1}, X_{t-2}, \dots, X_{t-d})z_t \quad (4)$$

$\mathbb{E}(X_t|X_{t-1} = x_1, X_{t-2} = x_2, \dots, X_{t-d} = x_d) = m(x_{t-1}, x_{t-2}, \dots, x_{t-d})$ is the non-linear autoregressive conditional mean (smooth) function of the returns.

Variance$(X_t|X_{t-1} = x_1, X_{t-2} = x_2, \dots, X_{t-d} = x_d) = \sigma^2(x_{t-1}, x_{t-2}, \dots, x_{t-d})$ is the non-linear autoregressive conditional variance (smooth) function of the returns,

z_t is an independent and identically distributed sequence of random variables with

$$\mathbb{E}(z_t|X_{t-1}, \dots, X_{t-d}) = 0 ,$$

Variance $(z_t|X_{t-1}, \dots, X_{t-d}) = 1$

and independent of $X_{t-1}, X_{t-2}, \dots, X_{t-d}$

Equation 4 above is a non-parametric autoregressive conditional heteroscedastic model and is the most flexible non-parametric time series model because it does not impose any (parametric) particular form on the conditional mean and conditional variance functions. Due to curse of dimensionality problem, where by as the dimension d grows, statistical and computational inefficiency comes in, we set $d = 1$ so that equation 4 above becomes

$$X_t = m(X_{t-1}) + \sigma(X_{t-1})z_t \quad (5)$$

Estimates of the functions $m(x)$ and $\sigma^2(x)$ are obtained by applying the Nadaraya Watson estimator of the unknown regression function (conditional mean at the evaluation points) and its properties such that

$$\widehat{m}_T(x) = \frac{\sum_{t=2}^{T} K\left(\frac{X_{t-1} - x}{b_x}\right) X_t}{\sum_{t=2}^{T} K\left(\frac{X_{t-1} - x}{b_x}\right)} \quad (6)$$

$$\hat{\sigma}_T^2(x) = \frac{\sum_{2}^{T} K\left(\frac{X_{t-1} - x}{b_x}\right) \left(X_t - \widehat{m}(X_{t-1})\right)^2}{\sum_{t=2}^{T} K\left(\frac{X_{t-1} - x}{b_x}\right)} \quad (7)$$

Under some assumptions, it can be shown that $\widehat{m}_T(x)$ is a consistent estimator of $m(x)$. $K(.): \mathbb{R} \to \mathbb{R}$ is a kernel function, which is continuous, symmetric, integrating to one with bounded support $[-1,1]$ in that the estimator only uses the observations in the interval $(x - b_x, x + b_x)$ and b_x is the bandwidth parameter or the tuning parameter. The bandwidth (smoothing parameter) controls the level of neighboring such that for a given kernel function K and a fixed x , observations (X_{t-1}, X_t) with X_{t-1} far from x are given more weights as b_x

increases. This means that the larger the bandwidth is chosen, the less the mean function $\widehat{m}_T(x)$ is changing with x . Therefore, we can conclude that the degree of smoothness of the conditional mean function increases with the bandwidth. Therefore, it means that a weighted average of the observations is used as an estimator for the conditional mean function .

The Nadaraya Watson kernel regression estimator was first proposed independently by (Nadaraya E. A., 1964) and (Watson, 1964)

The estimators of the mean function and conditional variance function have shown to be strongly consistent and asymptotically normal for α mixing observations. In this research, utilize the Epanechnikov kernel since it is the most efficient in minimizing the Mean Integrated Squared error putting in mind that the choice of the kernel is not as important as the choice of the bandwidth (this does not mean we disregard the choice of the kernel).

It is important to remember that when a kernel estimator is applied to dependent data, e.g. in financial time series returns data like in the case of this work, then it is affected only by the dependence among the observations in a small window and not by that between all data. This fact therefore reduces the dependence between the estimates so that most of the techniques developed for independent data are applicable as well. This is what we shall refer to as the **Whitening by window principle**. Also, the memory of the underlying process decreases with distance between events and that the rate of decay can be estimated by the mixing conditions some of which include the strong α mixing condition and the ϕ mixing condition as below

α (Strong) mixing condition. A sequence $\{X_t\}$ is said to be α mixing if

$\sup_{A \in \mathcal{F}_1^n B \in \mathcal{F}_{n+k}^{\infty}} |p(A \cap B) - p(A)p(B)| \leq \alpha_k \quad n = 1,2, \ldots$and $\alpha_k \to 0$ as $k \to \infty$ and $\mathcal{F}_i^j$ is the $\sigma -$field generated by $X_i, \ldots, X_j$

ϕ (Uniformly) mixing condition. This is a stronger condition which establishes that a sequence $\{X_t\}$ is said to be ϕ mixing if

$|p(A \cap B) - p(A)p(B)| \leq \phi_k \, p(A)$ for any $A \in \mathcal{F}_1^n$and $B \in \mathcal{F}_{n+k}^{\infty}$ and $\phi_k \to 0$ as $k \to \infty$. For more on this, visit (Robinson, 1983).

The mixing conditions above control the dependency between X_i and $X_j$as the time distance $i - j$ increases. The rate at which α_k and ϕ_k goes to zero plays a noble role in showing the asymptotic properties of the non-parametric smoothing procedure. These conditions are usually difficult to check but if the process follows a stationary Markov chain, then geometric ergodicity imply absolute regularity, which in turn implies strong mixing conditions. Proposition 6 in subsection 2.4.2.3 of (Doukhan, 2012) give conditions on m, σ and the innovations that imply geometric ergodicity of $\{X_t\}$. This implies strong mixing properties with exponential mixing rates.

Equation 5 can generate heavy tailed distributions and we demonstrate this by considering a simple model

$$X_t = \sigma(X_{t-1}) z_t \tag{8}$$

with z_t having a standard normal distribution. By Jensen's inequality (Pishro-Nik, 2016),

$$\text{Kurtosis}\,(X_t) = \frac{\mathbb{E}(X_t^4)}{[\mathbb{E}(X_t^2)]^2} = \frac{\mathbb{E}[\sigma^4(X_{t-1})z_t^4]}{[\mathbb{E}(\sigma^2(X_{t-1})z_t^2)]^2} = 3\frac{\mathbb{E}[\sigma^4(X_{t-1})]}{[\mathbb{E}(\sigma^2(X_{t-1}))^2]} \geq 3 \tag{9}$$

This heavy tailed-ness feature implied by equation 5 makes it a successful mode for modelling data, which exhibit heavy tails e.g. financial time series data of returns. It is important to note that non-parametric time series approach has been highly appreciated by practitioners as a preliminary search method aimed at establishing the final parametric model.

Subsection 3.1: Single change point test statistic

In this section, we derive an estimator for change point in volatility of a non-parametric regression model for time series as shown in equation 5. Since we are in the off-line setting and only the conditional variance function that is changing with time, with the assumption that the conditional mean function is not changing with time, we shall formulate the change point problem as a hypothesis testing procedure of the following form

$$H_0: \sigma_t^2(X_{t-1}) = \sigma_{(1)}^2(X_{t-1}) \qquad t = 1,2,\dots,T \tag{10}$$

While the at most one change point alternative is

$$H_1: \begin{cases} \sigma_t^2(X_{t-1}) = \sigma_{(1)}^2(X_{t-1}) & \text{for } t = 1,2,\dots,\tau \\ \sigma_t^2(X_{t-1}) = \sigma_{(2)}^2(X_{t-1}) & \text{for } t = \tau+1,\dots,T \end{cases} \tag{11}$$

We want to locate (estimate) the change point position $\hat{\tau}$ and probably the number of change point (s) (Chen J. a., 2001). The regression function (conditional mean function) $m(x)$, the conditional variance function $\sigma(X)$, the distribution of the covariate as well as the distribution of the errors is completely unknown and we have not made any parametric form for them meaning our approach is fully non-parametric.

If we consider H_0 when we do not have a change point in volatility, we can rewrite equation 5

$$X_t = m(X_{t-1}) + \sigma(X_{t-1})z_i \quad \rightarrow u_t^2 = \{X_t - m(X_{t-1})\}^2 = \sigma^2(X_{t-1})z_t^2 \tag{12}$$

$t = 1,2,\dots,T$.

Which in turn implies that the conditional variance function of ε_t.

$$\mathbb{E}\{(X_t - m(X_{t-1})\}^2 = \sigma^2(X_{t-1}) \tag{13}$$

If we consider the alternative hypothesis, H_1 we can re-write the non-parametric model 3 with a single change point in volatility as

$$X_t = m(X_{t-1}) + \sigma_t(X_{t-1})z_t \rightarrow u_t^2 = \{X_t - m(X_{t-1})\}^2 = \sigma_t^2(X_{t-1})z_t^2 \tag{14}$$

This means that under the alternative hypothesis,

$$\mathbb{E}\{(X_t - m(X_{t-1})\}^2 = \sigma_t^2(X_{t-1}) \tag{15}$$

$t = 1,2, \dots, \tau, \tau + 1, \dots, T.$

In this work, we assume that the conditional mean function (regression function) is stable and does not change with time but the conditional variance function is not stable and that $\mathbb{E}(z_t|X_{t-1}) = 0$, $\text{var}(z_t|X_{t-1}) = 1$ $\mathbb{E}(z_t)^4 < \infty$ with z_t being a sequence of random variables.

Suppose $\varepsilon_t = \frac{X_t - \hat{m}(X_{t-1})}{\hat{\sigma}(X_{t-1})}, t = 1,2, \dots, T$. We are concerned with testing non-parametrically our hypothesis above by defining the partial sum of the squared residuals across all possible sample segments as shown in equation 16 below

$$\varepsilon_T = \sum_{t=1}^{T} \varepsilon_t^2, \qquad \varepsilon_\tau = \sum_{t=1}^{\tau} \varepsilon_t^2, \quad \varepsilon_{\tau+1} = \sum_{t=\tau+1}^{T} \varepsilon_t^2 \tag{16}$$

Where $1 \leq \tau \leq T$ where $\sigma_{(1)}^2(X_{t-1})$and $\sigma_{(2)}^2(X_{t-1})$ for $t = 1,2, \dots, T$denotes the conditional variance functions of the sequence $\{\varepsilon_t^2\}_{t=1}^{\tau}$ and $\{\varepsilon_t^2\}_{t=\tau+1}^{T}$ before change point instant and after the change point instant respectively. We propose a change point test statistic which is able to quantify the deviation between $\sigma_{(1)}^2(X_{t-1})$and $\sigma_{(2)}^2(X_{t-1})$ written as $l_p(\sigma_{(1)}^2(X_{t-1}) - \sigma_{(2)}^2(X_{t-1}))$ where for $p \geq 1$

$$l_p\left(\sigma_{(1)}^2(X_{t-1}) - \sigma_{(2)}^2(X_{t-1})\right) = \left(\sum_{t=1}^{T} w_\tau |\varepsilon_\tau - \varepsilon_{\tau+1}|^p\right)^{\frac{1}{p}} \tag{17}$$

Motivated by the l_p norm and properties of l_p space, the change point test statistic and change point estimator is constructed. We set $p = 2$ and work in l_2 norm. w_τ is a weight function, which is measurable and which depends on the sample size n and the change point position τ . It gives the sensitivity of the test statistic against different alternatives in the sense of the position of change. The weight function is arbitrary chosen so that it satisfies the condition that

$$\sum_{t=1}^{T} \varepsilon_t^2 = \frac{\tau}{T} \sum_{t=1}^{T} \varepsilon_t^2 \to \frac{1}{T}\left(\sum_{t=1}^{\tau} \varepsilon_t^2 - \frac{\tau}{T} \sum_{t=1}^{T} \varepsilon_t^2\right) = 0 \tag{18}$$

Simple Algebra will help derive the Kolmogorov Smirnov type statistic for change point detection.

The Kolmogorov Smirnov type statistic upon derivation becomes

$$D_\tau = \left(\frac{\tau}{T}\left(1-\frac{\tau}{T}\right)\right)^{\frac{1}{2}}\left|\frac{1}{\tau}\sum_{t=1}^{\tau}\varepsilon_t^2 - \frac{1}{T-\tau}\sum_{t=\tau+1}^{T}\varepsilon_t^2\right| \quad (19)$$

The KS type test statistic above gives more weight to the observations at the tails of a distribution and hence it is an appropriate statistic for change point detection especially when handling financial time series data, which exhibit heavy tails.

Subsection 3.2: Single change point estimator

The KS type estimator of change point will be the point where the KS type test statistic has its global maximum. This is because, the global maximum will often occur at the area of true change point (The point where we have maximum distance between the conditional variances of the residuals). Hence, a good choice of the estimator for the time of change is as given in equation 20 below as

$$\hat{\tau} = \text{Arg}\max_{\tau}|D_\tau| \quad (20)$$

The estimate $\hat{\tau}$ is the point at which there is maximal sample evidence for a break in the squared residual process. In the presence of a single break, we shall show, through simulation, that $\hat{\tau}$ is a consistent estimator of the unknown change point τ^* .

Section 4: APPLICATION OF THE KS TYPE ESTIMATOR

Consider the model below

$$X_t = m(X_{t-1}) + \sigma(X_{t-1})z_t \quad (21)$$

Suppose the model has a single change point in the volatility function defined as

$$\sigma(X_{t-1}) = \begin{cases} 2 + 0.7\varepsilon_{t-1}^2 & for\ t = 1,2,\dots,\tau \\ 1 + 0.035\varepsilon_{t-1}^2 & for\ t = \tau+1,\dots,T \end{cases} \quad (22)$$

$$m(x) \rightarrow X_t = 0.35X_{t-1} + \varepsilon_t + 0.4\varepsilon_{t-1}$$

Where $\varepsilon_t = \sigma(X_{t-1})z_t$ and z_t is a sequence of independent and identically distributed random variables with mean zero and variance 1 assumed from a normal distribution.

We thus create a table under different sample sizes with 1000 bootstrap samples in each. We fix the change point at $\frac{1}{3}T$, $\frac{1}{2}T$ and $\frac{2}{3}T$. In each simulation, the estimates of the change point highly depended on the locations of the change points and the sample size. The estimates were most accurate if τ^* was fixed around the middle of the sample.

To demonstrate consistency of the change point estimator, the distance between an estimation and the true change point index is obtained, then normalized by the size of sample (Truong, 2018). This

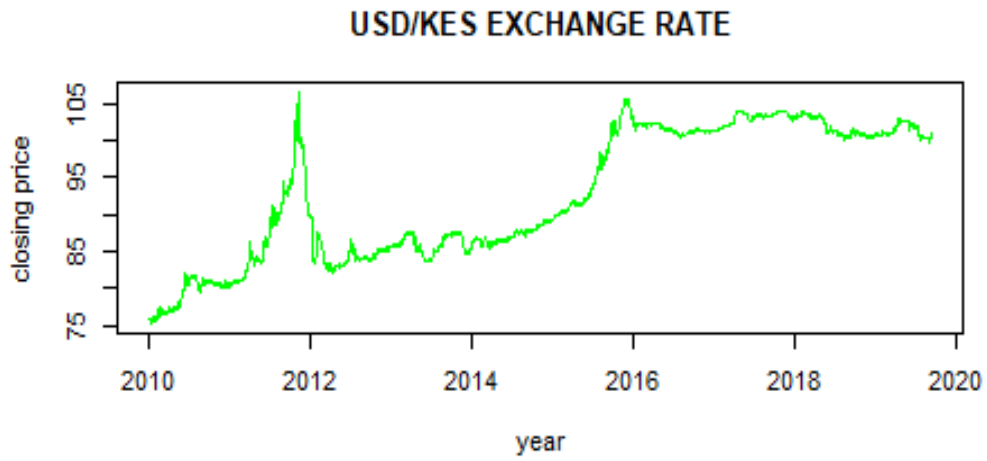
error was found to be decreasing to zero as the size of the samples grew unbounded which further verified the asymptotic consistency of the change point estimator. Consistency results only deal with change point fractions and not the time indexes themselves. We investigate the consistency of the estimator when the change point is fixed at $\frac{1}{3}T$, $\frac{1}{2}T$ and $\frac{2}{3}T$. Note that we are losing two observations in each simulation due to curse of dimensionality problem. The results from table 1 below showed that the change point estimator $\hat{\tau}$ was a consistent estimator of τ^*.

Table 5 : Table to demonstrate consistency of the change point estimator

Sample size T	True change point instant τ^*	Estimated change point instant $\hat{\tau}$	$\frac{\widehat{\lvert\tau - \tau^*\rvert}}{T} \xrightarrow{p} 0$
50	$\frac{1}{3}T \to \tau^* = 16$ $\frac{1}{2}T \to \tau^* = 24$ $\frac{2}{3}T \to \tau^* = 32$	14 17 20	0.04167 0.14583 0.27083
100	$\frac{1}{3}T \to \tau^* = 32$ $\frac{1}{2}T \to \tau^* = 49$ $\frac{2}{3}T \to \tau^* = 66$	26 36 48	0.06122 0.13265 0.18367
200	$\frac{1}{3}T \to \tau^* = 66$ $\frac{1}{2}T \to \tau^* = 99$ $\frac{2}{3}T \to \tau^* = 132$	53 80 107	0.06566 0.09596 0.12626
500	$\frac{1}{3}T \to \tau^* = 166$ $\frac{1}{2}T \to \tau^* = 249$ $\frac{2}{3}T \to \tau^* = 332$	149 226 309	0.03414 0.04619 0.04619
1000	$\frac{1}{3}T \to \tau^* = 332$ $\frac{1}{2}T \to \tau^* = 499$ $\frac{2}{3}T \to \tau^* = 668$	317 484 645	0.00751 0.01503 0.01151

Section 4.2: Data analysis and results

We apply the change point estimator to historical data set of USD/KES exchange rate data set from 2 January 2013 to 18 March 2019 to estimate change point in the conditional variance function (volatility) of exchange



rate returns. The data set consisted of 2444 daily observations and the plot of the exchange rates is as shown in figure 1 below

Figure 1: USD /KSH exchange rate

A plot of the returns is as shown in the figures 2 and 3 below

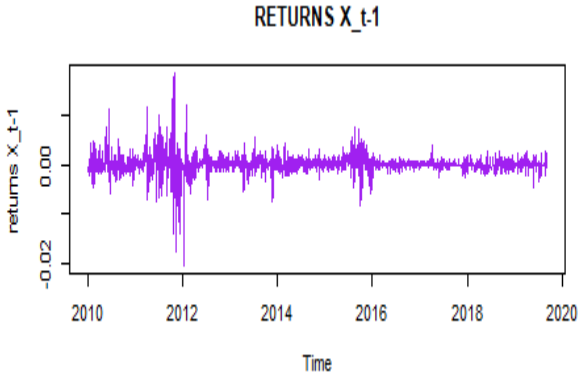


Figure 2: Returns X_{t-1}

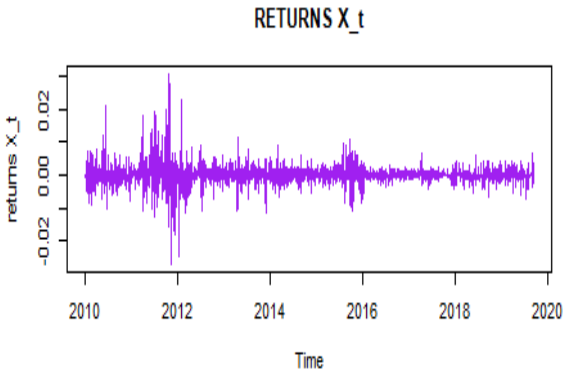
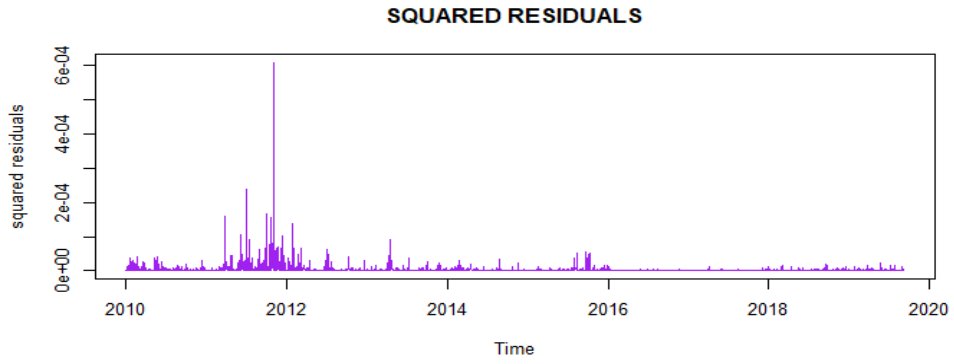


Figure 3: Returns X_t



A plot of the squared residuals is as shown in figure 4 below

Figure 4: plot of the squared residuals

A plot of the estimated conditional variances and residuals is as shown below

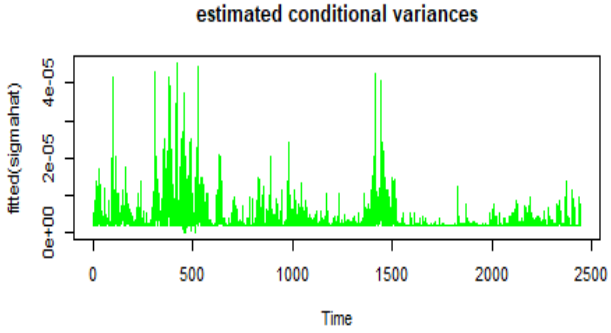


Figure 5: Estimated conditional variances.

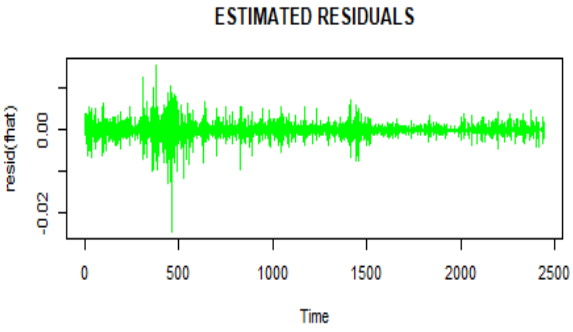


Figure 6: Estimated residuals.

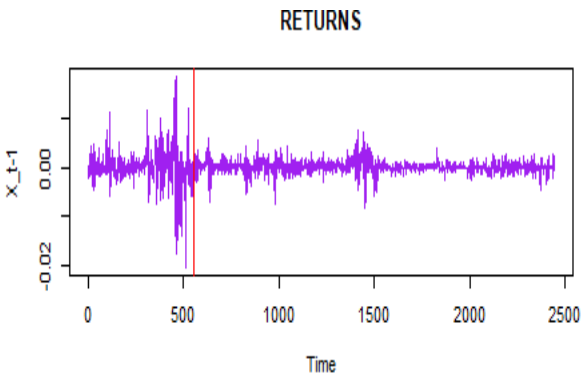


Figure 7: Returns with change point at 551

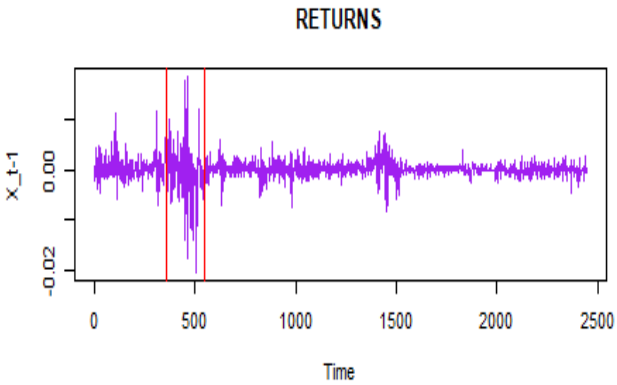


Figure 8: Returns with estimated change points at 551 and 35

From figure 2, we investigated the possibility of a single change point and were able to estimate it at point 551 corresponding to 13 February 2012. We also investigated the possibility of another change point by applying binary segmentation approach. Binary segmentation procedure allows for estimating the position of a single change point at each stage. The change point estimator is further applied to each sub-sequence of the returns. The next change point was estimated at point 358, which corresponded to 17 May 2011 and was as shown in figure 8 above.

The corresponding plots of the change point statistics at $\hat{\tau}$=551 and $\hat{\tau}$=358 were as shown in figures 9 and 10 below respectively

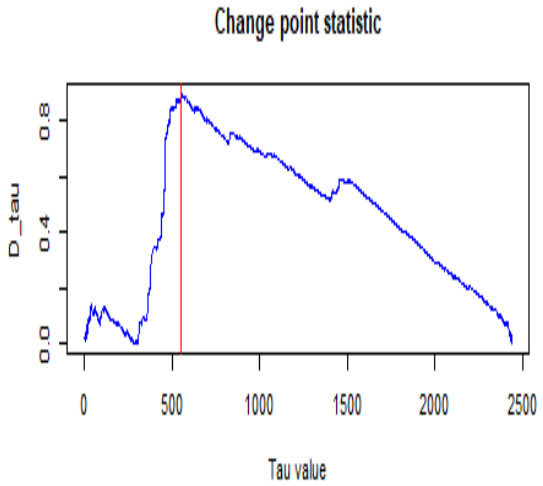


Figure 9: Change point statistic with estimated Change point at point 551

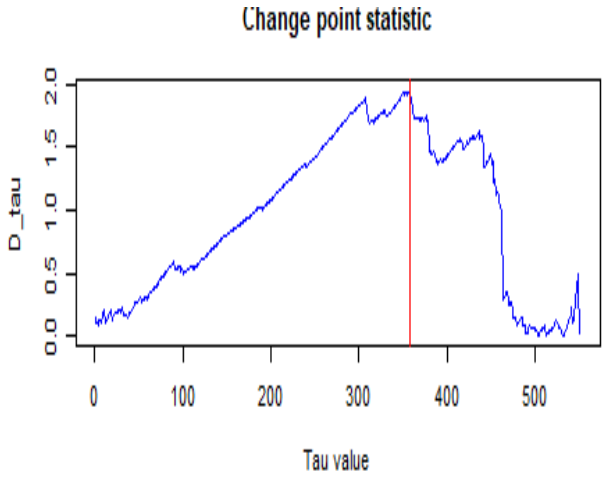


Figure 10: Change point statistic with estimated change point at point 358.

Subsection 4.3: Results and discussions

From figure 1, there is an increasing trend between January 2010 and October 2011 where the exchange rate prices were at the peak. Afterwards, one observes a decreasing trend after which the exchange rates started to rise again. The historical events associated with the behavior of the exchange rate plot were established. In 2011, there was the August 2011 stock market fall (Kibiy, 2016) because of price drop of stock prices in the stock exchanges across the major world markets in North America, Europe and Asia. The evidence from the seventh Bi-Annual Monetary Policy Committee Report issued by Central Bank of Kenya, in October 2011, can further support these results. A combination of both domestic and International economic developments during the six months period to October 2011 determined the conduct of monetary policy for Central Bank of Kenya overall mandate of price stability. These developments hence resulted in an escalation of inflationary pressure and exchange rate volatility, hence distorting the economy's recovery from the adverse effects of the global financial crisis. The USD/KSH exchange rate depreciated from 83.89 to 101.39 in the period April 2011 to October 2011. The depreciation of the shilling against US dollar could have been due to the buildup in the deficit in the current account. Current account is the gap between imports and exports of goods. This was because of a rise in imports of machinery and transport equipment, which are key inputs for the manufacturing sector required for the economic recovery process as well as the uncertainty in the global financial markets, caused by the debt crisis in the Eurozone.

From figure 7, to account for the change point at 17 May 2011, the foreign exchange market witnessed significant volatility between May 2011 and October 2011 reflecting the general volatility in the global financial markets as well as increase in demand for foreign exchange to finance imports. The result was that the Kenyan Shilling just like other currencies in the region and other global markets therefore weakened substantially e.g. the Kenyan shilling against the US dollar depreciated from an average of 84.2 in March 2011 to 101.39 in October 2011 (20.42% in percentage depreciation). Other reasons attributed to the change point in volatility on 17 May 2011 were high international food and fuel prices, the drought compounded by the conflict experienced in the Horn of Africa, the Euro crisis and major inefficiencies in Kenya's agriculture sector.

To account for the change point in 13 February 2012, in both Kenya and Uganda, the economies reported slow growth at the beginning of 2012 following high inflation and high commercial bank interest rates.

Section 5: CONCLUSION AND RECOMMENDATIONS

In this paper, we have proposed a procedure to estimate change point in volatility of a time series modelled using a non-parametric approach. This non-parametric modeling is important in finance and non-parametric estimators are very powerful in distinguishing among many models like derivative pricing models. We have demonstrated the consistency of the change point estimator through simulations and seen that our estimator is consistent. One can easily extend the method to multidimensional non-parametric models (models of higher dimension) of the form

$X_t = m(X_{t-1}, X_{t-2}, \dots, X_{t-d}) + \sigma(X_{t-1}, X_{t-2}, \dots, X_{t-d})z_t$ where the regression function and the conditional variance functions should be estimated using multivariate kernel methods. $m(.)$, $\sigma(.)$ are multiple variable d functions, while at the same time being careful on how to deal with the curse of dimensionality problem

which may lead to poor performance in higher dimensional regression problem since for $d > 2$, the subspace of $\mathbb{R}^{d+1}$ spanned by the data is rather empty.

REFERENCES

Chen, G. a. (2005). Nonparametric estimation of structural change points in volatility models for time series. *Journal of Econometrics, 126*(1), 79-114.

Chen, J. a. (2001). On change point detection and estimation. *Communications in statistics-simulation and computation, 30*(3), 665--697.

Doukhan, P. (2012). *Mixing: properties and examples* (Vol. 85). Springer Science \& Business Media.

Gichuhi, A. W. (2008). Nonparametric changepoint analysis for bernoulli random variables based on neural networks.

Kibiy, J. a. (2016). Determinants of Exchange Rate Volatility of the Kenyan Shilling Against World Major Currencies. *International Journal of Social Sciences and Information Technology, 2*, 1181-1198.

Mohr, M. (2018). Changepoint detection in a non parametric time series regression model.

Nadaraya, E. A. (1964). On estimating regression. *Theory of Probability \& Its Applications, 9*(1), 141--142.

Page, E. S. (1954). Continuous inspection schemes. *Biometrika, 41*(1/2), 100-115.

Pishro-Nik, H. (2016). *Introduction to probability,statistics, and random processes.*

Robinson, P. M. (1983). Nonparametric estimators for time series. *Journal of Time Series Analysis, 4*(3), 185--207.

Ross, G. J. (2013). Modelling financial volatility in the presence of abrupt changes. *Physica A: Statistical Mechanics and its Applications, 392*, 350-360.

Truong, C. a. (2018). A review of change point detection methods. *arXiv preprint arXiv:1801.00718*.

Watson, G. S. (1964). Smooth regression analysis. *Sankhy{\=a}: The Indian Journal of Statistics, Series A*, 359--372.

Results on Robust Model Based Estimation in Finite Populations

Conlet Biketi Kikechi*, Richard Onyino Simwa and Ganesh Prasad Pokhariyal

School of Mathematics, College of Biological and Physical Sciences, University of Nairobi, Nairobi, Kenya

Email address:

kikechiconlet@gmail.com (C.B. Kikechi), rsimwa@gmail.com (R.O. Simwa), pokhariyal@uonbi.ac.ke (G.P. Pokhariyal)

*Corresponding author

Abstract

In this article, we present results on nonparametric regression for estimating unknown finite population totals in a model based framework. Consistent robust estimators of finite population totals are derived using the procedure of local polynomial regression and their robustness properties studied (see Kikechi et al (2017), Kikechi et al (2018) and Kikechi and Simwa (2018)). Results of the bias show that the Local Polynomial estimators dominate the Horvitz-Thompson estimator for the linear, quadratic, bump and jump populations. Further, the biases under the model based Local Polynomial approach are much lower than those under the design based Horvitz-Thompson approach in different populations. The MSE results show that the Local Linear Regression estimators are performing better than the Horvitz-Thompson and Dorfman estimators, irrespective of the model specification or misspecification. Results further indicate that the confidence intervals generated by the model based Local Polynomial procedure are much tighter than those generated by the design based Horvitz-Thompson method, regardless of whether the model is specified or misspecified. It has been observed that the model based approach outperforms the design based approach at 95% coverage rate. In terms of their efficiency, and in comparison with other estimators that exist in the literature, it is observed that the Local Polynomial Regression estimators are robust and are the most efficient estimators. Generally, the Local Polynomial Regression estimators are not only superior to the popular Kernel Regression estimators, but they are also the best among all linear smoothers including those produced by orthogonal series and spline methods. The estimators adapt well to bias problems at boundaries and in regions of high curvature and they do not require smoothness and regularity conditions required by other methods such as the boundary Kernels.

Keywords: Finite population, Local polynomial regression, Model based framework, Nonparametric regression, Robust estimators, Survey sampling.

1. Introduction

The idea of nonparametric regression is introduced by Nadaraya (1964) and Watson (1964). Several types of nonparametric regression methods such as the kernels, penalized splines and orthogonal series are in existence (see Dorfman (1992), Hardle (1989) and Zeng & Little (2003)). In many estimation problems, the sample is used to describe and analyze the target population from which it was selected by estimating population parameters and other descriptive and analytic inferences such as correlations. Some common parameters of interest for the finite population $Y = (x_1, x_2, \dots, x_N)^T$ are the finite population total, the finite population mean, the finite population variance and the finite population proportion respectively given by,

$$T = \sum_{i=1}^{N} y_i \tag{1}$$

$$\bar{T} = \frac{1}{N}\sum_{i=1}^{N} x_i \tag{2}$$

$$V(x) = \frac{1}{N}\sum_{i=1}^{N} (x - \bar{x})^2 \tag{3}$$

$$P = \frac{A}{N} \tag{4}$$

Inferences may explore properties of the process that generate the population values (see Bolfarine and Zacks (1991)). We assume that the finite population has been generated by a super population model $\xi = f(x, y, \varphi)$ and we are interested in estimating the population parameters φ, where $\varphi = \alpha + \beta x_i$. The super population model can be applied to predict the unobserved values $y_i's$ after obtaining estimates of α and β using the known auxiliary information $x_i, i = 1,2 \dots, N$ (see Montanari & Ranalli (2005) and Sanchez Borrego (2009)). Using the model ξ, the nonparametric estimator of totals, T has been derived by Dorfman (1992) who has been able to prove the asymptotic unbiasedness and MSE consistency of this estimator. The estimator, however suffers from sparse sample problem, and more work needs to be done to come up with another technique that can overcome this problem. This is where the local polynomial procedure comes in (see Kikechi et al (2017), Kikechi et al (2018) and Kikechi and Simwa (2018)).

This study therefore considers a model based approach to robust finite population total estimation using the procedure local polynomial regression. It is typically of interest to estimate $m(x)$, using Taylor's expansion of the form:

$$m(x) \approx m(x_0) + (x - x_0)m'(x_0) + \frac{(x - x_0)^2}{2!}m''(x_0) + \cdots + \frac{(x - x_0)^p}{p!}m^p(x_0) \tag{5}$$

Then the estimate of $m(x)$ at any value of x is obtained by the minimization problem,

$$\min_{\beta} \sum_{i=1}^{n} \{Y_i - \beta_0 - \beta_1(X_i - x) - \beta_2(X_i - x)^2 - \cdots - \beta_p(X_i - x)^p\}^2 K_b(x - X_i) \quad (6)$$

with respect to $\beta_0, \beta_1, \ldots, \beta_p$, where β denotes the vector of coefficients $\beta = (\beta_0, \beta_1, \ldots, \beta_p)^T$. The result is therefore a weighted least squares estimator with weights $K_b(x - X_i)$.

Using the notations,

$$X = \begin{bmatrix} 1 & x - x_1 & \ldots & (x - x_1)^p \\ 1 & x - x_2 & \cdots & (x - x_2)^p \\ \vdots & & \ddots & \vdots \\ 1 & x - x_n & \cdots & (x - x_n)^p \end{bmatrix}, \qquad Y = \begin{pmatrix} Y_1 \\ Y_2 \\ \vdots \\ Y_n \end{pmatrix}$$

and

$$W = \begin{bmatrix} K_b(x - X_1) & 0 & \ldots & 0 \\ 0 & K_b(x - X_2) & \cdots & 0 \\ & \vdots & \ddots & \vdots \\ 0 & 0 & 0 & \cdots & K_b(x - X_n) \end{bmatrix},$$

we can compute $\bar{\beta}$ which minimizes (6) by usual formula for a weighted least squares estimator,

$$\bar{\beta}(x) = (X^T W X)^{-1} X^T W Y \quad (7)$$

Then, the local polynomial estimator of the regression function $m(x)$ is,

$$\bar{m}(x) = \bar{\beta}_0(x) = e_1^T (X^T W X)^{-1} X^T W Y \quad (8)$$

where e_1 is the $n \times 1$ vector having 1 in the first entry and 0 elsewhere.

The weighted least squares principle to be explored in the local polynomial approximation procedure, opens a wealth of statistical knowledge and thus providing easy computations and generalizations (see Fan and Gijbels (1996)). The local polynomial regression is one of the most successfully applied design adaptive non parametric regression. This estimation procedure is an attractive choice due to its flexibility and asymptotic performance. Because of its simplicity, it can be tailored to work for many different distributional assumptions. It does not require smoothness

and regularity conditions required by other methods such as boundary kernels. The procedure has also the advantage of adapting well to bias problems at boundaries and in regions of high curvature. Furthermore, it is easy to understand and interpret. The estimate is also linear in the response, provided the fitting criterion is least squares and model selection does not depend on the response. See Stone (1977), Fan (1992), Fan (1993) and Ruppert and Wand (1994) among others.

In this article, we combine and present results from simulation experiments carried out by Kikechi et al (2017), Kikechi et al (2018) and Kikechi and Simwa (2018).

2. The Proposed Robust Estimators

Using the procedure of local polynomial regression for $P = 0$ and $P = 1$, the super population model considered for estimating the finite population total estimators is given by,

$$Y_i = m(X_i) + \sigma^2(X_i)\varepsilon_i \quad (9)$$

Specifically, the following assumptions hold for the model considered in the nonparametric regression estimation of $m(x_i)$:

$$E(Y_i/X_i = x_i) = m(x_i)$$

$$Cov\left(Y_i, Y_j/X_i = x_i, X_j = x_j\right) = \begin{cases} \sigma^2(x_i), & i = j \\ 0 \quad , & i \neq j \end{cases} \quad i = 1,2,3,\ldots.,N \quad j = 1,2,3,\ldots,N. \quad (10)$$

The properties of the error are given by,

$$E(\varepsilon_i/X_i = x_i) = m(x_i)$$

$$Cov\left(\varepsilon_i, \varepsilon_j/X_i = x_i, X_j = x_j\right) = \begin{cases} \sigma^2(x_i), & i = j \\ 0 \quad , & i \neq j \end{cases} \quad i = 1,2,3,\ldots.,N \quad j = 1,2,3,\ldots,N. \quad (11)$$

The functions $m(x_i)$ and $\sigma^2(x_i)$ are assumed to be smooth and strictly positive.

Consider the Taylor series expansion of $m(x_i)$ expressed as,

$$m(x_i) = m\left(x_j + ht\right) = m\left(x_j\right) + htm'\left(x_j\right) + \frac{h^2t^2}{2}m''\left(x_j\right) + \frac{h^3t^3}{3}m'''\left(x_j\right) + \cdots$$

$$= m(x_j) + (x_i - x_j)m'(x_j) + \frac{(x_i - x_j)^2}{2!}m''(x_j) + \frac{(x_i - x_j)^3}{3!}m'''(x_j) \dots . \quad (12)$$

The Taylor series expansion is written in a general form expressed as,

$$y_i = \alpha + (x_i - x_j)\beta + \varepsilon_i \quad (13)$$

where x_i lies in the interval $[x_j - h,\ x_j + h]$ and

$$\varepsilon_i = \frac{(x_i - x_j)^2}{2!}m''(x_j) + \frac{(x_i - x_j)^3}{3!}m'''(x_j) + \cdots$$

The constants α and β are solved using the least squares procedure by making ε_i the subject of the formulae, squaring both sides, summing over all possible sample values and applying the weights to obtain a solution to the weighted least squares problem of the form

$$\sum_{i \in S} \varepsilon_i^2 = \sum_{i \in S} \left(y_i - \alpha - \beta(x_i - x_j)\right)^2 K\left(\frac{x_i - x_j}{h}\right) \quad (14)$$

The robust estimators for the mean regression functions and for the finite population totals as derived by Kikechi et al (2017), Kikechi et al (2018) and Kikechi and Simwa (2018) are defined as;

$$\bar{m}_0(x_j) = \sum_{i \in S} \left\{ \frac{\left(S_2(x_j; h) - S_1(x_j; h)(x_i - x_j)\right)}{S_0(x_j; h)S_2(x_j; h) - S_1(x_j; h)^2} K\left(\frac{x_i - x_j}{h}\right) y_i \right\}$$

$$= \sum_{i \in S} w_i(x_j) y_i \quad (15)$$

where

$$w_i(x_j) = \frac{\left(S_2(x_j;h) - S_1(x_j;h)(x_i - x_j)\right)}{S_0(x_j;h)S_2(x_j;h) - S_1(x_j;h)^2} K\left(\frac{x_i - x_j}{h}\right) y_i$$

Implying that the finite population total estimator for $P = 0$ can be estimated using,

$$\bar{T}_0 = \sum_{i\in S} y_i + \sum_{j\in R} \bar{m}_0(x_j)$$

$$= \sum_{i\in S} y_i + \sum_{j\in R}\left\{\sum_{i\in S}\left\{\frac{\left(S_2(x_j;h) - S_1(x_j;h)(x_i - x_j)\right)}{S_0(x_j;h)S_2(x_j;h) - S_1(x_j;h)^2} K\left(\frac{x_i - x_j}{h}\right) y_i\right\}\right\} \quad (16)$$

$$\bar{M}_1(x_j) = \sum_{i\in S}\left\{\frac{\left(S_2(x_j;h) - S_1(x_j;h)(x_i - x_j)\right)}{S_0(x_j;h)S_2(x_j;h) - S_1(x_j;h)^2} K\left(\frac{x_i - x_j}{h}\right) y_j\right\}$$

$$+(x_i - x_j)\sum_{i\in S}\left\{\frac{\left(S_0(x_j;h) - S_1(x_j;h)(x_i - x_j)\right)}{S_0(x_j;h)S_2(x_j;h) - S_1(x_j;h)^2} K\left(\frac{x_i - x_j}{h}\right) y_j\right\}$$

$$= \sum_{i\in S} w_i(x_j)\, y_j + (x_i - x_j)\sum_{i\in s} w_i'(x_j)\, y_j \quad (17)$$

where,

$$w_i(x_j) = \frac{\left(S_2(x_j;h) - S_1(x_j;h)(x_i - x_j)\right)}{S_0(x_j;h)S_2(x_j;h) - S_1(x_j;h)^2} K\left(\frac{x_i - x_j}{h}\right) \quad (18)$$

and,

$$w_i'(x_j) = \frac{\left(S_0(x_j;h) - S_1(x_j;h)(x_i - x_j)\right)}{S_0(x_j;h)S_2(x_j;h) - S_1(x_j;h)^2} K\left(\frac{x_i - x_j}{h}\right) \quad (19)$$

Implying that the finite population total estimator for $P = 1$ can be estimated using,

$$\begin{aligned}\bar{T}_{LL} &= \sum_{i\in S} y_i + \sum_{j\in R} \bar{m}_{LL}(x_j) \\ &= \sum_{i\in S} y_i + \sum_{j\in R}\left\{\sum_{i\in S}\left\{\frac{\left(S_2(x_j;h) - S_1(x_j;h)(x_i - x_j)\right)}{S_0(x_j;h)S_2(x_j;h) - S_1(x_j;h)^2} K\left(\frac{x_i - x_j}{h}\right) y_i\right\}\right\} \\ &\quad + \sum_{j\in R}\left\{\left(\frac{x_i - x_j}{S_0(x_j;h)S_2(x_j;h) - S_1(x_j;h)^2}\right)\sum_{i\in S}\left\{\left(S_0(x_j;h)(x_i - x_j) - S_1(x_j;h)\right) k\left(\frac{x_i - x_j}{h}\right) y_i\right\}\right\}\end{aligned} \quad (20)$$

3. Properties of Model Based Robust Estimators

Considering the fixed equally spaced design model, the following assumptions made in Ruppert and Wand (1994) are used to derive the properties of the model based robust estimators of finite population totals:

(i) The x_j variables lie in the interval $(0, 1)$.

(ii) The function $m''(.)$ is bounded and continuous on $(0, 1)$.

(iii) The kernel $K(t)$ is symmetric and supported on $(-1, 1)$. Also $K(t)$ is bounded and continuous satisfying the following: $\int_{-\infty}^{\infty} K(x)\,dx = 1$, $\int_{-\infty}^{\infty} xK(x)\,dx = 0$, $\int_{-\infty}^{\infty} x^2K(x)\,dx > 0$, $\int_{-\infty}^{\infty} K^2x\,dx < \infty$, $d_k = \int_{-\infty}^{\infty} K^2(t)\,dt$

(iv) The bandwidth h is a sequence of values which depend on the sample size n and satisfying $h \to 0$ and $nh \to \infty$, as $n \to \infty$.

(v) The point x_j at which the estimation is taking place satisfies $h < x_j < 1 - h$.

The expectation, the bias, the variance, the MSE, the unbiasedness and efficiency and the asymptotic relative efficiency of the model based robust estimators have been derived by Kikechi et al (2017), Kikechi et al (2018) and Kikechi and Simwa (2018).

4. Simulation Study

4.1 Description of the data sets

Simulation experiments are carried out to evaluate the performances of the estimators. The data are generated from the super population model of the form,

$$Y_i = m(X_i) + \sigma^2(X_i)\varepsilon_i \qquad i = 1,2,\dots,n \tag{21}$$

The data sets are obtained by simulation using specific models having relations $y_i = 1 + 2(x - 0.5) + \varepsilon_i$, $y_i = 1 + 2(x - 0.5)^2 + \varepsilon_i$ and $y_i = 1 + 2(x - 0.5) + \exp(-200(x - 0.5)^2 + \varepsilon_i$ and $y_i = 1 + 2(x - 0.5)I_{(x\leq 0.65)} + 0.65I_{(x>0.65)}$ for the linear, quadratic, bump and jump populations respectively. The $x_i's$ are generated as independent and identically distributed (iid) uniform (0, 1) random variables. The errors are assumed to be independent and identically distributed (iid) random variables with mean 0 and constant variance. The comparisons of the estimators of T according to their performances is based on Horvitz Thompson, Cochran, Dorfman and the local polynomial regression estimators $\bar{T}_0$ and $\bar{T}_1$ among others.

The Epanechnicov kernel given by $\frac{3}{4\sqrt{5}}\left(1 - \frac{1}{5}t^2\right) |t| < \sqrt{5}$ is used for kernel smoothing on each of the populations due to its simplicity and easy computations using well designed computer programs. In Silverman (1986), the search for optimal bandwidth is done within the interval, $\frac{\sigma}{4n^{1/5}} \leq \frac{3\sigma}{2n^{1/5}}$ where σ is the standard deviation of the $x_i's$. The bandwidths are data driven and are determined by the least squares cross validation method. For each of the four artificial populations of size 200, samples are generated by simple random sampling without replacement using sample size $n = 60$. For each combination of mean function, standard deviation and bandwidth, 500 replicate samples are selected and the estimators calculated.

Table 1: Various Estimators used for comparisons in the simulation experiments

$\bar{T}_{HT}$	*Horvitz − Thompson*	*Horvitz and Thompson* (1952)
$\bar{T}_{REG}$	*Linear Regression*	*Cochran* (197
$\bar{T}_{DORF}$	*Dorfman*	*Dorfman* (199
$\bar{T}_{LP}$	*Local Polynomial*	*Robust estimato*

Table 2. Computational formulae of population totals for different estimators

Estimator	Formulae
$Horvitz-Thompson, \bar{T}_{HT}$	$\bar{T}_{HT} = \sum_{i=1}^{n} \frac{y_i}{\pi_i}$
$Linear\ Regression, \bar{T}_{REG}$	$\bar{T}_{REG} = \sum_{i \in S} y_i + \sum_{i \in R} (\bar{\alpha} + \bar{\beta} x_i)$
$Dorfman, \bar{T}_{DORF}$	$\bar{T}_{DORF} = \sum_{S} Y_i + \sum_{P-s} \bar{m}(x_j)$
$LPRE, \bar{T}_0$	$\bar{T}_0 = \sum_{i \in S} Y_i + \sum_{j \in R} \bar{m}_0(x_j)$
$LPRE, \bar{T}_1$	$\bar{T}_1 = \sum_{i \in S} Y_i + \sum_{j \in R} \bar{m}_1(x_j)$

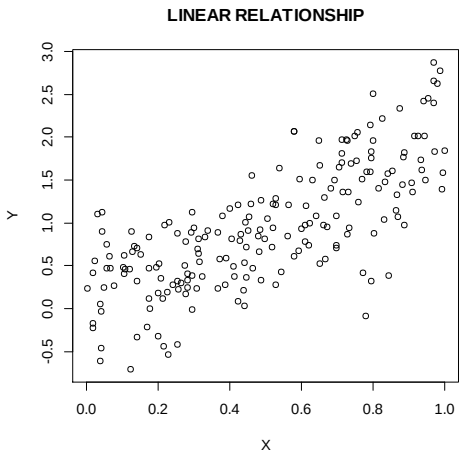


Figure 1. Scatter Diagram for the Linear Data

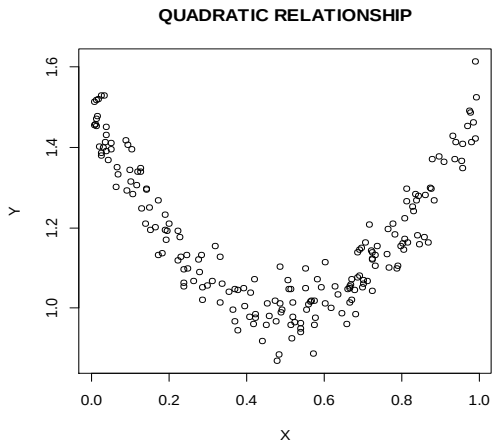
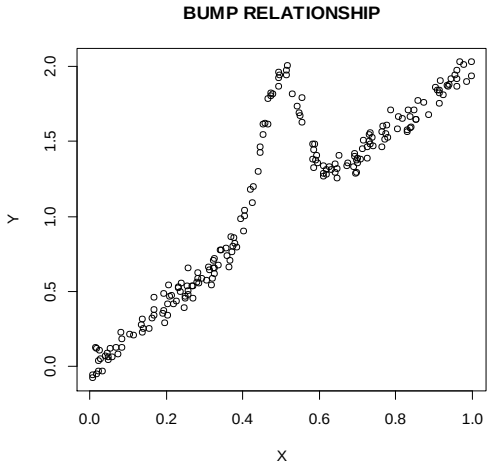


Figure 2. Scatter Diagram for the Quadratic Data



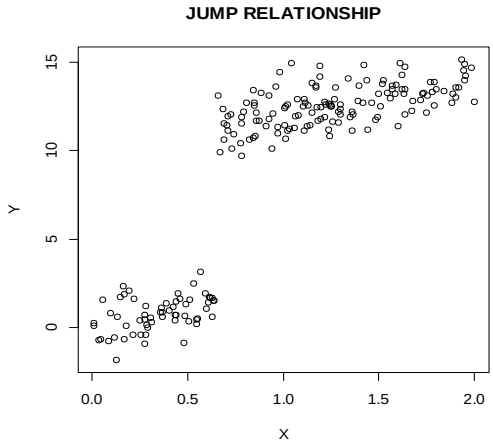


Figure 3. Scatter Diagram for the Bump Data **Figure 4.** Scatter Diagram for the Jump Data

The population totals, prediction errors, the biases, absolute biases, efficiencies, MSEs and AREs for the estimators of finite population totals have been computed. The relative efficiencies (RE) which examine the robustness of various estimators, i.e. the Horvitz-Thompson estimator, the REG estimator and the Dorfman estimator versus the proposed robust estimators have also been computed. Further, the 95 % confidence intervals (CI) and the average lengths (AL) of the confidence intervals of various estimators have been constructed (see Kikechi et al (2017), Kikechi et al (2018) and Kikechi and Simwa (2018)).

4.2 Results

The results for the absolute biases, mean squared errors, relative efficiencies, confidence intervals and average length of confidence intervals for the various estimators are provided in tables 3, 4, 5, 6, 7 and 8 respectively.

Table 3: The Absolute Bias of various estimators in four populations

ABSOLUTE BIAS				
	HORVITZ-THOMPSON(HT)	LINEAR REGRESSION (REG)	DORFMAN (DORF)	LOCAL LINEAR (LL)
Linear	139.1395	3.650095	3.628214	3.626798
Quadratic	163.4725	1.226636	0.403125	0.4323062
Bump	157.7427	2.018801	0.4777851	0.4087753
Jump	1219.668	21.785	9.760465	9.485367

Table 4: The Mean Squared Error (MSE) of various estimators in the four populations

THE MEAN SQUARE ERROR (MSE)				
	HORVITZ-THOMPSON (HT)	LINEAR REGRESSION (REG)	DORFMAN (DORF)	LOCAL LINEAR (LL)
Linear	514.9775	15.36639	15.74559	15.47903
Quadratic	453.5207	1.521063	0.1713249	0.160443
Bump	548.131	4.551133	0.2942485	0.1894413
Jump	35691.94	512.8734	110.7915	97.02299

Table 5: Relative Efficiency of various estimators versus the proposed estimators

RELATIVE EFFICIENCY			
	HORVITZ-THOMPSON (HT)	LINEAR REGRESSION (REG)	DORFMAN (DORF)
	Relative Efficiency	Relative Efficiency	Relative Efficiency
Linear	0.09467563	0.8093	0.95664
Quadratic	0.000464731	0.9954403	0.962707
Bump	0.0002038478	0.02743355	0.9433107
Jump	0.003577862	0.1901854	0.9706123

Table 6: Confidence Intervals of various Estimators with respect to the four populations

95% CONFIDENCE INTERVALS								
	HORVITZ-THOMPSON (HT)		LINEAR REGRESSION (REG)		DORFMAN (DORF)		LOCAL LINEAR (LL)	
	Lower Limit	Upper Limit	Lower Limit	Upper Limit	Lower Limit	Upper Limit	Lower Limit	Upper Limit
Linear	65.43579	78.35652	62.92036	63.24861	62.75978	63.01298	62.62953	63.06378
Quadratic	61.74714	62.41275	60.29736	60.30645	60.25827	60.27853	60.44418	60.47615
Bump	88.43077	92.85335	93.01087	93.14516	92.06424	93.34889	91.91642	93.18671
Jump	503.6836	565.5807	479.9458	495.7306	460.7667	479.1529	465.1171	483.1778

Table 7: Average Length of Confidence Intervals of various Estimators

AVERAGE LENGTH OF CONFIDENCE INTERVALS				
	HORVITZ-THOMPSON (HT)	LINEAR REGRESSION (REG)	DORFMAN (DORF)	LOCAL LINEAR (LL)
Linear	12.92073	0.3282467	0.2532001	0.4342478
Quadratic	0.6656047	0.009090092	0.02025908	0.03197243
Bump	4.422574	0.1342954	1.284649	1.270295
Jump	61.8971	15.78477	18.38621	18.06073

Table 8: The Bias and MSE for $\bar{T}_0$ and $\bar{T}_1$ in the three artificial populations

	Linear		Quadratic		Bump	
	$\bar{T}_0$	$\bar{T}_1$	$\bar{T}_0$	$\bar{T}_1$	$\bar{T}_0$	$\bar{T}_1$
BIAS	5.507608	3.777348	4.7372	0.45116	5.293896	0.4187236
MSE	100.8874	15.40735	18.40769	0.1601695	43.9272	0.1896261

5. Discussion

In all the populations considered according to table 3, the Horvitz-Thompson estimator was the poorest resulting in large biases as compared to the other three finite population total estimators. For all the biases computed, the Local Linear Regression estimator is superior and dominates the Horvitz-Thompson estimator and the Linear Regression estimator in all the populations in consideration. The Local Linear regression estimator also dominates the Dorfman estimator for all the populations except when the population is quadratic.

The MSE results in table 4 indicate that the Local Linear estimators outperform the Linear Regression estimator in all the populations except when the population is linear. The Local Linear Regression estimators are not only superior to the popular Kernel Regression estimators, but they are also the best among all linear smoothers including those produced by orthogonal series and spline methods. In general, Local Linear regression estimation removes a bias term from the kernel estimator, that makes it have better behavior near the boundary of the $x's$ and smaller MSE everywhere.

Further, results in table 5 show that the relative efficiency of the proposed Local Linear estimators to the Horvitz-Thompson estimator, the REG estimator and the Dorfman estimator is less than1. This implies that the proposed Local Linear estimators have a smaller variance than the three estimators and thus the three estimators are less efficient. Generally, the Local Linear regression estimators outperform the HT estimator, the REG estimator and the DORF estimator in all the populations implying that they are robust and are the most efficient estimators.

In table 6, the confidence intervals indicate that the Local Linear regression method dominates the REG and Dorfman methods when the model is incorrectly specified. Generally, the model based estimators are much far better than the traditional design based estimators. The biases under the model based approach are also much lower than those for the design based approach in different populations under consideration.

Finally, we observe in table 8 that the biases and MSEs computed for the local polynomial regression estimator $\bar{T}_1$ are small in all the three populations. The results therefore indicate that the local polynomial regression estimator $\bar{T}_1$ is superior and dominates the local polynomial regression estimator $\bar{T}_0$ for the linear, quadratic and bump populations and thus $\bar{T}_1$ is the most efficient estimator.

6. Conclusion

In this article, we have reviewed and presented model based robust estimators of finite population totals using the procedure of local linear regression as studied by Kikechi et al (2017), Kikechi et al (2018) and Kikechi & Simwa (2018). Results of the bias, mean squared error, relative efficiency, confidence intervals and average length of confidence intervals for the various estimators have been presented. The bias results show that the local linear regression estimators dominate the Horvitz-Thompson estimator for the linear, quadratic, bump and jump populations. The MSE results show that the local linear estimators are performing better than the Horvitz-Thompson estimator and Dorfman estimator, irrespective of the model specification or misspecification. Results also show that the local linear regression estimators are robust and are the most efficient ones.

Results further indicate that the confidence intervals generated by the model based local linear procedure are much tighter than those generated by the design based Horvitz-Thompson method, regardless of whether the model is specified or misspecified. It has been observed that the model based approach outperforms the design based approach at 95% coverage rate.

Generally, the local linear regression estimators are not only superior to the popular kernel regression estimators, but are also the best among all linear smoothers including those produced by orthogonal series and spline methods. The estimators adapt well to bias problems at boundaries and in regions of high curvature and do not require smoothness and regularity conditions required by other methods such as boundary kernels. Simulation experiments carried out on the proposed Local Linear regression estimators in comparison with some estimators that exist in the literature indicate that the proposed estimators are robust and are the most efficient estimators.

Further, the local polynomial regression estimators $\bar{T}_0$ and $\bar{T}_1$ of finite population totals have been studied and comparisons made. Analytically, variance comparisons are explored using the local polynomial regression estimator $\bar{T}_0$ for $P = 0$ and the local polynomial regression estimator $\bar{T}_1$ for $P = 1$ in which results indicate that the estimators are asymptotically equivalently efficient. Simulation experiments carried out in terms of the biases and MSEs show that the local polynomial regression estimator $\bar{T}_1$ outperforms the local polynomial regression estimator $\bar{T}_0$ in all the three artificial populations and therefore, $\bar{T}_1$ is the most efficient estimator.

References

Bolfarine, H. and Zacks, S. (1991). "Bayes and Minimax Prediction in Finite Populations." *Journal of Statistical Planning and Inference*, 28 (2), 139-151.

Cochran, W.G. (1977). "Sampling techniques." Newyork: *John wiley and sons Ltd.*

Dorfman, A. (1992). Nonparametric Regression for Estimating Totals in Finite Populations, Proceedings of the Section on Survey Research Methods. *American Statistical Association*, 622-625.

Fan, J. (1992). Design Adaptive Nonparametric Regression. *Journal of American Statistical Association, 87*, 998-1004.

Fan, J. (1993). Local linear regression smoothers and their minimax efficiencies. *Annals of Statistics, 21*, 196–216. https://doi.org/10.1214/aos/1176349022

Fan J. and Gijbels I. (1996). *Local Polynomial Modeling and its Applications.* London: Chapman and Hall.

Hardle, W. (1989). "Applied Nonparametric Regression Analysis." *Cambridge: Cambridge University Press.*

Horvitz, D.G. and Thompson, D.J. (1952) A Generalization of Sampling without Replacement from a Finite Universe. *Journal of American Statistical Association*, 47, 663-685.

https://doi.org/10.1080/01621459.1952.10483446

Kikechi C.B., Simwa R.O. and Pokhariyal G.P. (2017). On Local Linear Regression Estimation in Sampling Surveys. *Far East Journal of Theoretical Statistics,, 53*(5), 291-311. http://dx.doi.org/10.17654/TS053050291

Kikechi C.B., Simwa R.O. and Pokhariyal G.P. (2018). On Local Linear Regression Estimation of Finite Population Totals in Model Based Surveys. *American Journal of Theoretical and Applied Statistics, 7*(3), 92-101. https://doi: 10.11648/j.ajtas.20180703.11

Kikechi, C.B. and Simwa, R.O. (2018). On Comparison of Local Polynomial Regression Estimators for $P = 0$ and $P = 1$ in a Model Based Framework. *International Journal of Statistics and Probability, 7*(4), 104-114. https://doi.org/10.5539/ijsp.v7n4p104

Montanari, G.E. and Ranalli, M.G. (2005) Nonparametric Model Calibration Estimation in

Survey Sampling. *Journal of the American Statistical Association*, 100, 1429-1442.

https://doi.org/10.1198/016214505000000141

Nadaraya, E.A. (1964). On Estimating Regression. *Theory of Probability Applications, 10*, 186-190.

Ruppert D. and Wand M.P. (1994). Multivariate Locally Weighted Least Squares Regression. *Annals of Statistics, 22*, 1346-1370. https://doi.org/10.1214/aos/1176325632

Sanchez-Borrego, I.R. and Rueda, M. (2009) A Predictive Estimator of Finite Population

Mean Using Nonparametric Regression. Computational Statistics 24,1-14. https://doi.org/10.1007/s00180-008-0140-x

Silverman, B. (1986). "Densty Estimation for Statistics and Data Analysis," Monographs on Statistics and Applied Probability, Chapman and Hall, London.

Stone, C. (1977). Consistent Nonparametric Regression. *Annals of Statistics, 5*, 595-645.

Watson, G. (1964). Smooth Regression Analysis. *Sankhya Series A, 26*, 359-372.

Zheng, H. and Little, R.J. (2003). "Penalized Spline Model-Based Estimation of the Finite Population Total from Probability-Proportional-To-Size Samples." *Journal of Official Statistics* 19, 99–117.

Effects of Problem - Solving Approach to Teaching Mathematics on Students' Achievement in Secondary School in Murang'a County, Kenya

GAKINYA KIGAMBA JOHN

School of Education

Mount Kenya University

Abstract

This study examined the effects of problem – solving to teaching of Mathematics on students' achievements in secondary schools in Murang'a County. The study was guided by the following four objectives to: establish the preference for conventional strategies in teaching Mathematics over problem – solving strategies in teaching secondary school, compare students' performance in Mathematics for those taught using problem - solving strategies with those taught using conventional strategies, assess the students change in attitude towards Mathematics when taught through problem - solving strategies and develop a prototype lesson plan for problem – solving in teaching of Mathematics in secondary schools in Murang'a County.

KEYWORDS: Mathematics, Education Students, Examinations, Teachers

Background to the Study

Mathematics teaching involves the learner, teacher and the society. To achieve the intended aims and goals, the three must be involved (Lesh & Zawajewki, 2007). This study involved learners and teachers through problem – solving to obtain meaningful solutions to mathematical problems. The learner was involved directly in solving real life problems. This was done using problem - solving strategies in specified learning conditions in schools. These conditions provided different learning situations under controlled classrooms. In Plato's division of the liberal arts trivium which included Mathematics, Literature and Gymnasium. This historical perspective has shown that mathematical knowledge occupies the highest status in form of cognitive knowledge. These early fathers of Mathematics considered it to be most essential subject because it teaches students how to think, how to be creative and resourceful by providing them with tools to use (Microsoft Encarta, 2017). According to these early Philosophers, Mathematics is the subject that takes a significant position in developing the individual logical reasoning and plays a significant role in enhancing the country's socio-economic development. This means that social functions in our daily activities involve Mathematics. These social functions include merchants, economics, technology, engineering and biological sciences (Uchechi, 2013).

The core target of high quality Mathematics education is development of problem - solving abilities (Hull, Balka & Miles, 2011). Mathematics skills could be effectively passed through concentrated Mathematics instructional teaching strategies which promote learners retention and understanding. Therefore, in this study, the researcher focused on teaching Mathematics through problem-solving strategy to students in Kenya. The study found that Mathematics achievement was improved in secondary schools in Murang'a County through intervention in problem - solving. This study weighed the importance on teaching Mathematics through problem - solving in context and enquiry - oriented environments in which was characterized by teacher "helping students to construct mathematical ideas while given profound opportunity in learning process" (Lester, Masingila, Mau, & Raymond, 1994).

There is a general feeling that to live normal life in many parts of the world, you require everyday use of Mathematics of some kind. It is also believed that greater advancement of technology has an essential background in Mathematics. Therefore, Mathematics is considered as "servant" and "queen" of all sciences. Since all subjects depend on Mathematics, there is need to study it. However, Mathematics is part of education of life-long learning process which is necessarily essential in life (Cockcroft, 1982). What students learn in school is not enough to make practical live in Mathematics. They are able to learn how to arrange working, understanding and apply Mathematics knowledge they acquire in order to deal with complex and diverse questions in their daily life (Singer & Voica, 2013). The learners should have ability

to distinguish how to use what they have learned and continue to learn and create "new information" to solve problems they meet when they leave schools. That is why it is important to use problem-solving strategy to teach Mathematics.

The study of Mathematics leads to good thinking, correctness of reasoning and originality. Mathematics becomes necessary tool in the investigation of the world around us. It is cited as the science of understanding models that exist within us and solving problems in our daily life (Agwu, 2015). NCTM (2006) proposed that students at secondary school level of education need to learn Mathematics to do extremely well at higher levels. This would provide the prospect to many countries of the world to remain competitive in terms of economy that is needed for social, scientific and technological development. National Council of Teachers of Mathematics (NCTM, 2012) maintained that every student should have equitable and optimal opportunities to learn Mathematics free from deliberate or unintentional based on race, gender, socio-economic status, or language. To close the achievement gap, all students need the opportunity to learn challenging Mathematics from a well-qualified teacher who would make connections to their background, needs, and cultures of all learners (NCTM, 2012).

Teaching Mathematics through problem–solving allows the learners enjoy to learning Mathematics amusingly than when it is self-generated and enforced by teacher or textbook (Lang & Evans, 2006). This study was carried out using problem – solving by students in teaching and learning Mathematics in secondary schools in Murang'a County. It also provided learners an opportunity to create, investigate and explore the solutions to unfamiliar problems. The learners worked in collaboration in small groups learning through plenty of discussion, solving problems in untried situations which were encouraged through problem - solving instructional strategy. This study will enable students to become resourceful aligned with the Country's National Goals of Education that learners should competently solve problems. The intention was to make Kenya middle earning economy with technological innovations (Kenya Vision 2030, 2010). However, despite this, there was a concern those Murang'a County secondary school students Mathematics achievements have been on plummeting. Bruce (2007) who studied ways to get better achieving students suggested that education experiences in Mathematics would explain that dialogue in Mathematics classrooms is very significant in student's achievements. Students in Mathematics classroom feel like a community where constructive ideas could be discussed, developed, questioned and understood (Bruce, 2007).

According to Singer and Voica (2013), in ordinary life, people naturally solve problems in order to satisfy their various needs. Problem- solving is a long – life process which is practised in and out of school. The main objective of secondary school education is to equip students with skills for solving problems to a pertaining variety of areas. Christy and Lima (2007), problem - solving involves higher cognitive skills organised in a systematic order applying an approach of collecting information in order to make a synthesized educated decision. A supportive teacher who engages students in a classroom environment is important to help in developing students' self-confidence in understanding mathematical concepts (Christy & Lima, 2007).

During the past four years KCSE results in Murang'a County have exposed that more than 70% of students succeeded to obtain grades D, D- and E, which are weak grades as assessed by KNEC. This achievement has been similar to National Mathematics performance according to KNEC results analysis. According to Kenya Educational

system, Mathematics learned in form one and form two have adequate content for students to gain a desired grade C or better since form one and form two syllabus covers paper one and papers two about 60% of national examination. The results of Murang'a County have been on decline, although form one and two work is sufficient for someone to perform better than grade C. The numbers of secondary schools in Murang'a County were categorized as A, B, C, and D. These categories of schools were based on the past four years in KCSE examinations Mathematics performance prior to the time of this study. Table 1.1 shows the number of students' Mathematics KCSE entry in each category in secondary schools in Murang'a County during the period of 2014 to 2017. Table 1.2 shows results of each category. The mean score shown in the table reflect that few secondary schools perform extremely well whereas majority of the schools obtain below average grades.

Table 1.1: Student in Mathematics KCSE entry in secondary schools in Murang'a County

between 2014 and 2017

Category	2014		2015		2016		2017	
Mean score	Number of Schools	Number of students	Number of Schools	Number of students	Number of Schools	Number of students	Number of Schools	Number of students
A:6≤X ≤ 12	20	3220	20	3430	20	3354	20	3697
B:4 < X < 6	35	3246	35	3241	35	3531	28	3450
C:3≤ X < 4	60	3813	60	4724	60	4879	57	4094
D:1 ≤ X < 3	195	10327	200	11410	208	11778	228	12301
Totals	310	20536	315	22845	323	23542	333	24633

Source: Murang'a County Education Office, 2018

The table 1.1 shows that most secondary schools in Murang'a County obtain mean grade below 3 which proves that majority of students achieve grade D. The past KCSE results have shown that more than 70% of students attain grades D+, D, D- and E in Mathematics each year. The national performance of Mathematics in secondary schools in Murang'a County in the years 2014, 2015, 2016 and 2017 were an expected. This national examination performance could be improved through studying Mathematics problem solving using situations happening in secondary schools in Murang'a County, whose Mathematics students' performance in KCSE were indicated that results during 2014 - 2017 as shown in Table 1.2 had same trend. The main results revealed that most mistakes made by students are misconception, misunderstanding and language interpretation. These mistakes pointed more to the pedagogical approach of teaching and learning Mathematics. Although most teachers in Murang'a County were trained in Diploma and Bachelor of Education graduates, the strategies they use had contributed to these declining results.

Table 1.2: Students' Performance in Mathematics in KCSE between 2014 and 2017 per category

in secondary schools in Murang'a County

Grades mean scores	Mean 2014	Mean 2015	Mean 2016	Mean 2017
A:6 ≤ X ≤ 12	7.284	7.471	6.748	7.418
B:4 < X < 6	4.346	4.638	4.184	4.591
C:3 ≤ X < 4	3.39	3.24	3.044	3.316
D:1≤ X < 3	1.012	1.006	1.068	1.0023
Totals	4.012	3.941	3.460	3.629

Source: Murang'a County Education Office, 2015

They have a good command of content as well as teaching strategies. They have also participated in project and seminars in strengthening Mathematics and sciences in secondary schools (SMASSE). This was an indication that the cause of low achievement was due to methodologies employed by teachers. Since majority of schools performance is below average, the researcher investigated whether problem – solving approach would alleviate their Mathematics achievement. In the table 1.2, it means that student's performance is affected by the extreme values shown by the quality grades A - C+ in Mathematics (15%) which is the entry grades for University admission. These entry grades are important particularly in studying Science - oriented subjects including Business and Economics, (Kenya University & College Central Placement Service (KUCCPS), 2017).

Miheso O'Connor (2009) noted that students in Kenya are engaged in activities of demonstrated algorithm by their teachers in a procedural level which does not assist students develop conceptual understanding. However, this study involved learners in organized groups to face the challenges of learning Mathematics in secondary schools. Students who were weak found it significantly difficult, although normal rationalization is usually associated with poor Mathematics abilities. Their difficulties included basic Mathematics facts, reading and interpreting problems. This research through quasi - experiment on effect of using problem - solving strategies addressed the gap in the achievement through learners' involvement to construct Mathematics, ability to use Mathematics tools and change of attitude towards formation of Mathematics culture. According to Polya (1957), problem - solving needs practice when deciding on methods required to be used to solve problems. The first thing to do is to look for hints through guessing and experiences of similar problems. Hints are the most important skills in solving problems (Polya, 1957). This study investigated how teaching Mathematics through problem –solving in secondary schools in Murang'a County improves students' achievement. Uchechi (2013) submitted that the students' poor performance in Mathematics in Nigerian Public examinations in secondary schools is traceable to lack of content coverage and poor teaching methods by teachers. This is similar to Kenyan situations. Table 1.3 shows the grades of Mathematics in number of secondary schools in different categories in 2015 as a sample of grades obtained in Table 1.1.

Table 1.3: Students' Performance in Mathematics in KCSE in 2015 in Murang'a County

Category	Entry	A	B	C	D	E
A	3430	768	992	979	653	38
B	3281	90	500	879	1573	240
C	4724	66	317	801	2604	936
D	11410	46	302	742	5399	5136
Total	22845	970	2111	3401	10229	6134

Source: Murang'a County Education Office Mathematics Result Analysis, 2015

Table 1.3 shows Murang'a County Mathematics performance according to ranking, the top 20 schools seem to have reasonably quality grades particularly the 'A' grades within the County. In these schools, about 79.2% grades A whereas the remaining 19.8% to be shared by 295 schools in 2015. The instructional strategies used by these schools were investigated and compared with the ones used by the lower 295 schools. The weak performing schools have 93.6% grades D and E in secondary schools in Murang'a County. The tables also give emphasis of those secondary schools whose performance in more than 200 schools curriculum outcome in secondary schools in Murang'a County is below community expectations. The most important factors for improving Mathematics performance are students' involvement in creating and thinking through the problem (Polya, 2011). By involvement, it means how much time, energy and effort students dedicate to the learning process through problem – solving which this study propose to investigate. The main purpose of this study in the Murang'a County was to inspire learners to discover, cultivate and apply relevant Mathematics concepts after understanding through problem – solving. Students were directed all the way through the development of inquiry and problem – solving processes (Barbeau & Taylor, 2009).

In Malaysia, students' performances at secondary school level of education remained very low and continued to decrease. Mathematics achievement test in TIMSS in 2012 clearly indicates how well students in Singapore have done. The poor Mathematics performance of the students becomes a major concern among Malaysian educational stakeholders. This brings about the need for the government to look at the policy for teaching mathematics. This policy was then commenced and takes up properly after a period of five years in the level of education. In Nigeria, good performance in Mathematics is one of the basic requirements for admission into tertiary institutions (Adeyemi, 2011). Candidates with distinction and good credit grades in five subjects including Mathematics and English language possess the required grades for admissions into Nigerian universities. Emaikwu (2012) in his research 'Effectiveness of three teaching methods in the measurement of students performance in Mathematics in Nigerian secondary schools' there has been drastic drop in the achievement level of learners in Mathematics for the past decades. Uchechi (2013) proposed that students' poor performance in Mathematics in Nigerian public examinations is traceable to lack of content coverage and poor teaching methods by teachers.

In Kenya, the language instruction in learning Mathematics at secondary schools contributed to low outcome in Mathematics curriculum. The students need to learn mathematical language to be meaningfully able to interpret Mathematics problems (Benson & O'Connor, 2015). This could be provided by exposing learners to problem solving. The resultant effect is the poor performance and low retention level in learners' achievement at the national examinations. In view of this observation, there is a serious and great concern among the educational stakeholders and parents. Mathematics is compulsory in Kenya secondary schools curriculum despite the difficulties in the teaching and learning. The poor curriculum outcome in Mathematics may affect individual future career development (Ministry of Education, MoE, 2002). Low performance in Mathematics in Murang'a County would affect future generation on career choices. Therefore, because increasing weak performance in most secondary schools in Mathematics in Murang'a County, there was need to study the instructional strategies preferred by practising teachers and the prominence of problem -solving teaching strategy to improve students' achievement in Mathematics. Secondary schools students being unsuccessful in Mathematics might

have caused by misuse of instructional strategies in which problem-solving strategy was not correctly applied. Through reasonable argument the question is "Why do incompetent teachers engage learners in problem-solving?"Most teachers argue that they do not understand the breadth of problem-solving activities well enough to connect and support learners in them. Problem-solving has never been sufficiently articulated in the instructional strategies (Martin, 2007). The behaviorist practices are emphasized in transmission of knowledge and stress the pedagogical value of formulae, procedures drill and product rather than processes.

2. Methodology

The study employed quantitative quasi – experimental design. The Solomon Four Group design in which 16 schools were sampled according to the category in their previous four years KCSE performance. The target population was 104562 students and 1365 Mathematics teachers in 340 secondary schools in Murang'a County. Form three students comprising 28,475 were sampled. Four schools randomly sampled represented each category where two schools were experimental and two schools were control comprising a sample size of 544 students and 16 teachers. Eight schools participated in pre-test and all 16 schools received post- test Mathematics achievements tests after intervention. Delphi questionnaire was used to collect data on Mathematics teachers' preferred conventional methods of teaching Mathematics. Students' Mathematics attitude questionnaire was used to collect data on students' attitude towards Mathematics in both control and experimental groups. Data from the research instruments were coded and analysed using Statistical Package for Social Sciences (SPSS) version 22. Analysis of Variance (ANOVA) was used test hypotheses where more than three or more, independent t-test was used to test hypotheses at 0.05 level of significance where two variables were involved, Kendal –tau for comparison of used on preferred strategies and Cohen's d. was to determine the effect of power test. Analysis of data generated from students pre-test revealed that, the effect of problem - solving performance was insignificant ($t(273) = 0.924$, Cohen's $d = 0.17$ which is small, $p > 0.05$).

3. Research Findings and Discussions

Students Mathematics Performance

The second objective of the study was to compare performance of students in Mathematics for those taught using problem - solving strategies with those taught using conventional method in secondary schools in Murang'a County. These are considered as being conceptual and cognitive growths were determined by the achievement test using pre-test and post-test questionnaires. The students' were expected to learn Mathematics through problem - solving strategy or other conventional strategies. This study suggested that the students' conceptual understanding was developed better using problem – solving than on procedural knowledge using conventional methods in secondary schools in Murang'a County.

Experimental and Control Groups Pretests

The various combinations of tested and untested groups with treatment and control groups allowed the researcher and extraneous factors to have not influenced the results. E1, C1, E2, and C2 are exactly the same in all four categories according to their previous national examination. They were drawn four similar schools with the same standards. The first hypothesis was that there was no difference in performance to Mathematics achievement (performance) test between the experimental group and the control group. The pre-test involved experimental, E1 and control, C1 groups. The results are shown in table 4.6.

Table 4.6: Pre – test performance per category

	Experimental			Control		
Category	No of respondents	Mean	Standard deviation	No of respondents	Mean	Standard deviation
A	33	54.67	6.79	45	50.44	8.79
B	35	44.94	11.09	35	42.57	10.74
C	40	28.75	13.36	40	30.48	7.71
D	20	25.55	15.15	27	14.70	9.65
Combined	128	39.36	16.39	147	36.57	15.79

Source: Field study, 2018

Table 4.6 shows that there is no difference between groups except from the categories which are due to entry point at secondary school from primary schools where category A are those in national and extra - County schools. The other three categories are from county and sub – county secondary schools. I tested this hypothesis by carrying out a two – sample t –test on the mean scores of the pre –test between the combined experimental group and the control group and the results as shown in table 4.7.

Effects on Students Performance by Experimental and Control Groups Pre-tests

The study employed the Solomon Four - Group design. These had enabled the researcher to have two groups in each category to sit for pre- tests as recommended by Borg and Gall (2003). The two groups were Experimental group (E1) and Control group (C1). A pre-test was conducted before commencement of the treatment

therefore; it was administered to schools involved in groups E1 and C1 prior to the experiment. The pre-test contained 20 items that sought to test students understanding of numbers, number patterns, basic algebra, geometry, measurement and arithmetic which were the focus of this study. The mean scores and standard deviation of the two groups (E1 and C1) were computed. The results were recorded in table 4.7.

Table 4.7: Pre – test performance per group

Combined group	NUMBER	MEAN	VAR	STDEV	Standard error	95% Confidence	T–value
E1	128	39.36	268.66	16.39	1.454	36.52 - 42.20	1.43
C1	147	36.57	249.22	15.79	1.307	43.02 - 39.12	
Combined	275	37.87	259.26	16.10	0.969	35.97 - 39.77	
Difference		2.79					

Pr (T > t) = 0.17

Source: Field study, 2018

VAR: Variance

STDEV: Standard Deviation

Table 4.7 shows that students from experimental group E1 performed slightly better than students from control groups C1 in the pre-test Mathematics performance. This was affected by the mean score of schools in category D, since mean is usually affected by extreme values. To test whether there was a significant difference on effect on students' performance between experimental group E1 and control group C1 in the pre-test, a t-test was computed. In table 4.7 the independent t-test reveal a statistically insignificant difference in the mean scores of pre - test for the experimental (E1) and control groups (C1) at $t(274) = 1.43$, $p = 0.0233$ at $\alpha = 0.05$ where $p > 0.05$. This clearly indicated that students' performance in the pre - test was similar and their level of understanding in problem - solving is the same. Table 4.7, also shows that there was no means difference between groups. The slight mean difference was not statistically significant at $\alpha = 0.05$ as $t = 1.43$ with a small effect size of $d_s = 0.17$ from Cohen's power test interpretation. This shows that the groups were of the same strength in terms of performance of Mathematics achievement test before intervention was initiated.

Thus, the hypothesis which stated that, there was no significant difference on the effects in students' performance for those taught using problem - solving approach and others taught using convention method was retained. This finding agrees with Njoroge & Githua (2013) who in their study found that there was no statistical significance between experimental and control groups' difference in the pre - test Mathematics Achievement Test before commencement of the intervention on Cooperative learning strategy. The study was also interested in determining the attitude of students taught using problem - solving approach had no significant difference in students' attitude before commencement of the treatment using only experimental groups E1 and E2.

Effects of Post – test Students' Performance

The researcher employed the Solomon Four Group designs where all groups experienced the post - test. The comparison between the post–test results of groups E2 and C2; allows the researcher to determine if the actual act of pre – testing influenced the results. To further investigate the stated objective number one and hypothesis one. The post - test was administered to the same categories of students in their schools. The post-test contained 20 items which were based on topics set in the pre -test. The topics discussed during intervention were similar to both pre- test and post -test. The post – test topics included the similar topics that were used during the intervention period and further practice given using textbooks. The intervention topics included natural numbers, number patterns, Algebra, geometry, fractions and integers which provoke learners' creativity.

Analysis of the post - test results are tabulated in table 4.8, table 4.9 and table 4.10 which gives the mean score of students' performance in the post-test of groups E1, C1, E2 and C2. To find out whether there is significant difference in the performance.

Table 4.8: Pretest E1 & C1 and Post – test C2 performance per group

Combined group	NUMBER	MEAN	STDEV	Standard error	95% C -I	T – value
E1 pre-test	128	39.36	16.39	1.454	36.52-42.20	
C1 pre- test	147	36.57	15.79	1.307	34.02 – 39.12	
C2 post - test	143	34.92	14.53	1.219	32.54-37.30	
Combined	418	40.66	15.40			

Source: Field study 2018

Table 4.8 shows that students of experimental group E1 and control C1 pre - test have same performance as control group C2 in the post -test. The claim that C2 control group has the same mean at post - test as it was with experimental group E1 and control C1 group pre - test. To test this, hypothesis I used ANOVA. The null hypothesis to test the differences in more than two normally distributed populations. S^2_B means variations between the means which implies variations of the group means about the overall mean, GM. S^2_W the variations within group variations. This is where variations of the individual values about the group means. Table 4.9 shows the ANOVA table to show that the groups in the study have a common entry point at any first test.

Table 4.9: ANOVA Pre – test E1 and C1 and Post – test C2 performance on three groups

	Variation	Df	Mean square	$F = \frac{S_B^2}{S_W^2}$	P -value
Between groups	3.2391	2	1.62	0.0138	
Within groups	242.10	415	0.583		
Total	245.34				

Source: Field study 2018

I accepted the null hypotheses since there is enough evidence that the three mean scores had no difference between the groups before any treatment is done. The critical value at F (2, 415) is 3.018, whereas the tabulated F = 0.014 (0.014 < 3.018). The null hypothesis is accepted that means are the same for both experimental and control groups before intervention. It also revealed that control group E1 has better performance than C1 as shown in table 4.10 of the post-test. This is a clear indication that the pre-test has had some effect upon the result of post - test. Table 4.10 shows that if there is effect in achievement after treatment of experimental group E1 and control C1 both groups received pre - test before intervention was commenced. The two groups also received post - test immediately after intervention. The claim is that there is no significant difference in Mathematics between students Mathematics using problem -solving approach and those taught using conventional strategies in secondary schools in Murang'a County.

Table 4.10: Statistics for Mathematics Achievement assessment paired differences post test experimental group E1 and control group C1

Variable	Mean	Standard deviation	Standard error	95% confidence interval		t	Degree of freedom
				Lower	Upper		
PosttestE1	48.91	15.42	1.368	46.24	51.58	5.334	274
PosttestC1	38.15	16.26	1.346	35.52	40.78		
Combined	43.53	15.82	1.245				
Difference	10.76						

Pr (|T| > t) = 0.68

Source: Field study 2018

According to table 4.10, it can be seen that there is a significant improvement in students' problem – solving performance after the intervention period. It is obvious that problem - solving can enhance students' problem – solving performance in Mathematics. The result from observation rating scales of problem – solving and students showed the changes of students' behaviour. Observation results showed an average ability of students who could read the problem carefully throughout the intervention period. But she\he used different strategies to persevere with problems and never checked solutions. During intervention period, the learner tried problem better and better getting closer to solution while peer partners gave her/him opportunities to see the different ways to approach mathematical problems. The hypothesis is rejected that the mean scores of post - test for both experimental group E1 and control group C1 are the same. There was a significant difference, since 5.334 > 1.967. The mean of experimental group was significantly higher than that of control group at post - test. The Cohen's d is 0.68 which shows that there is moderate positive effect size of the means difference.

Table 4.11 shows the post - test of experimental group E1 and control C2. The hypothesis that problem solving strategies in teaching and learning Mathematics have no significant effect on the students' performance in secondary schools in Murang'a County.

Table 4.11: Statistics for Mathematics achievement assessment paired differences post test

Experimental group E1 and control group C2.

Variable	Mean	Standard deviation	Standard error	95% confidence interval		t	Degree of freedom
				Lower	Upper		
PosttestE1	48.91	15.42	1.368	46.24	51.58	T = 7.663	
PosttestC2	34.92	14.53	1.219	32.54	37.30		
Combined	41.92	14.90					
Difference	13.99						

Pr (|T| > t) = 0.94

Source: Field study 2018

The analyses of the post – test results are shown in table 12. The table shows there was statistical difference in the mean scores between the two groups as p > 0.05 and t = 7.663. This shows that 7.663 > 1.96, reject the null hypothesis on the basis that differences are significant that there evidence that the means are not equal. The Cohen's d of 0.94 which shows that there is large positive effect size of the means difference which shows that the pre - test has slight effect compared with table 4.11 where C1 had received pre - test.

Table 4.12: Statistics for Mathematics Achievement assessment paired differences post – test

experimental group E1 and experimental group E2.

Variable	Mean	STDEV	Standard error	95% confidence interval		t	Degree of freedom
				Lower	Upper		
Posttest E1	48.91	15.42	1.368	46.24	51.58		127
PosttestE2	45.80	14.24	1.274	43.31	48.29		125
combined	47.37	14.90	0.937	45.54	49.20	T= 1.67	252
difference	3.11						

Pr (|T| > t) = 0.2087

Source: Field study 2018

Table 4.12 shows the two experimental groups E1 and E2. The groups' commenced treatment at the same time, but E2 did not receive pre - test. The hypothesis is that there is no significant difference in means of the students' Mathematics achievement after the post - test when the two groups underwent treatment. The critical value t at 95% confidence limit in degree of freedom DF = 252 is 1.967 by interpolation. When t = 1.67 (1.67 < 1.9670), the hypothesis is accepted and there is enough evidence that the means do not have any difference. The Cohen's d of 0.21 which shows that there is small effect size of the means difference which might have affected by the pre - test.

Table 4.13 shows the post - test of control group C1 and control group C2. The hypothesis that there is no difference between mean of C1and mean of C2 on the students' performance in secondary schools in Murang'a County.

Table 4.13: Statistics for Mathematics Achievement assessment paired differences post - test

control group C1 and control group C2

Variable	Mean	Standard deviation	Standard error	95% confidence interval		t	Degree of freedom
				Lower	Upper		
PosttestC1	38.15	16.26	1.346	35,52	40.78	1.775	288
PosttestC1	34.92	14.53	1.219	32.54	37.30		
Combined	36.26	15.49	0.911	34.48	38.04		
Difference	3.23						

Pr (|T| > t) = 0.2085

Source: Field study 2018

Table 4.13 has shown that the two post - test for control groups C1 and C2. The groups did not receive any treatment at the same time, and C2 did not receive pre - test. The hypothesis is that there is no significant difference in means of the students' Mathematics achievement after the post - test when the two groups did not undergo treatment. The critical value t at 95% confidence limit in degree of freedom DF = 288 is 1.968 by interpolation. When t = 1.775 (1.775 < 1.968), the hypothesis is accepted and there is enough evidence that the means do not have any difference. The Cohen's d of 0.21 which shows that there is small effect size of the means difference which might have affected by the pre - test.

Table 4.14 shows achievement of post - test for combined experimental groups and combined control groups. Table 4.12 and table 4.13 have already shown that there are no significant differences in means of E1 and E2 or means of C1 and C2.

Table 4.14: Mathematics achievement post–test for combined experimental and control groups

Variables	No of respondents	Mean score	Standard deviation	Standard error	95% confidence interval	
					Lower	Upper
Post – test E1	128	48.91	15.42	1.368	46.24	51.58
Post – test E2	126	45.80	14.24	1.274	43.31	48.29
Combined	254	47.37	14.90	0.937	45.54	49.20
Difference		3.11			-2.46	2.70
Post – test C1	147	38.15	16.26	1.346	35.52	40.78
Post – test C2	143	34.92	14.53	1.219	32.54	37.30
Combined	290	36.56	15.49	0.911	34.48	38.04
Difference		3.23			-2.42	2.59

Pr (T > |t|) = 0.287

The control groups C1 and C2 have t value 1.775 which is less than critical 1.96 at 95% confidence interval. As t – score is within this value, there is nothing to suggest that there is any difference between the two means and the hypothesis is accepted.

Table 4.14 shows that students of experimental groups E1 and E2 have better performance than control groups C1 and C2 in the post - test. When this two experimental E1 and E2 combined and two control C1 and C2 combined yielded Cohen's d 0.71 which had moderate positive effect. It also revealed that experimental group C1 had better performance in the post - test than C2 because of pre - test before post - test. This established that there are some external factors which have caused minimum temporal increment. The slight difference between E1 post - test and E2 post - test shows the effect that pre - test has had upon treatment. Further, it shows there was statistical difference in the mean scores between the experimental group E1 and control groups C1 and C2. The difference also existed between experimental group E2 and control groups. This is a clear indication that experimental groups E1 and E2 who were exposed to problem solving approach have shown a better performance than the control groups C1 and C2 respectively. The implication here is that when learning Mathematics through problem - solving strategies, students' performance increased. This was supported by results of Lesh and Zawojewski, (2007) observation that engaging students in mathematical problem - solving activities would help them discover mathematical ideas. Hence students' achievement is enhanced. Table 4.15 shows post - test performance per group and ANOVA hypothesis testing is applied. It also shows the tabulated values for ANOVA.

Table 4.15: Post – test performance per group

Combined group	Number	Mean	Standard deviation	Standard error	95% C -I	T – value
E1	128	48.91	15.42	1.368	46.24-51.58	
C1	147	38.15	16.26	1.346	35.52-40.78	
E2	126	45.80	14.24	1.274	43.31-48.29	
C2	143	34.92	14.53	1.219	32.54 - 37.30	
Total	544					

Source: Field study 2018

Table 4.15 shows that there are significant differences between the post - test experimental groups mean scores and the post - test control groups mean scores, with (t =1.967) and (t =1.96) and small effect size of f = 0.18. The post - test items develop on higher order thinking skills that required students to reason before applying procedure for getting solutions. The assessment involving synthesis and evaluation levels as according to Blooms (1956) taxonomy of cognitive objectives categorization. This shows that a problem – solving strategies to teaching and learning Mathematics can assist students to reason and help them to develop creative and critical thinking which improves their understanding of Mathematics concepts and hence improvement in performance. Students' achievements and understanding are significantly improved when teachers are aware of how students construct knowledge familiar with the intuitive solution methods that students use when they solve problems. Teachers should utilize this knowledge when planning and conducting instruction in Mathematics allowing students' collaborative interactions.

To test hypothesis one (H1) which states that, there is no statistically significant means difference in the effect of problem approach solving on secondary schools students performance on those taught using conventional strategies. Analysis of variance

(ANOVA) was carried out on post - test scores. Table 4.16 gives the result of the ANOVA of the difference in the post test scores.

Table 4.16: ANOVA Post – test performance on four group

	Number	Mean	Variance	Between groups	Within groups
E1	128	48.91	237.72	583.17	229.82
C1	147	38.15	264.39		
E2	126	45.80	202.80		
C2	143	34.92	211.03		
Combined	544	41.95			

Source: Field study 2018

S_B^2 : The between group Variations

S_W^2 : The Within group Variations

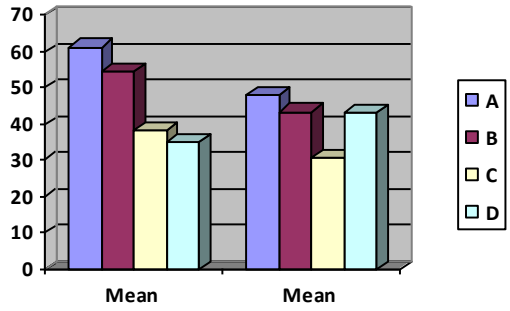
Table 4.16 shows that there was a significant mean difference in the student performance in the post - test between the 4 groups, $F(540) = 2.537$, $p = 0.01$, $\alpha = 0.05$ where $p < 0.05$. The study concluded that using problem - solving in teaching and learning increases students achievement (performance) in Mathematics. Therefore, the hypothesis (H2) which states that, there was no significant difference in students' performance in Mathematics taught using problem - solving approach and those taught using conventional strategies in pre - test and post - test in secondary schools in Murang'a County was rejected. Since this result was statistically significant, the acceptance of that teaching through problem – solving improves the student Mathematic achievement agreed with Kirtikar (2013). Kirtikar reacted on the criticism that conventional teaching did not trigger critical thinking. The cognitive skills and holistic learning environment for students through problem – solving. This study had shown that teaching through problem - solving the students improved the Mathematics achievement. The tables 4.17 and table 4.18 had shown that it existed in the categories and with or without pre - test respectively.

Table 4.17: Post – test performance per category

	Experimental E1 and E2 combined				Control C1 and C2 combined			
Category	NO.	Mean	STDEV	C.I.	NO.	Mean	STDEV	C.I
A	66	61.14	8.66	59.05 - 63.23	90	46.60	11.2	44.29 - 48.91
B	62	54.46	9.58	52.07 - 56.84	61	43.31	9.53	40.92 – 45.70
C	72	38.42	9.64	36.19 - 40.65	77	31.63	10.87	29.20 – 34. 06
D	54	34.32	14.14	30.55 - 38.09	62	28.67	12.32	15.60 - 21. 74
Combined	254	47.37	14.90	45.54 - 49.20	290	36.56	15.49	34.78 – 38.34

Source: Field study 2018

Figure 4.1: *Category comparisons* experimental E1 & E2 and ccontrol C1 & C2



Experimental E1 & E2: Control C1 & C2

Figure 4.1: Category comparisons

Table 4.17 has shown that students' who were presumed to be of low ability, the study shows that there significant gains in Mathematics achievement after intervention of E1 & E2. The control groups C1 & C2 did not improve the Mathematics achievement. The effect size is Cohen's d is 0.71 which is a moderate positive effect in the combined groups. Therefore, the evidence is enough to accept the null hypothesis that the mean scores between control groups and experimental groups are significant.

Figure 4.1, reveals that each category improved after intervention despite the ability of students. The bar graph shows almost a similar increments spread throughout the categories. These shows that teaching Mathematics through problem – solving has a positive impact on the student achievement. The respondents of control groups scored less mean score compared with experimental groups. The importance of these statistics is to show pictorial perspective of each category.

Table 4.18: Solomon Four Group Pre - test and Post - test comparison performance

	Number	Mean
Pre-test experimental E1	128	39.36
Post-test experimental E1	128	48.91
Pre – test control C1	147	36.57
Post – test control C1	147	38.15
Post – test experimental E2	126	45.80
Post – test control C2	143	34.92

Source: Field study 2018

There was no significant difference in performance between the experimental category groups. Similarly, was no significant difference between category control groups. The study found that classrooms community and culture promote students Mathematics achievement in all types of schools. The findings conclude that there is significant improvement in Mathematics achievement between those students who used problem - solving and those students who used conventional strategies.

*Figure 4.2: **comparisons** Experimental E1 & E2 pre –test and post - tests and*

Control C1 & C2 pre-test and post -tests

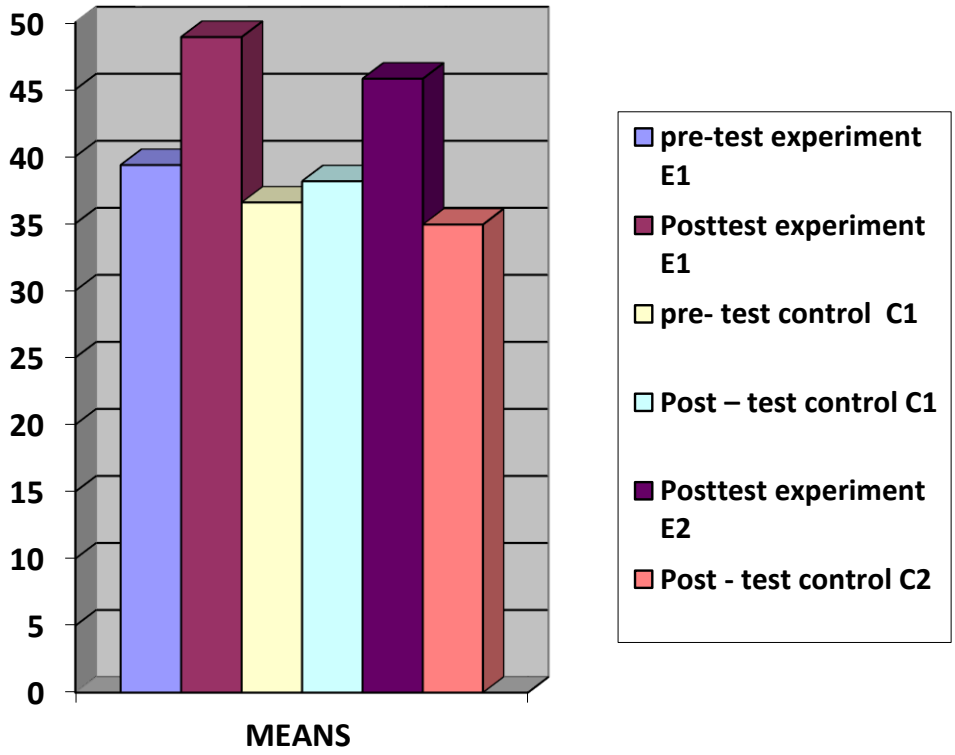


Figure 4.2: comparisons of all tests

Figure 4.2 presents findings on the availability of physical facilities that had affected teaching and learning of Mathematics in secondary schools through creating environment for problem - solving. The category comparison confirms that improvement of Mathematics achievement was almost the same in respect of the schools.

Attitude towards Mathematics

The third objective of the study was to assess students change in attitude towards Mathematics when taught through problem – solving approach with those taught using conventional methods. This study compared the attitudes toward Mathematics between the two groups (experimental and control) at both pre - test and post – test levels. Table 4.19 shows the summary of the mean scores and standard deviation for pre – test results. Table 4.19 has shown that there is no statistical difference between the pre – test experimental group (E1) mean score and pre – test control group (C1) mean score , with $t = 0.16$ at $\alpha = 0.05$. This shows that the attitude of the students were at the same level.

Table 4.19: Two – sample t –test with equal variances on the mean scores of the pre –test for

Experimental E1 and control group C1.

Variable	No of respondent	Mean score	Standard deviation	Standard error	95% confidence interval	
					Upper	Lower
Pre – test E1	128	45.6	3.04	0.19	45. 07	46.13
Pre – test C1	147	45.52	4.07	0.30	44.86	46.18
Combined	275	36.99	3.61	0.17	36.56	37.42
Difference		0.08			-0.5	0.68

P > 0.05 P (|T| > |t |) = 0.02 t = 0.16

The attitude questions were distributed into three sub- scales. These scales were for monitoring students' attitude to learning Mathematics through problem – solving. These subscales include Mathematics behaviour (MB), Mathematics confidence (MC) and Mathematics Engagement (ME). The elaborative feedback on treatment of experimental and control groups was given by computing experiences separately instead of giving total score. The post - test attitude could be reported as individual item rather than aggregate results (Ross & Morrison, 2002). Table 4.20 shows post - test results according to individual items MB, MC and ME in percentage scores. The students interacted and discussed during intervention so they gained confidence, changed behaviour and they were engaged in Mathematics.

Table 4.20: Posttest comparison attitude of experimental groups E1&E2 and controlC1 &C2

	Number	Percentage
Experimental MB	254	24.5%
Experimental MC	254	34.5%
Experimental ME	254	21.5%
Control MB	290	20.5%
Control MC	290	27%
Control ME	290	18%

Source: Field study 2018

There was significant improvement in attitudes towards Mathematics and students achievement when taught through problem - solving. This was in agreement with Dutton who claimed that most standardized achievement tests in Mathematics were obtained in subtests in attitude on problem - solving. The study shown on table 21 revealed that Mathematical attitudes was promoted through problem - solving. Attitude assessment towards Mathematics revealed that experimental groups after post - test at 80.5% against control groups 65.5%.

Figure 4.3: ***Students' attitude Mathematics Behaviour, Confidence, and Engagement***

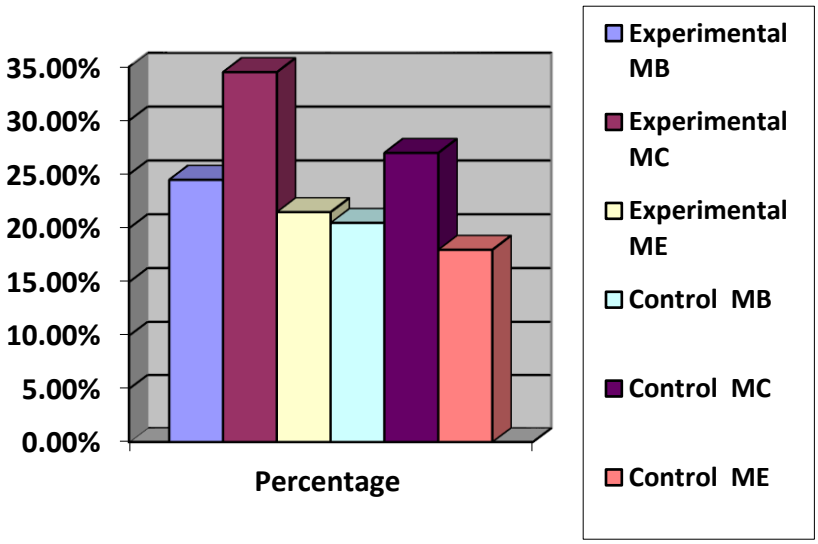


Figure 4.3: Students' attitudes

The chart shows that experimental components were all better than in control groups after intervention. Mathematics behaviour included the students' reaction on the subject while Mathematics confidence increased. The activities during intervention improved learners' engagement.

Prototype Lesson Plan

The fourth objective of the study was to develop a prototype lesson plan for problem –solving in teaching Mathematics in secondary schools in Murang'a County. Problem – solving model lesson plan consist of a structural systematic approach. This is first to ensure that there is consistency in students participation. The teachers and students are required to know what process others are using to keep the process more scientific. Second, the model provide a focus for the group activities where the individual contribution in making – decision to arrive at consensus. The group having considered are possible causes of a problem and all possible solutions. The model uses a series of logical steps to help a group identify the most important causes of the best solutions.

Third, the model will provide avenues to test all the steps and eliminate those which can work in a given situation. This model presents process improvement activities to arrive at a better solution. The model is developed using Bloom's cognitive taxonomy domain. The steps are as follows:

Step one: The learner has acquired knowledge to enable her/him to define the problem. The problem is diagnosed and redefined according to student experiences. If the concept is not familiar the teacher guides the students.

Step two: The student determines the root causes of the problem related concepts. The student must synthesize what he\she has learned and apply it to a new situation.

Step three: The student generate the solutions which are related to the concept. The student can develop alternative solutions and attempt to work the problem backward. The algorithm followed and devised plan can be explored further through students' interactions.

Step four: The student select a solution which is acceptable. The heuristics plan of carrying out problem –solving by selecting suitable strategies.

4 Conclusions

The study has shown that a general problem - solving strategy has been successful in school practice even in the lower category (D). This was confirmed by Lesh and Zawojewski (2007) who suggested that there is need to teach more specific problem - solving strategies to let students effectively deploy their problem – solving strategies and content knowledge. Peer partners and small problem - solving groups gave learners opportunities to see the different ways including teammates approach to mathematical problems. First, the study concluded that a well-developed, planned and executed problem -solving instruction can significantly improve students' achievement in Mathematics.

Second, an effective mathematical problem - solving strategy can be used to promote Students' interest in Mathematics. The teacher would be fully prepared since the strategy is more of student - centred rather than teacher - centred.

Third, problem - solving as the strategy enhances students performance in Mathematics since there will be better improved understanding of the problem and even compute Mathematics in classroom community. The fourth conclusion was that problem solving instruction should be developed and used to enhance deeper understanding and achievement on students'.

REFERENCES

Adeyemi, T. (2011). A comparative study of students' academic performance in public examinations in secondary schools in Ondo and Ekiti States, Nigeria. *Current Research Journal of Economic Theory* Vol. 3(2).pp.36 - 42

Anderson, J., & White, P., (2004). Problem solving in learning and teaching Mathematics, In B Research in Mathematics education in Australasia, 2000 – 2003.

Artzt, A., Armour –Thomas, E., & Curcio, F. (2008). *Becoming a Reflective Mathematics Teacher.* New York Lawrence Erlbaum Associates

Benson, W. & O-Connor, M. (2015). Effects of Mathematical Vocabulary Instruction on Students' Achievement in Mathematics in Secondary Schools of Murang'a County, Kenya. *Journal of Education and Practice* Vol. 6 (18).

Bloom, B., (1956) *Taxonomy of Educational Objectives* NY: Longmans, Green. (Internet source: November 2014).

Brahier, D. (2009) *Teaching Secondary and Middle School Mathematics* Pearson Education, Inc.p52 -53

Dewey, J. (1954). *Experiences and Education*, a Touchstone Book, Kappa Delta Ps, New York Downloaded www.ascd.org.publication, 23rd May 2014.

Dursun, S., & Dede, Y, (2004). The factors Affecting Students Success in Mathematics: Mathematics Teachers Perspectives. *Journal of Gazi Educational Faculty*

Ellen, A., (2011). Validity and Reliability in Social Science: Research in Education and Research

Perspectives. Vol.38 (1) 105-120.

Fonsnot, C. (2014). *Models of Intervention in Mathematics Reweaving the Tapestry*, USA: National Council of Teachers of Mathematics, Pearson.

Gakinya, K. (1987). *Instructional Strategies Used in Teaching Secondary School Mathematics*. M.Ed. Thesis in Kenyatta University.

Goldstein, E. (2011). *Cognitive Psychology, connecting mind research and every day experience* (3rd ed.). Australia Wadswrith Cangage learning

Heason, K. (2004). *Constructivist teaching strategies for diverse Middle –level classrooms* Boston: Pearson Education.

Kenya *Institute of Curriculum Development, (2002) Secondary education syllabus Volume two*, Nairobi, Kenya: KICD (MoE).

Kenya National Examination Council, KNEC, (2018).*The year 2017 KCSE examination report* With question papers and marking schemes. Volume 2: Mathematics & Science: the text Development department KNEC, Nairobi Kenya.

Lawson, A. (2016*). The Mathematical Territory between Direct Modeling & Proficiency Student Achievement*. Downloaded http/www.edu.gov.ca/eng

Marzano, R., Frontier, T. & Livingstone, D., (2011) *Effective Supervision; supporting the art And sciences of teaching* Alexandria, VA: ASCD.

Mbugua, Z., Mungiri, M., & Reche, N., (2012). Factors Contributing to Students' Poor Performance in Mathematics at Kenya Certificate of Secondary Education in Baringo County, Kenya. *American International Journal of Contemporary Research*; Vol. 2 (6) 87-90.

National Council of Teachers of Mathematics, (NCTM, 2012). Closing the Opportunity Gap in Mathematics Education

National Centre for Educational Achievement, (2010). *Best Practice Framework*. Accessed online at http://www.just4kids.org/en/texas/best practices/framework.cfm, January 24, 2010

Njoroge, N., & Githua, N., (2013). Effects of Cooperative Learning/ Teaching Strategy on Learners` Mathematics Achievement by Gender. *Asian Journal Social Sciences & Humanities;* Vol. 2 (2).pp.569-571.

Odindo, F., (2013). *Teaching and Learning Mathematics through Problem - Solving Activities in Kenya Secondary Schools.* Lambert publishers.

Polya, G., (2004). *On solving Mathematics Problems in High School.* In S. Krulik (Ed), Problem- Solving in School Mathematics, Reston, Virginia: NCTM.

Protheroe, N. (2007). "*What Does Good Mathematics Instruction Look like?"* Principals and Education Research service

Saeed, M., Shahvarani, A. & Behzadi, H., (2012). *The role of problem solving method on the Improvement of mathematical learning*. Mathematical Education Trends and Research.

Singer, M. & Voica, C. (2013). *A Problem – solving Conceptual Framework And it's Implications in Designing Problem posing tasks*: Educational Studies in Mathematics.

Slavin, R., (2007). Educational research in an age of accountability, Boston Pearson Education.

Smith, M. & Kay, M., (2011). Practices for orchestrating productive Mathematics discussion. (National Council of Teachers of Mathematics)

Uchechi, F., (2013). Enhancing Mathematics Achievement of Secondary School Students using Mastery learning Approach. Journal of Engineering Trends in Educational and Policy Studies., 4 (6).pp. 848-854.

Umameh, M. (2011). Survey of students' poor performance in Mathematics Bristol: University of Bristol.

Umay, A. (2007). *EskiArkadasimizOkulMatematiginin YeniYuzu*, Aydan Web Tesisleri, Ankara.

Voica, C., & Singer, F., (2013). *Problem modification as a tool for detecting cognitive Flexibility in school children* ZDM, 45(2)

Voica, C., & Singer, F., (2014). Problem posing: A pathway to identifying gifted students. In MCG8 Proceedings (pp. 119–124). Univ. of Denver, Colorado, USA.

Vula, E. & Berdynaj, L. (2011). *Collaborative action research: Teaching of multiplication and* Division in the second grade of primary school. Turkish online Journal of Qualitative Inquiry, 2(2), 7-16.

Walker, J. & Lofton, and S. 2003). *Effect of Problem based Learning Curriculum on Students'* Perceptions of Self - directed Learning, Issues in Educational Research, University of Mississippi Medical Centre.

The Effects Of Holidays On The Ghanaian Equity Market

Alexandra Fafali Kudjawu

Department of Finance, University of Ghana Business School, University of Ghana, Legon, Accra, Ghana. Email: afkudjawu001@st.ug.edu.gh

Charles Andoh*

Department of Finance, University of Ghana Business School, University of Ghana, Legon, Accra, Ghana. Email: candoh@ug.edu.gh

Saint Kuttu

Department of Finance, University of Ghana Business School, University of Ghana, Legon,Accra, Ghana. Email: skuttu@ug.edu.gh

Abstract

This paper sought to determine if the Ghanaian equity market is a semi-strong efficient market by investigating whether or not the holiday effect exists by adopting an ARMAX (2, 2) - GARCH (1, 1) model with GL^{+} innovation. The results show that there are significant positive pre-holiday and post-holiday effects which may not be as a result of bearing higher levels of risk. This finding is important to investors to assist strategise better in order to take advantage of this calendar anomaly discovered on the Ghanaian equity market.

Keywords: ARMAX, calendar anomalies, efficient market hypothesis, GARCH, GL^{+} innovation, holiday effect.

JEL classification*:* C22 E37 G14

Introduction

Efficiency of the stock market is one of the fundamental concepts in finance that is used to explain and understand how the stock market functions. In his effort to explain the concept of efficiency, Fama (1970) proposed the Efficient Market Hypothesis (hereafter, EMH). It refers to the notion that capital markets are efficient and that these efficient markets follow the random walk theory, and past information cannot be used to predict the future. The EMH is categorised into three forms that are conditional to three types of information; strong-form efficiency, semi-strong efficiency and weak-form efficiency. Out of these three forms, the weak-form is believed to be the most acceptable due to the attention and weight it has drawn from the academic society (Jarett, 2010). The EMH states that it is extremely difficult and highly impossible to predict stock prices precisely because of the assumption that the market participants are rational, and the determination of the stock prices are as a consequence of the changes in demand and supply. The EMH has currently become one of the significant areas in financial literature, and as a result, there exists much research on this concept (Mlambo & Biekpe, 2007; Lee, Lee & Lee 2010; Jovanovic, Andreadakis & Schinckus, 2016; Jackson & Kremer, 2007; Hung, 2009).

Malkiel (2003) suggested that "a random walk is a term loosely used in the finance literature to characterise a price series where all subsequent price changes represent random departures from previous prices". It further states that a time series consisting of changes in stock price does not depend on its past or historical values. Again, this theory suggests that because of the nature of stock prices to change randomly, it is highly not possible to predict the stock prices. It is prudent to note that when stock prices follow a random walk theory or model, it does not imply that the stock market with relatively rational investors is efficient (Malkiel, 2003).

However, with the discovery of calendar anomalies, the EMH has come under attack in the financial literature. Calendar anomalies are said to be the likelihood for returns of financial assets to display systematic patterns at certain times of the day, a particular day, a specific month (Alagidede & Panagiotidis, 2009; Brooks, 2008, p. 454). The discovery of these patterns has for the past three decades remained an area of increased interest for researchers since its existence has been discovered in most developed capital markets in the world. A study by Fields (1931) is considered as the first documentation of the existence of seasonalities. Fields (1931) analysed the weekend effect and showed that Saturdays tended to record higher returns than on Fridays and

Mondays. After the study carried out by Fields (1931), many more anomalies have been discovered

(Dodd & Gakhovich, 2011; Alagidede & Panagioditis, 2009; Mensah, Bokpin & Owusu-Antwi, 2016) and are used to test the efficiency of various stock markets. Some of such anomalies are the day-of-the-week (Alagidede & Panagioditis, 2009; Mensah et al., 2016), month-of-the-year

(Alagidede & Panagioditis, 2009) and the holiday effect (Dodd & Gakhovich, 2011; Marrett & Worthington, 2009; Yuan & Gupta, 2014; Wassiuzaman, 2017 & 2018).

Marret and Worthington (2009) pointed out that the existence of calendar anomalies in the stock market returns is one of the consistent themes in the literature on market efficiency. The different studies together with their outcomes and explanations associated with the calendar anomalies make their study and examination even more crucial to all stakeholders in the financial industry. This has succinctly been emphasised by Jahfer (2015) and Lim, Ho and Dollery (2009) that the study of calendar anomalies is important to financial managers and investors, as well as, others who have a keen interest in developing a trading strategy that will lead to profit eventually. Hence, the most researched calendar anomalies in literature are the day-of-the-week and the month-of-the-year (Alagidede & Panagioditis, 2009; Mensah et al., 2016). Another of such calendar anomalies which has not received much attention is the holiday effect which is defined as "the tendency of stock market returns to exhibit significant higher returns before a holiday in comparison with the other normal trading days" (Ariel, 1990; Dodd & Gakhovich, 2011; Yuan & Gupta, 2014).

Generally, holiday effects in stock markets are said to occur when the returns on a day or few days (differ from studies to studies and could be a day or 5 days) before a holiday exhibit a pattern that is usually abnormally higher than the returns on other regular trading days. According to Pearce (1996) and Brockman and Michalyuk (1998), "the 'holiday effects' are one of the most mysterious and baffling of all the seasonal anomalies". A holiday is defined by Lakonishok and Smidt (1988) as a day

when trading would normally have occurred but did not as a result of the holiday occurring. Studies on the holiday effect on the various stock market returns have been approached from various perspectives; in terms of specific holidays such as Ramadan effect, Halloween effect, Chinese Lunar New Year effect, religious and secular holiday effects, firm size effect, and industry level effects among others.

Huang, Shieh and Kao (2016) affirm that decision making by human beings always begins with behavioural finance. Behavioural finance has become a widely popular and relevant concept in financial literature. It has its roots firmly in the fields of psychology, economics, finance and sociology (Schindler, 2007; Huang, Shieh & Kao, 2016). Behavioural finance argues that behaviours and mood are among the many other factors that affect humans in the shaping of their investment preferences. There is no doubt that market participants have been exhibiting "irrational" attitudes as a matter of fact and this is arguably supported by Malkiel (2003) who is of the view that mistakes are bound to be made as a result of collective judgment of investors. This leads to the occurrence of pricing irregularities and prediction over some time and their persistence lasts for a short period. Again, Malkiel (2003) believes that the existence of a holiday effect is a violation of both the semi-strong and weak form of efficiency because of the patterns of returns around holidays. As a result, an investor either adopting the technical approach or the fundamental approach can earn abnormal returns, and this implies that in an efficient market no such anomaly should exist.

Early studies (Ariel, 1990; Pettengill, 1989; Lakonishok & Smidt, 1988; Kim & Park, 1994) show that holiday effect exists in developed countries and other studies including Alagidede (2013) indicate the presence of holiday effects in developing markets. For example, Yuan and Gupta (2014) examined the Chinese Lunar New Year (CLNY) holiday effect in major Asian stock markets: South Korea, Japan, Taiwan, China and Hong Kong as well as India for a period of 1st September 1990 to 28th March 2012. They used an ARMA (1,1) - GARCH (1,1) model to

investigate the daily stock index returns for each market and concluded that in all the Asian stock markets a positively significant pre-Chinese Lunar New Year effect is observed. They also employed the ARMA-GARCH-in-mean (ARMA-GARCH-M) model to determine if the abnormal

returns observed before the CLNY holiday was as a result of a reward for risk. From their findings, they observed that whereas the higher returns in other markets are caused by unknown factors as well as conditional risk, the higher returns in China were as a result of compensation for high risks levels. They argued that previous studies that ignored the distributional properties of the returns series and adopted the Ordinary Least Squares (OLS) dummy regression model did not acknowledge the reality of this property.

Alagidede (2013), on the other hand, investigated the presence of pre-holiday effects in six African countries and the implication on stock market efficiency by using OLS dummy regression model. By estimating a regression model and examining the significance of the mean and variance of the returns series, South Africa was the only country that showed significantly high pre-holiday returns. Alagidede (2013) opined that the discovery of a pre-holiday effect within the period of study could have been as a result of the closing effect which is usually characterised by high returns for observed financial assets at market closing and good mood usually exhibited by investors around holidays.

Contrary to previous studies such as Tonchev and Kim (2004) on the holiday effect in Central and Eastern European countries, Dodd and Gakhovich (2011) documented abnormal positive and significant post-holiday returns as well as the usual pre-holiday effect. Their paper applied OLS regression and found out that there was no single industry that was responsible for this effect. However, the Christmas and New Year holidays were the most common holidays which produced the highest and significant returns. They finally concluded that the diminishing trend of the preholiday effect observed was an indication of the improvement in the level of market efficiency of the countries considered over the period of the study.

Wasiuzzaman (2018) also performed a similar study as Yuan and Gupta (2014) where the study sought to find the relationship between Hajj pilgrimage on the Tadawull All-Shares Index (TASI) and other industrial indices of the Saudi stock market. She used ARMA (1,1) - GARCH (1,1) model from January 2010 to August 2014 and found that the Hajj period had a significant increase in volatility for all the indices except for that of the agricultural, petrochemical, food and retail sectors and an insignificant and negative impact on the mean return of all the sector indices and the TASI. However, Wasiuzzaman (2017) had established the fact that TASI of Saudi stock market exhibited a Hajj effect.

Various explanations have been attributed to the existence of holiday effects. First is the existing relationship between the holiday anomaly and other calendar anomalies. This is to say that holiday effect occurs as a result of other calendar anomalies such as the day-of-the-week effect or the month-of-the-year. Researchers such as Lakonishok and Smidt (1988), Ariel (1990) and Liano, Marchand and Huang (1992) used this explanation and concluded that the high returns observed on days preceding a holiday were not as a result of the occurrence and existence of the other calendar anomalies. Secondly, it has been established that holidays affect the mood, demeanour, attitude, and daily experiences of persons who observe them (Mehran, Meisami & Busenbark, 2012). It is believed that the euphoria which accompanies holidays, affects the mood and demeanour of most investors and make them act in ways that tend to affect the activities of the stock market. The euphoria that accompanies holidays is believed to eventually lead to short covering and a general and impulse buying pressure (Jacobs & Levy, 1988; Thaler, 1987; Lahav, Shavit & Benzion, 2016).

Wright and Bower (1992) are of the view that judgements of investors are likely to originate from their moods, whence a bad mood and a good mood could lead to pessimism and optimism respectively. Therefore, emotions and moods associated with the various holidays are believed to tend to exert influence on the decisions of investors and eventually their stock market attitudes. However, according to Keim (1989), Pettengill (1989) and Lahav, Shavit and Benzion (2016), the holiday effect discovered over the years was neither as a result of euphoria nor short-sellers as suggested by previous researchers but could be as a result of an effect of just the market closing which they termed the "closing effect".

Overall, the holiday effect can be put into two forms; pre-holidays and post-holidays. The preholidays are days preceding holidays and post-holidays are days after holidays. However, the preholiday effect occurs when the returns of pre-holidays are significantly different from the other regular trading days, and the post-holiday effect occurs when the returns of post-holidays are also significantly different from the other trading days. Ariel (1990) and Dodd and Gakhovich (2011), believe that generally before a holiday, investors tend to close their short-selling positions before a holiday and reopen them after the holiday. This phenomenon tends to increase the

pre-holiday returns and decrease post-holiday returns which lead to significant positive and significant negative returns respectively.

Most equity markets in Africa have relatively smaller sizes as compared to their counterparts in developed countries. Hence, the data set adopted in stock markets where the holiday effect was discovered in other parts of the world, cannot be used to explain the behaviour of investors on the Ghanaian stock market. This is because the variables used in such studies could have been influenced by distinct factors which are peculiar to their territories. Ghana, just like any other developing African market is characterised by illiquidity, higher volatility, low number of listed firms as well as thin trading which are unique to her environment and as such needs a unique study to focus on the holiday effect on the Ghanaian equity market.

A variety of studies on the efficiency of the Ghanaian equity market suggest that it is fully inefficient (Magnuson & Wydick, 2002; Appiah-Kusi & Menya, 2003; Simons & Laryea, 2006; Jefferis & Smith, 2005; Ntim, Opong, Danbolt & Dewotor, 2011, Mensah et al., 2016). The indication of this inefficiency serves as a perfect focal point for breeding of market anomalies. A market can become an efficient market if investors try to beat the market as a result of inefficiencies discovered (Malkiel, 2003). A further probe into the Ghanaian financial literature shows that majority of the studies conducted in the field of market efficiency employed the standard efficiency test such as the correlation test, run test, Augmented Dickey-Fuller test, random walk models, GARCH models (Magnuson & Wydick, 2002; Appiah-Kusi & Menya,

2003; Simons & Laryea, 2006; Jefferis & Smith, 2005; Ntim et al., 2011) amongst other tests and models. In the Ghanaian context, however, the existing works on calendar anomalies have concentrated mostly on the month-of-the-year effect and the day-of-the-week effect (Alagidede & Panagiotidis, 2009; Mensah et al., 2016).

In relation to the holiday effect, there have been various methods that have been employed by previous research papers. For instance, Pettengill (1989), Ariel (1990) and Kim and Park (1994) calculated the mean and variance of the daily returns as well as their respective t-statistics or chisquare to determine if there existed a difference in their average returns. Later studies such as Marrett and Worthington (2009), Alagidede (2013), Dodd and Gakhovich (2011) went a step further to estimate a simple Ordinary Least Square (OLS) dummy regression model to check the significance and equality of means. However, in their study Chien, Lee, and Wang (2002) pointed out that the OLS method might not have been a suitable approach for testing the seasonality in stock markets because of its empirically invalid assumptions (heteroscedasticity, non-normality and serial correlation). In effect, the use of OLS regression may result in questionable findings

(Brooks, 2008, p. 386). According to Wasiuzzaman (2017) and Yuan and Gupta (2014), the ARMA (p, q) - GARCH (x, y) where $p, q, x, y \in \mathbb{Z}^+$ rather appears to be a better model than the OLS regression to test seasonalities since it has the capacity of treating autocorrelation and timevarying variance in the data (heteroscedasticity).

This paper is different from other existing papers on developing equity markets in three respects. First and foremost, extant researches that investigated the holiday effect did not adjust for thintrading. This study adjusted the returns for thin-trading to remove any potential bias in its analysis. Again, the study used ARMAX-GARCH model to determine if the Ghanaian equity market had the holiday effect because it was capable of correcting for autocorrelation and heteroscedasticity in the data.

Finally, the error terms assumed a GL^{+}innovation (Andoh, 2009 & 2010;ah & Atsu, 2018) instead of the usual normal distribution imposed by other researchers. This is because most financial studies which used GARCH models and assumed normality test failed to appropriately model the leptokurtic nature of their distribution (tail of dithe stribution) (Nidhin & Chadran, 2013).

This paper focuses on holiday effect while examining the efficiency of the stock market through behavioural approach of investors to discover if there are abnormal returns as a result of a holiday occurring, using an ARMAX (p, q) - GARCH (1, 1) model, an extension of the ARMA (p, q) -

GARCH (1, 1) model proposed by Wasiuzzaman (2017) and Yuan and Gupta (2014).

The rest of the paper is organised as follows: Section 2 focuses on a review of relevant literature. Section 3 highlights the methodology used in the analysis of the data. Section 4 provides an analysis and a discussion of the empirical results. Section 5 summarises and concludes the paper.

Methodology

Method of data analysis

The natural logarithm of the relative price was calculated for each day and a time series made up of continuously compounded returns was generated. A continuously compounded returns R_t time series (Brooks, 2008, p.7), is defined as inter-daily difference of the natural logarithm of the daily prices of the assets (P_t) and is given by:

$$R_t = log\left(\frac{P_t}{P_{t-1}}\right) * 100 \quad (2.1)$$

where R_t is the continuous compounded return on day t, P_{t-1} is the closing market price in period $t-1$ (previous period), P_t is the closing market price in period t (current period) and log is the natural logarithm.

Thin trading is said to occur when stocks do not trade at every consecutive interval (Alkhazali, 2008). Emerging markets are on the whole described as having low liquidity, considerable high volatility, thin trading and perhaps investors that are less informed and have access not only to unreliable but also delayed information (Bekhaert, Erb, Harvey & Vishanta, 1998; Alkhazali, 2011; Yuan & Gupta, 2014). Hence, in testing the efficiency of the stock markets in these emerging markets, considering thin trading effects is imperative because it is usually considered as one of the major characteristics of such markets (Alkhazali, 2011). Most African equity markets have empirically documented pervasive thin trading (Appiah-Kusi & Menyah, 2003; Mlambo & Biekpe 2007; Kuttu, 2017) as such, the continuously compounded returns that are calculated for this study in equation (2.1) were adjusted for the thin trading effect with a methodical approach used by Kuttu (2017) and propounded by Miller, Muthuswamy and Whaley (1994). The following autoregressive model of order 1 (AR (1)) is used:

$$R_t = \alpha + \beta R_{t-1} + \varepsilon_t \quad (2.2)$$

where α is the constant term, R_{t-1} is lag of the returns of order 1 or the previous term of the returns, β is the parameter for the past term of the returns, and ε_t is the error term. The adjusted returns for thin trading are calculated by:

$$\hat{R}_t^{adj} = \frac{\hat{\varepsilon}_t}{1-\hat{\beta}} \quad (2.3)$$

The calculated $\hat{R}_t^{adj}$ is the adjusted for thin trading return at time t and it is hereafter represented

as $\tilde{R}_t$.

These returns $\tilde{R}_t$ are then classified into pre-holiday returns, post-holiday returns and other normal trading days' returns. The average daily returns for n number of days preceding the holiday and after the holiday are determined.

Looking for a pattern using event study approach

Event studies, according to Sharpe, Alexander and Bailey (1999), are undertaken to see how returns react to an event or the release of information. This approach, in the end, is attempting to see if the returns are high or low, react rapidly or slowly or are just normal before the event. The event date for this study was defined as a date on which the holiday was declared and was observed during the period of study. Event studies essentially are usually employed to investigate the magnitude and relevance of a particular event on another event. The event window was extended to 8 days before and after the event date, in this case, the date of the holiday. That is, the event window for this study had 17 days (-8, -7, -6, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8). Most researchers found the holiday effect on a day before and a day after a holiday (Ariel, 1990; Dodd & Gakhovich, 2011; Lakonishok & Smidt, 1988). However, there could be cases that these investors made preparations long before and in anticipation of the holiday or reacted oppositely after a holiday. Therefore, this allowed us to explore the timing of market reaction surrounding the observance of a holiday by investigating if there was any pattern in the returns of the stocks that could be as a result of a holiday occurring.

ARMAX (p, q) – GARCH (x. y) models

ARMA models incorporating GARCH-type innovations have been widely used to analyse particularly economic and financial time series data because of their stylised properties which include leptokurtic, volatility clustering and leverage effects (Makridakis & Hibon, 2000; Brooks, 2008, p. 380; Tolikas, 2011). The ARMA-GARCH models are basic and important because the theorems and methods obtained in these models form the basis for further inferences for more sophisticated models (Oh & Lee, 2017). The ARMA-GARCH model seems to be preferably better to adopt when testing for seasonalities than the OLS regression because ARMA-GARCH has the capacity of dealing with both autocorrelation and a time-varying variance in the dataset (Yuan & Gupta, 2014; Wasiuzzaman, 2017; Brooks, 2008, p. 386). One requirement that needs to be considered when using ARMA models is that the time series under consideration should be stationary. GARCH models have over the years received a

considerable amount of attention from both the academic and other stakeholders since their discovery by Engle (1982), Bollerslev (1986) and Taylor (1986). These classes of models have in the past become important and have played a vital role in financial literature and most especially in the analysis of financial time series data particularly when it has to do with analysing and forecasting volatility (Angabini & Wasiuzzaman, 2011).

An extension of the ARMA model is the ARMAX model, which is an Autoregressive Moving Average (ARMA) model with exogenous input variables, X (Pickup, 2015, pp. 114-115). For this paper ,the exogenous variables are the dummy variables: preholiday and postholiday. This allowed us to determine whether the returns of the sub-periods (pre- and post-holidays) are statistically and significantly higher than the returns of the normal trading days. The ARMAX- GARCH model ,was estimated and modelled in the following form and assumed a GL^{+} innovation (Andoh, 2009; Yuan & Gupta, 2014; Wasiuzzaman, 2017 & 2018). To determine if there was a holiday effect in Ghana and to investigate which holidays celebrated led to a holiday effect, we used the following equations:

$$\tilde{R}_t = c + \beta_1 preholiday + \beta_2 postholiday + \omega_p \tilde{R}_{t-p} + \delta_q \quad _{t-q} + _t \qquad (2.4)$$

$$\tilde{R}_t = c + \sum_{j=1}^{11} \beta_j preholiday_j + \sum_{j=12}^{22} \beta_j postholiday_j + \omega_p \tilde{R}_{t-p} + \delta_q \varepsilon_{t-q} + \varepsilon_t \qquad (2.5)$$

where $preholiday$ and $postholiday$ are dummy variables that represent 1 for all pre-holiday average returns and post-holiday average returns respectively and 0 otherwise, c is the average returns for normal trading days, $\beta_j, j = 1, \ldots, 22$ are the average returns coefficients for either preholidays and post-holidays for holiday j.

The innovations of $_t$ are modelled as GARCH (x, y) given by:

$$_t = \sigma_t z_t \,, \qquad (2.6)$$

$$\sigma_t^2 = \omega_0 + \sum_{i=1}^{x} \omega_i \sigma_{t-i}^2 + \sum_{j=1}^{y} \rho_j \, z_{t-j}^2 \qquad (2.7)$$

$$\omega_0 > 0, \omega_i \geq 0, \rho_j \geq 0 \,, \ \omega_i + \rho_j < 1 \qquad (2.8)$$

where σ_t^2 is the conditional variance based on the historical data, ω_i expresses how volatility responds to movements in the market (ARCH effects of the ith order of the AR model) and ρ_j measures the persistence shocks caused by extreme values of the conditional variance (GARCH effects of the jth MA model)).

According to Brooks (2008, p. 394), the GARCH (1, 1) is sufficient to capture all the volatility clustering in the data. Therefore, the study used the GARCH (1, 1) process to model the volatility present in the returns series data ($\tilde{R}_t$) and assumed it had a GL^{+} innovation (see Andoh, 2010 & 2009; Andoh et al., 2018). The estimates of the parameters of the ARMAX-GARCH model were obtained via a maximum likelihood.

Parameter estimation

Let $f(\ , \theta)$ denote the joint density function for a vector of observations defined as:

$$= (\varepsilon_1, \varepsilon_2, \varepsilon_3, \dots, \varepsilon_n) \quad (2.9)$$

where θ is the parameter space.

For $= (\varepsilon_1, \varepsilon_2)$ the conditional probability function (or likelihood function) is:

$$f(\varepsilon_2 | \varepsilon_1) = \frac{f(\varepsilon_2, \varepsilon_1)}{f(\varepsilon_1)} \quad (2.10)$$

$$f(\varepsilon_1, \varepsilon_2) = f(\varepsilon_1).\, f(\varepsilon_2 | \varepsilon_1) \quad (2.11)$$

Therefore, by a repeated application of the definition of the conditional density function, we have for n number of observations, $= (\varepsilon_1, \varepsilon_2, \varepsilon_3, \dots, \varepsilon_n)$, the joint density function is given as:

$$f(\varepsilon|\theta) = \prod_{t=(x \vee y)+1}^{n} f(\varepsilon_t | F_{t-1}) \;.\; f(\varepsilon_{x \vee y}, \dots, \varepsilon_2, \varepsilon_1) \quad (2.12)$$

where $F_{t-1} = (\varepsilon_{t-1}, \varepsilon_{t-2}, \varepsilon_{t-3}, \dots\dots\dots, \varepsilon_{t-(x \vee y)})$ and $n \gg x, n \gg y$.

The log-likelihood function is given as:

$$l(\varepsilon | \theta) = \sum_{t=(x \vee y)+1}^{n} \log(f(\varepsilon_t | F_{t-1})) + \log(f(\varepsilon_{x \vee y}, \dots, \varepsilon_2, \varepsilon_1)) \quad (2.13)$$

We use the following definition of Andoh (2009):

Definition: A random variable X has the GL^+ innovation (for short $GL^+(\mu, v^2, a, b)$) if its density

function is given by:

$x-\mu$

$$f(X) = b\frac{loga}{v}\frac{a^{-\frac{}{v}}}{\left[1+a^{-\frac{x-\mu}{v}}\right]^{b+1}} \quad (2.14)$$

The following preposition from Andoh (2009) is needed: let $X \sim GL^+(\mu, v^2, a, b)$ and suppose that

$Var(X) = \sigma^2$ and $E(X) = 0$. Then $\exists$ a unique $\tilde{a} \in \mathcal{R}^+$ such that

$$X \sim GL^+\left(\frac{-\sigma(\varphi(b)-\varphi(1))}{\sqrt{\varphi'(b)+\varphi'(1)}}, \sigma^2, \tilde{a}, b\right) \quad (2.15)$$

To use the GL^+ innovation for the ARMA-GARCH model, let =

$SGL^{+}(b)$.

$$z_t \sim GL^{+}\left(\frac{-(\varphi(b)-\varphi(1))}{\sqrt{\varphi'(b)+\varphi'(1)}}, 1, \tilde{a}, b\right)$$

Hence, $f(\varepsilon_t|F_{t-1}) = GL^{+}\left(-\frac{\sigma_t(\varphi(b)-\varphi(1))}{\sqrt{\varphi'(b)+\varphi'(1)}}, \sigma_t^2, \tilde{a}, b\right)$, where $\tilde{a} = \sqrt{\varphi'(b)+\varphi'(1)}$ and

$$SGL^{+}(b) = SGL^{+}\left(-\frac{(\varphi(b)-\varphi(1))}{\sqrt{\varphi'(b)+\varphi'(1)}}, 1, \tilde{a}, b\right).$$

The log-likelihood function $l(\varepsilon_t|\theta)$ is obtained as follows

$$\mathrm{L}(\varepsilon_t|\theta) = \log\left(\prod_{t=1}^{n}\left[blog\,\tilde{a}\,\frac{\tilde{a}^{-\varepsilon_t-\left(\frac{(\varphi(b)-\varphi(1))}{\sqrt{\varphi'(b)+\varphi'(1)}}\right)}}{\left[1+\tilde{a}^{\varepsilon_t+\frac{(\varphi(b)-\varphi(1))}{\sqrt{\varphi'(b)+\varphi'(1)}}}\right]^{b+1}}\right]\right) + \log(f(\varepsilon_{p\vee q}, \dots, \varepsilon_2, \varepsilon_1)$$

$$\left(\tilde{a}^{-\varepsilon_t-\left(\frac{(\varphi(b)-\varphi(1))}{\sqrt{\varphi'(b)+\varphi'(1)}}\right)}\right)\Bigg] \quad (2.16)$$

$$= \sum_{t=1}^{n}\left[\log(blog\,\tilde{a}) + \log\left(\frac{\tilde{a}^{\left(\sqrt{\varphi'(b)+\varphi'(1)}\right)}}{\left[1+\tilde{a}^{\varepsilon_t+\frac{(\varphi(b)-\varphi(1))}{\sqrt{\varphi'(b)+\varphi'(1)}}}\right]^{b+1}}\right)\right] + \log(f(\varepsilon_{p\vee q}, \dots, \varepsilon_2, \varepsilon_1) \quad (2.17)$$

$$= \sum_{t=1}^{n}\left\{\log(b) + \log(log\,\tilde{a}) + \log\left(\tilde{a}^{-\varepsilon_t-\left(\frac{(\varphi(b)-\varphi(1))}{\sqrt{\varphi'(b)+\varphi'(1)}}\right)}\right) - \log\left[\left[1+\tilde{a}^{-\varepsilon_t-\frac{(\varphi(b)-\varphi(1))}{\sqrt{\varphi'(b)+\varphi'(1)}}}\right]^{b+1}\right]\right\} + \log(f(\varepsilon_{p\vee q}, \dots, \varepsilon_2, \varepsilon_1) \quad (2.18)$$

$$= \sum_{t=1}^{n} \left\{ \log(b) + \log(1) + \log(\log(\tilde{a})) + \left(-\varepsilon_t - \left(\frac{(\varphi(b)-\varphi(1))}{\sqrt{\varphi'(b)+\varphi'(1)}} \right) \right) \log(\tilde{a}) - (b+1)\ \log\left(1 + \tilde{a}^{\,-\varepsilon_t - \frac{(\varphi(b)-\varphi(1))}{\sqrt{\varphi'(b)+\varphi'(1)}}} \right) \right\} + \log(f(\varepsilon_{p\vee q}, \dots, \varepsilon_2, \varepsilon_1) \quad (2.19)$$

Let $l_c = \log(f(\varepsilon_{p\vee q}, \dots, \varepsilon_2, \varepsilon_1)$ however, there is no analytical form this term in equation 2.19. As

$n \to \infty$, $l \to l_c$ is neglible (See Andoh, 2010). Therefore l_c is the conditional distribution of ε_t

given its past information F_{t-1}.The negative conditional distribution $(-l_c)$of ε_t given its past information F_{t-1} and neglecting the constant in the log-likelihood function is:

$$= -\sum_{t=(x\vee y)+1}^{n} \left[-\log(b) + \left(\varepsilon_t + \left(\frac{(\varphi(b)-\varphi(1))}{\sqrt{\varphi'(b)+\varphi'(1)}} \right) \log(\tilde{a}) \right) + (b+1)\log(1 + \tilde{a}^{-\left(\varepsilon_t + \frac{(\varphi(b)-\varphi(1))}{\sqrt{\varphi'(b)+\varphi'(1)}} \right)} \right]$$

(2.20)

The values of the parameters are determined numerically by using Matlab R2017a.

Risk metrics

The VaR and the Expected Shortfall (ES) (ES is also referred to as the Conditional Value at Risk (CVAR)) were used to measure the risk associated with the holiday effect on the Ghanaian equity market. It is worth noting that the value of the CVaR risk measure is always higher than the value of the VaR risk measure, simply, because the former is larger than the later by the average excess of all losses exceeding VaR (Danielson, 2011, p. 87).

Data

This paper utilised mainly secondary data from the Ghana Stock Exchange (hereafter referred to as GSE) which primarily consists of daily closing prices of both the main financial index on the GSE; All Shares Index and the Ghana Stock Exchange Composite Index (hereafter referred to as GSE-CI). Currently, the total number of stocks listed on the GSE is approximately 43 as well as about 21 Licensed Dealing Members (LDM). The dataset for this study had a total of 2476 number of daily observations. The data used to carry out this empirical research was divided into three groups: pre-holiday days (105 observations), post-holiday days (105 observations) and other normal trading days (2266 observations). When identifying the existence of a holiday anomaly within the dataset used, the long period of daily historical data will help capture the various trends both within short and long periods because the larger the size of the data, the better estimates are believed to be.

The period of this study is from 3rd January 2007 to 30th December 2016; a 10-year period. The year 2007 was used because in 2006 the trading days changed from 3 days to 5 days while the year 2016 was the last full year that data could be obtained. This study used a more recent set of data for its analysis because changes and trends that have occurred in the past would have been documented. The same dataset was also used to examine the risk pattern around holidays.

The holidays to be considered are as follows: "New Year's Day, Independence Day, Good Friday,

Easter Monday, May day, African Union day, Republic day, Eid-ul-Fitr, Eid-al-Adha, National Founder's day, Farmers' day, Christmas day and Boxing day". These holidays are public holidays as defined by the Holidays Act-2001 (Act 601), approved by the country's Ministry of Interior. However, there is no trading when any of the above falls on a week day due to the observance of the holiday. The dates of the holidays were collected from the Ministry of Interior website.

However, for this paper, holidays such as "Good Friday" and "Easter Monday" are put together and referred to as Easter holiday while "Christmas day" and "Boxing day" are also considered Christmas holiday.

The pre-holidays are described as one or more number of days before a holiday. The post-holidays are also described as one or more number of days after a holiday. Normal trading days are any other trading around which no holiday occurs. However, trading on the Exchange takes place on all days except for days on which a holiday is observed. Hence, trading takes place on normal days, pre-holiday days and post-holiday days.

According to the descriptive statistics of the daily return series adjusted for thin trading as shown in Table 1, the normality is rejected, and the residual diagnostic test performed on the data indicated that the data is not well-behaved because it had the presence of heteroscedasticity, serial correlation and non-normality. However, the data was stationary.

(Insert Table 1 here)

Empirical results

Event study

Event date is defined in this study as the day on which the holiday occurred during the period of study. An event window around each holiday was centred such that there was the one day before and one day after a holiday event window, and 2nd day before and 2nd day after a holiday event window till the 8th day before and 8th day after a holiday event window. The creation of these different event windows was to enable the determination of any abnormal price reactions following shortly after or leading up to the occurrence and observance of a holiday. The estimation window was created for each defined event window. The data failed the normality test as shown in the descriptive statistics table; Table 1. The study, thus, focused more on the ARMAX-GARCH results because of the non-normality of the error terms in the data and the presence of heteroscedasticity and serial correlation. ARMA (2, 2) was used to run the estimation because it had the least information criteria value (shown in

Appendix B) and based on the regression model stated in equation (2.4), the parameters of the ARMAX model was estimated and the results presented in Table 2.

(Insert Table 2 here)

A cursory look at Table 2 above shows abnormal returns for different days within the event window of interest. The regression results show that existing investors on the GSE have over the 10 years of the study exhibited diverse trading patterns with regards to the observance and celebration of a holiday. For instance, on the 8th day before a holiday, investors are seen to have engaged in substantially higher trading activities (average returns of about 13.59 per cent). Again, approximately 19.39 per cent was recorded on the 7th day before a holiday and represents the day on which the most trading activities occurred. However, from the 1st day to the 5th day before a holiday there was a major reduction of trading activities with some fluctuations between these days.

However, a closer analysis of this same table reveals that the GSE documented both pre-holiday and post-holiday effects because, for most of the days, the returns from pre-holidays or postholidays are much higher than those of other normal trading days. These results could be an indication that on the whole, the GSE is informationally inefficient as suggested by Dodd and Gakhovich (2011). Pre-holiday effects occurred on the following windows; the 2nd day, the 7th day and the 8th day before a holiday because the other five windows either recorded lower returns (in comparison to returns of normal trading days) or had results that were not significant. Also, post-holiday effects occurred on all windows except on the 3rd day, 4th day, 6th day and 8th day after a holiday. It is worth noting that despite the significant results recorded in windows such as

(+1 day), (-3 days, +3 days), (-4 days, +4 days) and (+5 days), there were neither pre-holiday effects nor post-holiday effects. This is because during these windows the average returns were lower than those of the normal trading days.

On the occasion where the average returns were positive, it implied that the market experienced greater returns. Conversely, the market underperforms when it recorded negative returns. Hence, the highest average return of 19.39 per cent for the period; pre-holiday days which occurred on the 7th day before a holiday may be due to the euphoria associated with holidays, meaning investors on the GSE currently tend to trade more on the 7th day before a holiday, in anticipation of the holiday as suggested by Gama and Vieira (2013). Again, the principle of demand and supply where excess demand leads to increase in price level may explain the phenomenon observed on the 5th day after a holiday and the post-holiday effects recorded the highest average returns of about 18.92 per cent. Another explanation for these observations may be as a result of buy-sell strategies as iterated by Meneu and Pardo (2004), where investors are just willing to buy before a holiday and buy after a holiday. These findings are not consistent with the findings of Ariel (1990) and Dodd and Gakhovich (2011) who found holiday effects occurring on one day before and one day after a holiday in the US and some selected Central and Eastern European countries respectively. These findings as discussed above were significant at 5 per cent significance level.

Comparing the returns for the 5th day and the 7th day (these days recorded the highest return as shown in Table 2), the 7th day had the least information criteria (AIC, HQIC and SBIC) which are an indication that it is the best model fit for this data set in this

study. Hence, the holiday effect on the Ghanaian equity market occurs on the 7th day before and 7th day after a holiday. The preholiday effect discovered supports the results of Alagidede (2013), Ariel (1990) and Dodd and Gakhovich (2011). Again, the positive post-holiday effect observed in the results was the same observation discovered by Dodd and Gakhovich (2011) which is a contradiction to studies by Ariel (1990) who opined that usually investors after a holiday open their short-selling positions which leads to lower and sometimes negative post-holiday returns. This implies that currently, investors on the GSE trade more on the 7th day before and the 7th day after a holiday. During this period the average returns before a holiday are about 19.39 per cent and 8.94 per cent after a holiday.

Finally, the significant pre- and post-holiday effects suggest that investors can take advantage of this anomaly and trade before or after a holiday on the GSE. For instance, on the (+7, -7) window the pre-holiday return is positively significant and about 969.50[96] times higher than the average return for normal trading days. The post-holiday returns are 447[97] times higher than the average returns for normal trading days.

Specific holiday

(Insert Table 3 here)

The results in Table 3 suggest that Farmers day holiday celebrated in Ghana is responsible for the pre-holiday effect observed in Table 3. Again, both the Farmers day holiday and the Workers day holiday are contributing to the post-holiday effects documented in Table 2. These results show that there is some evidence of the existence of abnormally high returns on the 7th day before Farmers' day of about 93.74 per cent and on the 7th day after both Farmers' day and Workers day of about

46.15 per cent and 47.93 per cent respectively. Again, these returns are significantly different from zero at 95 per cent confidence level.

Generally, there seems to be insufficient evidence for individual holidays generating significant returns in this study. Out of the 11 holidays considered in this study only two exhibit significant results. Even holidays that are regarded as highly celebrated such as the New Year and Christmas holidays did not exhibit any significant results, contrary to Dodd and Gakhovich (2011).

The holiday effect on the GSE is further examined to substantiate if investors are influenced by strictly Ghanaian-specific observed holidays or non-Ghanaian specific holidays. Ghanaian holidays, for the purpose of this study, are holidays that are celebrated uniquely and only recognised in Ghana. They include the Independence Day, Republic day, Farmers' day and

Founders day holidays. From the results on Table 4 A), both Ghana- specific holidays and NonGhanaian specific holidays contribute to the holiday effects observed in Table 2.

$$\frac{\frac{postholiday\ return}{normal\ trading\ day\ return}}{\frac{preholiday\ return}{normal\ trading\ day\ return}}$$

[96] Based on results from Table 2,

[97] Based on results from Table 2,

Again, the results from Table 4 B) show that there are significant and positive pre-holiday and post-holiday effects for Ghanaian holidays and only a positive and significant pre-holiday return for Non-Ghanaian holidays. However, the average return for days before Ghanaian holidays are greater than the other three categories, an indication that there are more trading activities in the market during such periods.

(Insert Table 4 here)

Risk measures

As opined by Andoh (2010) one interesting property of the GL^+ innovation is the malleable nature of the skewness and shape parameters. This is important because of the empirical features of assets returns (such as leptokurtic- fatter tails). With the use of the GL^+ innovation, one is able to choose the appropriate parameter that will appropriately represent the true nature of the distribution of the data and, this is done by adjusting at least one of the parameters and in this case the skewness parameter, b. The options for a suitable parameter b for this study were estimated and are shown in the Table 5.

(Insert Table 5 here)

In Table 5, the estimate for the level where the skewness, $b = 12.1$ is preferred because it has the closest values for the various levels of VaR at 5 per cent, 2.5 per cent and 1 per cent. Also, the non-negativity and stationarity assumptions were adhered to. Figure 1 shows 5 per cent VaR estimates (dashed lines) as well as the VaR exceedances (dotted lines) of the GARCH (1, 1)

process $\sigma_t^2 = 0.1 + 0.23z_{t-1}^2 + 0.60\sigma_{t-1}^2$ with a GL^+ innovation for the period 2007-2016. The

exceedances (dotted line) are the times where the VaR exceeded the 5 per cent VaR levels. The next section examined the VaR and CVaR for the various sub-periods: pre-holiday, postholiday and normal trading days. The VaR at 5 per cent significance level for each period was calculated and compared amongst one another. The results are displayed in Table 6. (Insert Table 6 here)

The results in Table 6 shows the Value-at-Risk (VaR), and the Conditional Value-at-Risk (CVaR) estimates at 5 per cent significance level for the sub-periods considered include the pre-holiday days, post-holiday days and the normal trading days. From the results, the risk measures for the normal trading days are higher than the other two sub-periods. Hence, in the worst 5 per cent of returns, an investor's average loss is approximately 8.43 per cent during post-holiday days on the GSE, and for an investor on the GSE, there is a 5 per cent chance to lose about 8.78 per cent of his or her return during pre-holiday days. This could be an indication that the high and abnormal returns observed in Table 5 above for the pre-holiday and post-holiday returns (in comparison to that of the normal trading days) could not be as a result of bearing higher risk as observed by Yuan and Gupta (2014) in China.

However, it could be as a result of other unknown factors as iterated by Yuan and Gupta (2014) as possible explanations for other countries where their risk measures were relatively lower.

(Insert Table 7 here)

From Table 7 it is observed that the risk levels associated with some of the holidays (Workers post and Farmers' pre) that had significant returns as observed in Table 3 are relatively lower. Workers post-holiday had a CVaR of approximately 0.541 per cent, and Farmers pre-holiday of about 0.694 per cent are comparatively lower than that of the other holidays considered in this study. These are indications that the significant results shown in Table 3 for both Farmers preholidays and Workers day holiday may be as a result of other factors such as mood or closing effect.

This notwithstanding, the Farmers post-holiday recorded the third highest CVaR of approximately

1.757 per cent after that of the Christmas pre-holidays (1.797%) and Normal trading days

(62.19%). This value is an indication that the abnormally high returns observed in Table 3 for

Farmers post-holiday may be as a result of their associated risk.

Generally, it is observed that all the holidays from both Table 8 and Table 9 have VaR and CVaR values below 5 per cent.

(Insert Table 8 and Table 9 here)

From Tables 8 and 9, it is generally observed that the risk levels associated with the returns of Ghana- specific holidays are relatively lower than that of the non-Ghana specific holidays. This again is an indication that the returns that contributed to the pre-holiday and post-holiday effects in Table 4 did not have their associated risk levels as a contributing factor.

A robustness test on the standardised residuals (z_t) and the squared standardised residuals (z_t^2)was performed and reported in Appendix C and shows there was no ARCH effect in the standardised residuals and squared standardised residuals. Whereas, there was no serial correlation in the squared standardised residuals, beyond the 7th lag there was evidence of relatively little serial correlation in the standardised residuals. The two variables showed that they were not normally distributed but leptokurtic. This is a confirmation that the ARMAX-GARCH model is an appropriate model for the data used for the study.

Summary, Conclusion and Recommendations

Summary

The results suggest that there exist statistically significant positive pre-holiday effects and positive statistically significant post-holiday effects on the Ghanaian equity market.

Furthermore, the study showed that the pre-holiday effects and post-holiday effects discovered occurred on the 7th trading day before and on the 7th trading day after a holiday. Significant pre- and post-holiday returns are implications that investors can

take advantage by trading on the 7th trading day before and the 7th trading day after a holiday which means that there might be a possibility for investors to earn abnormal returns in these sub-periods.

Again, whereas, the 7th trading day before and the 7th trading day after the Farmers day holiday contributed significantly to the pre-holiday and post-holiday effects respectively, only the 7th trading day after the International Workers day (Labour day) holiday contributed significantly to the post-holiday effects. This suggests that on these days, the average returns on the GSE are abnormally higher than the returns on normal trading days indicating that on these days' investors tend to trade more.

Conclusion

The study revealed that the Ghana-specific holidays which are defined as holidays that are celebrated uniquely and only recognised in Ghana have pre- and post-holiday effects. The nonGhana specific holidays which are holidays that are celebrated both locally and internationally, on the other hand, recorded only a pre-holiday effect. The results show that generally, only nonGhanaian specific post-holiday returns are insignificant at 5 per cent. The highest average return was documented in the Ghana-specific pre-holiday days, followed by non-Ghana specific preholiday and the Ghana-specific post-holiday had the least average return. This shows that investors could take advantage of Ghana-specific pre-holiday days in terms of the holiday effect. Generally, investors are usually attracted to take on higher risks which usually come with higher returns.

However, the results from the study show that the significant abnormal returns observed in both the pre- and post-holidays sub-periods were not serving as compensation to existing investors on the Ghana Stock Exchange for taking a higher level of risks because the risk measures for the normal trading days were higher than the other two sub-periods.

Also, the Farmers post-holiday returns amongst the other holidays considered recorded the second highest Value-at-Risk (VaR) and Conditional Value-at-Risk (CVaR) estimates, whereas the other two holiday days (Farmers pre-holiday and Workers post-holiday) that recorded significant abnormal returns had relatively lower risks. These are indications that this could be the explanation for the abnormal returns observed during the Farmers post-holiday days and other factors such as mood, euphoria, closing effect could explain the Workers pre-holiday and Farmers pre-holiday abnormal returns. Again, the associated risk for non-Ghana specific pre-holiday days was the highest, and the lowest was recorded for the Ghana-specific pre-holiday days. Hence, investors could take advantage of the Ghana-specific pre-holiday days because the risk associated with these average returns are minimal.

Finally, the overall results showed that returns on the 7th day before International Workers day and the 7th day after either International Workers day or Farmers' day or both were abnormally higher and statistically significant. These results indicate that on Workers day and Farmers day the GSE experienced stronger investor reactions than on the other holidays, and therefore investors should trade on these days without necessarily worrying about their risk levels. The results also show that mood may not be the reason associated with the occurrence of the holiday effect since holidays such as Christmas, New Year and Easter had insignificant returns.

Recommendation and direction for further research

With the discovery of the holiday effect on the Ghanaian equity market and an eventual indication of the inefficiency of the market, investors on the GSE can make abnormal returns by taking advantage of this calendar anomaly. Again, with the indication of the inefficiency of the GSE, it is prudent for the regulatory bodies especially the Security and Exchange Commission (SEC) and the Ghana Stock Exchange (GSE) to formulate policies that are geared towards making the stock Exchange in Ghana efficient. These policies should encourage investors to take advantage of this anomaly because according to Malkiel (2003) a market can eventually become efficient if its inefficiencies are taking advantage of. This claim is supported by Philpot and Peterson (2011) who explained that particularly the day-of-the-week effect had gradually disappeared since 2003 and attributed it to the fact that investors had incorporated these patterns in their trading strategies with the widespread of its knowledge of existence.

Direction for further research

The number of years considered for this study was 10, this period compared to similar works done by Ariel (1990), Kim and Park (1994) and Dodd and Gakhovich (2011) could be referred to as a short period. There is, therefore, the need for further studies to consider larger observations by using hourly returns. It will be intriguing also to investigate the significance of the holiday effect by controlling for other market anomalies such as the month-of-the-year and day-of-the-week effects. This will determine if the holiday effect discovered is as result of other calendar anomalies. Additionally, investigating the holiday effect in relation to the following themes: firm size level, industry level, liquidity and its persistence over time will help determine which industry, firm size level experiences the holiday effect and if the holiday effect is persistent over time. Finally, investigating the spillover effects of public holidays in other nations such as Nigeria on the GSE will help know if holidays celebrated in other countries affect the way investors react on the GSE.

REFERENCES

Alagidede, P. (2013). Month-of-the-year and pre-holiday effects in African stock markets. *South*

African Journal of Economic and Management Sciences, 16(1), 64-74.

Alagidede, P., & Panagiotidis, T. (2009). Calendar anomalies in the Ghana Stock Exchange. *Journal of Emerging Market Finance, 8*(1), pp. 1 - 23.

Alkhazali, O. (2008). The impact of thin trading on day-of-the-week effect: Evidence from the

United Arab Emirates. *Review of Accounting and Finance, 7*(3), 270-284.

Alkhazali, O. (2011). Does infrequent trading make a difference on stock market efficiency?

Evidence from the Gulf Cooperation Council. *Studies in Economics and Finance, 28*(2), 96-110.

Andoh, C. (2009). Stochastic variance models in discrete time with Feedforward Neural Networks.

Neural Computations, 21, 1990-2008.

Andoh, C. (2010). GARCH family models under varying innovations. *Decision, 37*(1), 22-55.

Andoh, C., Mensah, L., & Atsu, F. (2018). GL^{+} and GL^{-} Regressions. In: Anh L., Dong L., Kreinovich V., Thach N. (eds) *Econometric for financial Applications*. ECONVN 2018. Studies in Computational Intelligence, vol 760, pp. 63-77, Springer, Cham.

Angabini, A., & Wasiuzzaman, S. (2011). GARCH models and the financia crisis: A study of the Malaysian stock market. *The International Journal of Applied Economics and Finance, 5*(3), pp. 226-236.

Appiah-Kusi, J., & Menyah, K. (2003). Returns predictability in African stock markets. *Review of*

Financial Economics, 12(3), 247-270.

Ariel, R. (1990). High stock returns before holidays: Existence and evidence on possible causes. *Journal of Finance, 45*(5), 1611-1626.

Bekhaert, G., Erb, B. C., Harvey, R. C., & Viskanta, T. E. (1998). Distributional characteristics of emerging markes and asset allocation. *Journal of Portfolio Management, 24*(2), 102-116.

Bollerslev, T. (1986). Generalized Autoregressive Conditional Heteroscedasticity. *Journal of*

Econometrics, 31, pp. 307-327.

Brockman, P., & Michalyuk , D. (1998). The persistent holiday effect: Additional evidence.

Applied Economics Letter, 5(2), 205-209.

Brooks, C. (2008). *Introductory Econometrics for Finance* (2 ed.). Cambridge University Press,

Cambridge, New York, NY.

Chien, C., Lee, C., & Wang, A. (2002). A note on stock market seasonality: The impact of stock price volatility on the application of dummy variable regression model. *The Quarterly Review of Economics and Finance, Elsevier, 42*(1), 155-162.

Danielson, J. (2011). *Financial Risk Modelling.* (1 ed.) . UK: John Wiley & Sons Ltd.

Dodd, O., & Gakhovich, A. (2011). The holiday effect in Central and Eastern European financial markets. *Investment Management and Financial Innovations, 8*(4), 1.

Engle, R. F. (1982). Autoregressive Conditional Heteroscedasticity with estimates of the variance of United Kingdom inflation. *Econometrica*, 50, pp. 987-1007.

Fama, E. (1970). Efficient capital markets: A review of theory and empirical work. *Journal of*

Finance, 25(2), 383-417.

Fields, M. J. (1931). Stock prices: A problem verification. *The Journal of Business, 4*, 415.

Gama, P., & Vieira, E. (2013). Another look at the holiday effect. *Applied Financial Economics,*

23(20), 1466-4305.

Holiday Act, (2001) retrieved on *30th November, 2018* from

http://www.ilo.org/dyn/natlex/docs/ELECTRONIC/88538/101272/F1539860417/GHA885

38.pdf

Huang, J., Shieh, J., & Kao, Y.-C. (2016). Starting points for a new researcher in behavioral finance. *International Journal of Managerial Finance, 21*(1), 92-103.

Hung, Jui-Cheng (2009). Deregulation and liberilazation of the Chinese stock market and the improvement of market efficiency. *The Quarterly Review of Economics and Finance, 49*(3), 843-857.

Jacobs, B. I., & Levy, K. N. (1988). Calendar anomalies: Abnormal returns at calendar turning points. *Financial Analyst Journal, 44*(6), 28-39.

Jackson, M. O., & Kremer, I. (2007). On the informational inefficiency of the discriminatory price auctions. *Journal of Economic Theory, 132*(1), 507-517.

Jahfer, A. (2015). Calendar effects of Colombo markets. *Journal of Management, 12*(2), 121-132.

Jarrett, J. E. (2010). Efficient Market Hypothesis and daily variation in small Pacific-Basin stock markets. *Management Research Review, 33*(12), 1128-1139.

Jefferis, K., & Smith, G. (2005). The changing efficiency of African stock markets. *South African*

Journal of Economics, 73(1), 54-67.

Jovanovic, F., Andreadakis, S., & Schinckus, C. (2016). Efficient market hypothesis and fraud on the market theory a new perspective for class actions. *Research in International Business and Finance,* 36, 177-190.

Keim, D. B. (1989). Trading patterns, bid-ask spreads and estimated security returns: The case of common stocks at calendar turning points. *Journal of Financial Economics,* 25,75-97.

Kim, C., & Park, J. (1994). Holiday effects and stock returns: Further evidence. *Journal of*

Financial and Quantitative Analysis, 29(1), 145-157.

Kuttu, S. (2017). Modelling long memory in volatility in Sub-Saharan equity markets. *Research in International Business and Finance*, 44, 176-185.

Lahav, Eyal, Shavit, Tal, & Benzion, U. (2016). Can't wait to celebrate: Holiday euphoria, impulsive behavior and time preference. *Journal of Behavioral and Experimental Economics,* 65, 128-134.

Lakonishok, J., & Smidt, S. (1988). Are seasonal anomalies real? A ninety year perspective. *Review of Financial Studies, 1*(4), 403-425.

Lee, Chien-Chiang, Lee, Jun-De & Lee, Chi-Chuan (2010). Stock prices and the efficient market hypothesis: Evidence from a panel stationary test with structural breaks. *Japan and the World Economy, 22*(1), 49-58.

Liano, K., Marchand, P. H., & Huang, Gow-Cheng. (1992). The holiday effect in stock returns: Evidence from the OTC market. *Review of Financial Economics,* 2(1), pp. 45-54.

Lim, Y. S., Ho, M. C., & Dollery, B. (2009). An empirical analyis of calendar anomalies in the

Malaysian stock market. *Applied Financial Economics, 20*(3), 255-264.

Magnusson , M., & Wydick , B. (2002). How efficient are Africa's emerging stock markets?

Journal of Development Studies, 38(4), 141-156.

Makridakis, S., & Hibon, M. (2000). The M3-Competition: results, conclusions and implications. *International Journal of Forecasting, 16*(4), 451-476.

Malkiel, B. G. (2003). The Efficient Market Hypothesis and its critics. *Journal of Economic*

Perspectives, 17(1), 59-82.

Marrett, G. K., & Worthington, A. C. (2009). An empirical note on the holiday effect in the

Australian Stock Market. *Applied Economics Letters, 16*(17), 1769-1772.

Mehran, J., Meisami, A., & Busenbark, J. (2012). L'Chaim: Jewish holidays and stock market returns. *Managerial Finance, 38*(7), 641-652.

Meneu, V., & Pardo, A. (2004). Pre-holiday effect, large trades and small investor behaviour. *Journal of Empirical Finance, 11*(2), 231-246.

Mensah, L., Bokpin, G., & Owusu-Antwi, G. (2016). Time your investment on the Ghana Stock

Exchange (GSE). *African Journal of Economic and Management Studies, 7*(2), 256-267.

Miller M.H., Muthuswamy J., & Whaley R.E. (1994). Mean reversion of Standard and Poor's 500

Index basis changes: Arbitrage-induced or statistical illusion? *Journal of Finance*, 49,479– 513

Ministry of Interior, retrieved on *1st February, 2018* from https://www.mint.gov.gh/statutory- public- holidays/

Mlambo, C., & Biekpe, N. (2007). The Efficient Market Hypothesis: Evidence from ten African stock markets. *Investment Analysts Journal, 36* (66), 5-18.

Nidhin, K., & Chandran, C. (2013). Importance of Generalized Logistic distribution in extreme value modelling. *Applied Mathematics,* 4, 560-573.

Ntim, C. G., Opong, K. K., Danbolt, J., & Dewotor , F. S. (2011). Testing the weak-form efficiency in African stock markets. *Managerial Finance, Vol. 37* (3), 195-218.

Oh, H., & Lee, S. (2017). On change point test for ARMA-GARCH models: Bootsrap approach. *Journal of the Korean Statistical Society*.

Pearce, D. K. (1996). The robustness of calendar anomalies in daily stock returns. *Journal of*

Economic and Finance, 20(3), 69-80.

Pettengill, G. N. (1989). Holiday closings and security returns. *Journal of Financial Research,*

12(1), 57-67.

Philpot, James, & Peterson, A. Craig. (2011). A brief history and recent developments in day-ofthe-week effect literature. *Managerial Finance, 37*(9), pp. 808-816.

Pickup, Mark. (2015). *Quantitative applications in the social sciences: Introduction to time series analysis.* Thousand Oaks, CA: SAGE Publications Ltd.

Schindler, M. (2007). *Rumors in financial markets: Insight into behavorial financial.* Hoboken,

NJ, USA: John Wiley & Sons, Inc.

Security and Exchange Commission (SEC). (2016). *Annual Report, 2016.* Accra, Ghana: SEC.

Sharpe, W., Alexander, G., & Bailey, J. V. (1999). *Investments* (6 ed.). Englewood Cliffs, N.J.: Prentice Hall.

Simons, Daniel, & Laryea, S. (2006). The efficiency of selected African stock markets. *Finance*

India, *20*(2), pp. 553-571.

Taylor, S. (1986). *Modelling financial time series.* Wiley, Chichester.

Thaler, Richard H. (1987). Anomalies: The January effect. *Journal of Economic Perspectives,*

1(1), pp. 197-201.

Tolikas, K. (2011). The rare event risk in African emerging stock markets. *Managerial* Finance,

37(3), 275-294.

Tonchev, Dimitar, & Kim, Tae-Hwan. (2004). Calendar effects in Eastern European financial markets: Evidence from the Czech Republic, Slovakia and Slovenia. *Applied Financial Economics, 14*(14), 1035-1043.

Wasiuzzaman, S. (2017). Religious anomalies in Islamic stock markets: The Hajj effect in Saudi

Arabia. *Journal of Asset Management, 18*(3), 157-162.

Wasiuzzaman, S. (2018). Seasonality in the Saudi stock market: The Hajj effect. *Quarterly Review of Economics and Finance, Elsevier, 67*, 273-281.

Wright, William F., & Bower, Gordon. (1992). Mood effects on subjective probability assesssment. *Organizational Behavior and Human Decision Process,* 52, 276-291.

Yuan, T., & Gupta, R. (2014). Chinese Lunar New Year effect in Asian stock markets, 1999-2012.

The Quarterly Review of Economics and Finance, Elsevier.

APPENDICES

Appendix A

Table 1: Descriptive statistics of thin trading adjusted stock returns

ADJUSTED RETURNS	
Mean	-3.63E-17
Maximum	10.5070
Minimum	-11.3630
Std. Dev.	0.8380
Skewness	-0.7240
Kurtosis	40.3870
Jarque-Bera	144307.7000***
ARCH(p)	102.3330***
ADF	-12.3890***
Observations	2474.0000

Notes: *** denotes statistically significant at 1%, ADF denotes Augmented Dickey Fuller unit root test, ARCH(p) is the Engle (1982) test for ARCH with order p. Data source: GSE, 2007-2016

Table 2: ARMAX regression results (pre- and post-holiday effects)

	0.0002	-0.0003	-0.0007	0.0002	0.0011	0.0002	0.0002
C	(0)	(0)	(0)	(0)	(0)	(0)	(0)
	0.8411**	0.8426**	0.5406**	0.8022**	0.850**	0.8366**	0.8142**
AR(2)	(0.00106)	(0.0009)	(0.0073)	(0.0011)	(0.0011)	(0.0036)	(0.0009)
	-0.261**	0.0229**	-0.565**	-0.270**	-0.098**	0.0380	0.1939**
PRE	(0.0684)	(0.0051)	(0.0408)	(0.0273)	(0.0178)	(0.0393)	(0.0096)
	0.0562**	0.0363**	-0.098**	-0.030**	0.1892**	0.0762	0.0894**
	(0.0233)	(0.0051)	(0.0120)	(0.0093)	(0.0089)	(0.0089)	(0.0098)
POST	-0.711**	-0.714**	-0.376**	-0.664**	-0.728**	-0.707**	-0.695**
MA(2)							
SEregression	0.8142	0.8130					

Log

	DAY WINDOW							
VARIABLE	±1	±2	±3	±4	±5	±6	±7	±8
Likelihood	-3.0E+03	-3.0E+03	-2.9E+03	-2.9E+03	-3.0E+03	-3.0E+03	-3.0E+03	-3.0E+03
AIC	-0.4090	-0.4089	-0.4379	-0.4211	-0.4120	-0.4094	-0.4126	-0.4101
HQC	-0.4047	-0.4047	-0.4336	-0.4168	-0.4078	-0.4051	-0.4083	0.4058
SBIC	-0.3972	-0.3972	-0.4261	-0.4094	-0.4003	-0.3977	-0.4009	-0.3983

Source: Authors' calculations, using MatlabR2017a.

Table 3: ARMAX regression results for specific holidays

	(0.0014)	(0.0012)	(0.0075)	(0.0013)	(0.0015)	(0.0015)	(0.0013)	(0.0013
		0.8143	0.8026	0.8093		0.8141	0.8128	0.8138

	Coefficient	Std. Error	*t* - Statistics

Variables			
C	0.0003	0.0000	0.00
AR(2)	0.8215**	0.0039	211.2864
NYPRE	0.4894	1.1576	0.4228
NYPOST	-0.2677	1.4057	-0.1904
INDEPRE	0.2755	0.5114	0.5387
INDEPOST	0.1654	0.4033	0.4101
EASTERPRE	0.1589	0.8166	0.1946
EASTERPOST	0.1226	0.2949	0.4157
WORKERPRE	0.4393	0.2358	1.8627
WORKERPOST	0.4793**	0.2413	1.9864
AUPRE	0.5168	0.2978	1.7353
AUPOST	-0.0453	0.0957	-0.4736
REPUPRE	0.1753	0.1768	0.9916
REPUPOST	-0.025	0.0551	-0.4534
FITRPRE	0.1771	0.2055	0.8618
FITRPOST	-0.1375	0.8056	-0.1707
ADHAPRE	0.5874	0.4449	1.3202
ADHAPOST	-0.0221	0.0514	-0.4301
FARMERPRE	0.9374**	0.2223	4.2167
FARMERPOST	0.4615**	0.1044	4.4224
XMASPRE	0.0794	0.3298	0.2408
XMASPOST	0.0075	0.0283	0.2652
FOUNDERPRE	-0.1498	0.3531	-0.4242
FOUNDERPOST	-0.2566	0.2384	-1.0764
MA(2)	-0.6968**	0.0046	-151.9870

Notes: **- 5% Significance level

Source: Authors' calculations, using MatlabR2017a.

Abbreviations:

pre – pre-holiday effects, post – post- holiday effects.

nypre – New Year day pre, nypost – New Year day post, indepre – Independence day pre, indepost

Independence day post, aupre - African Union day pre, aupost – African Union day post, repupre

Republic day pre, repupost – Republic day post, fitrpre – Eid-il-Fitr pre, fitrpost – Eid-il-fitr post, adhapre – Eid-al-Adha pre, adhapost – Eid-al-Adha post, farmerpre –

Farmers day pre, farmerpost – Farmers day post, xmaspre – Christmas day pre, xmaspost – Christmas day post, founderpre –

Founder's day pre, founderpost – Founder's day post.

Table 4: ARMAX regression results for Ghana specific holidays and non-Ghana specific holidays

A) GENERAL

VARIABLES	COEFFICIENT	STD. ERROR	*t*-STATISTICS
C	0.0003	0.0000	0.0000
AR(2)	0.8216**	0.0011	772.2915
GH	0.1382**	0.0110	12.6017
NONGH	0.0571**	0.0127	4.4957
MA(2)	-0.6893**	0.0014	-480.0904

B) PRE AND POST

VARIABLES	COEFFICIENT	STD. ERROR	*t*-STATISTICS
C	0.0004	0.0000	0.0000
AR(2)	0.8192**	0.0011	743.9250
GHPRE	0.1817**	0.0232	7.8348
GHPOST	0.0793**	0.0204	3.8870
NONGHPRE	0.0860**	0.0110	7.8412
NONGHPOST	0.0213	0.0275	0.7744
MA(2)	-0.6857**	0.0014	-472.9686

Notes: **- 5% Significance level

NONGH- NON- GHANA SPECIFIC HOLIDAY

GH- GHANA SPECIFIC HOLIDAY

Source: Authors' calculations, using MatlabR2017a.

Table 5: VaR estimates for thin trading adjusted returns with possible asymmetry in the innovations

PARAMETERS	ω_0	ω_1	ρ_1
	0.1000	0.2300	0.6000

	LEVEL OF α% VaR		
UNDERLYING DISTRIBUTION	0.0500	0.0250	0.0100
$SGL^+(0.5)$	0.0784	0.0574	0.0396
$SGL^+(0.9)$	0.0651	0.0440	0.0222
$SGL^+(5.1)$	0.0505	0.0255	0.0125
$SGL^+(10.1)$	0.0501	0.0246	0.0121
$SGL^+(11.1)$	0.0497	0.0246	0.0121
$SGL^+(12.1)$	0.0497	0.0246	0.0117

Note : SGL^+ - Standardised GL^+

() are the parameter choice of the skewness (b) Source: Authors' calculations, using MatlabR2017a.

Table 6: 5% VaR and 5% CVaR estimates for thin trading adjusted returns for the period

03.01.2007 to 30.12.2016 under the various categories.

	Preholiday	*Postholiday*	*Normal*
$VaR_{0.05}$	0.0858	0.0827	0.5755
$CVaR_{0.05}$	0.0878	0.0843	0.6220

$CVaR_{0.05} = VaR_{0.05} + average(exceedances)$

Note:

Source: Authors' calculations.

Table 7: 5% VaR and 5% CVaR estimates for the adjusted for thin trading returns for the period 03.01.2007 to 30.12.2016 for the various holidays

Variables	$VaR_{0.05}$	$CVaR_{0.05}$
NYPRE	0.0156	0.0156
NYPOST	0.0096	0.0100
INDEPRE	0.0038	0.0038
INDEPOST	0.0037	0.0037
EASTERPRE	0.0038	0.0042
EASTERPOST	0.0069	0.0069
WORKERPRE	0.0062	0.0066
WORKERPOST	**0.0054**	**0.0054**
AUPRE	0.0052	0.0052
AUPOST	0.0090	0.0090
REPUPRE	0.0083	0.0083
REPUPOST	0.0072	0.0072
FITRPRE	0.0079	0.0083
FITRPOST	0.0054	0.0062
ADHAPRE	0.0089	0.0089
ADHAPOST	0.0055	0.0055
FARMERPRE	**0.0065**	**0.0069**
FARMERPOST	**0.0172**	**0.0176**
XMASPRE	0.0180	0.0180
XMASPOST	0.0111	0.0111
FOUNDERPRE	0.0039	0.0043
FOUNDERPOST	0.0040	0.0040
NORMAL	0.5755	0.6219

Source: Authors' calculations, using MatlabR2017a.

Table 8: 5% VaR and 5% CVaR estimates for Ghana-specific and non-Ghana specific holidays

Ghana-specific	Non-Ghana specific holidays	holidays
$VaR_{0.05}$	0.0536	0.1148
$CVaR_{0.05}$	0.0548	0.1173

Source: Authors' calculations, using MatlabR2017a.

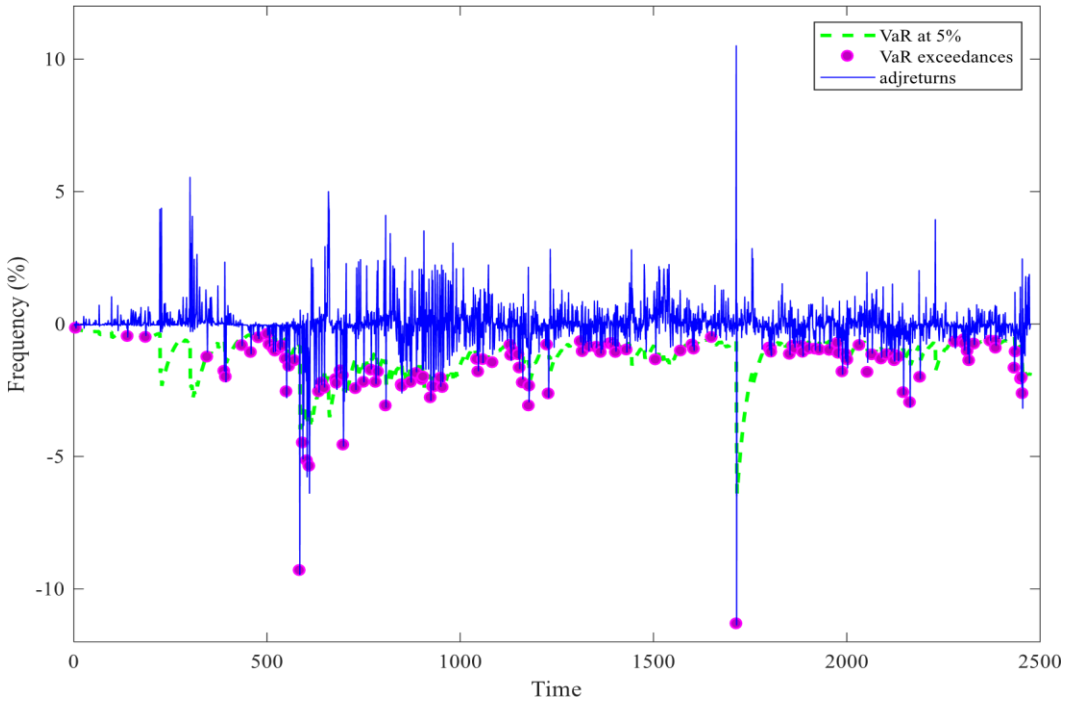
Table 9: 5% VaR and 5% CVaR estimates for pre- and post-holidays of Ghana-specific holidays and non-Ghana specific holidays

Variables	$VaR_{0.05}$	$CVaR_{0.05}$
GH. PRE	0.0223	0.0231
GH. POST	0.0318	0.0322
NON-GH. PRE	0.0606	0.0637
NON-GH. POST	0.0519	0.0532

Note: GH. –Ghana-specific, NON-GH- Non-Ghana specific.

Source: Authors' calculations, using MatlabR2017a.

Figure 1: Adjusted for thin trading returns, 5% VaR estimates and VaR exceedances estimates from 2007 to 2016.



Source: Authors' calculations, using MatlabR2017a.

Appendix B: Model specification for ARMAX model

To determine the order that will best fit the data in this study the information criteria was used. The results are shown in Table B.1 a) and Table B.1 b) below:

Table B.1: Model Specification for ARMAX (p, q) model.

Table B.1 a)

p	0	0	0	0	0	1	1	1	1	1 q	0
	1	2	3	4	0	1	2	3	4		
Adj T	2476	2476	2476	2476	2476	2475	2475	2475	2475	2475	
T	2476	2476	2476	2476	2476	2476	2476	2476	2476	2476	
K	2	2	2	2	2	2	2	2	2	2	
AIC	-0.402	-0.402	-0.422	-0.405	-0.418	-0.402	-0.401	-0.422	-0.405	-0.418	
HQC	-0.400	-0.398	-0.419	-0.414	-0.414	-0.398	-0.397	-0.418	-0.401	-0.413	
SBIC	-0.395	-0.392	-0.413	-0.395	-0.408	0.392	-0.389	-0.410	-0.393	-0.406	

Note: Adj T denotes the length of sample used for estimation after holdback adjustment, T represents the number of observations and K represents the number of exogenous variables.

Table B.1 b)

2	2	**2**	2	2	3	3	3	3	3	
0	1	**2**	3	4	0	1	2	3	4	
Adj T	2474	2474	**2474**	2474	2474	2473	2473	2473	2473	2473
T	2476	2476	**2476**	2476	2476	2476	2476	2476	2476	2476
K	2	2	**2**	2	2	2	2	2	2	2
AIC	-0.429	-0.429	**-0.441**	-0.431	-0.436	-0.406		-0.406		-
0.425	-0.408	-0.420								
HQC	-0.426	-0.425	**-0.437**	-0.427	-0.432	-0.402		-0.402		-
0.421	-0.403	-0.416								
SBIC	-0.420	-0.417	**-0.429**	-0.420	-0.425	0.396		-0.394		-
0.414	-0.396	-0.408								

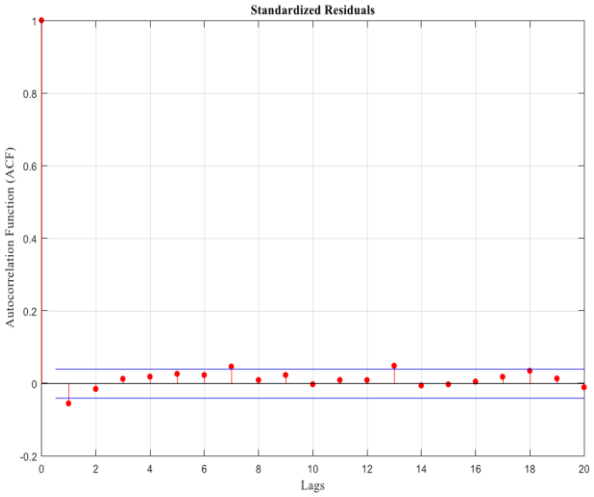
Source: Authors' calculations, using MatlabR2017a.

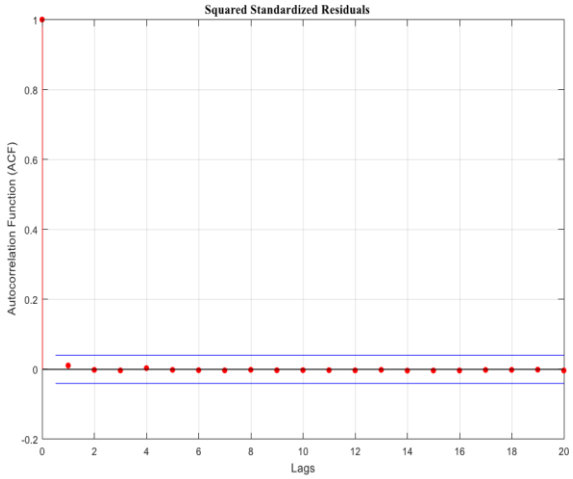
The Table B.1 a) and Table B.1 b) show the information criteria associated with the various orders

(p, q) for the ARMAX model. For example, the order (1, 0) had an AIC value of -0.402, order (1, 4) had a SBIC value of -0.406 and order (3, 3) had an HQC value of -0.403. The order that best fits the data for the ARMAX model is order (2, 2) (the bolded values) because it recorded the lowest information criteria.

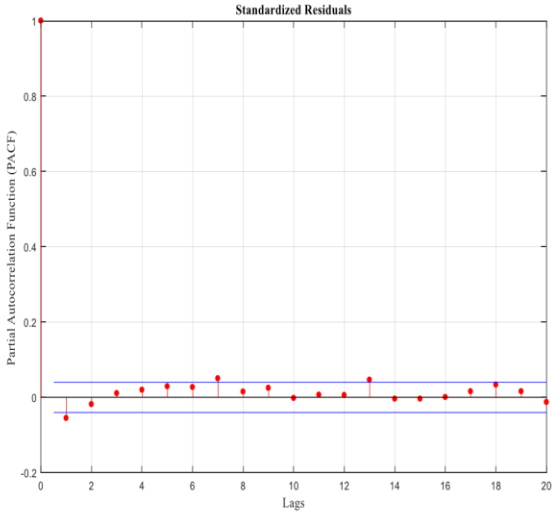
Appendix C: Robustness Test

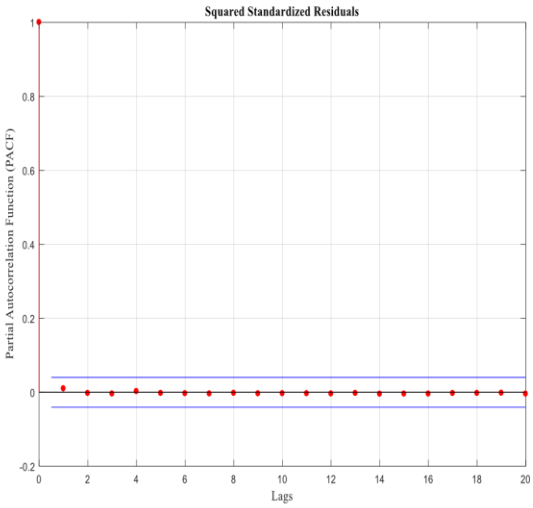
Autocorrelation Function (ACF)





Partial Autocorrelation Function (PACF)





Normality test

Variables	Stats.	Prob.*
z_t	0.1932	0.000
z_t^2	0.1247	0.000

SUB-THEME 7: ISSUES IN EDUCATION AND TRAINING

A Comparative Study of Academic Performance of Students Admitted Through Pre-Nce & Direct Entry In Final Nce Examination (A Case Study Of English Department Federal College Of Education, Yola)

By

Aminu Ahmadu Michika

Amsonmed4real@Gmal.Com

Tel. +2348034420856

English Department

Federal College Of Education, Yola

Adamawa State

Nigeria

Abstract

This research is designed to compare the academic performance of students admitted through the Pre-NCE and Direct entry in the NCE final Examination. The purpose of this research works was to ascertain whether the performance of Pre-NCE and Direct entry students in final NCE examination relate to their entry qualifications. A total of 314 students was used as population sample for the study out of 314 students, 150 are students admitted through PRE-NCE while 164 are those admitted through direct entry. A table format was designed to collect data concerning the already graduated students, the two-tailed z-test statistics was used to test the research hypothesis and the findings of the research revealed that students admitted through direct entry performed significantly higher than those admitted through the Pre-NCE in the final NCE Examination.

Keyword: Comparative analysis of academic performance of students at the final NCE examination.

Introduction

Background of the study

In the modern society, education has been identified as the important tool for development and progress as Zainab Umar (2001) expresses, "The growth of any nation is based upon its technological advancement and the sound education of its people". The attention of everyone is now directed towards acquisition of knowledge by all means possible. Walter Rodney (1972) explains, "Education promotes social change". Therefore, emphasis on the need for education has been repeatedly made by both individuals and government at all levels. This scenario has given rise to increase in student enrolment at all levels of education and this in turn, has affected the

standard of education right from the primary school university level. Therefore, a number of higher institutions evolved remedial studies programme to improve the entry qualification of students in their areas of specialization. The point to be noted here is that, admissions are obtained not only through JAMB, but also through Pre-NCE program. It is in this connection that F.C.E; Yola introduced the Pre-NCE programme to supplement the admission through JAMB Direct entry. However, it has been observed that the Pre-NCE students admitted by the college seem to be full of all categories of candidates who affect the academic standard expected of NCE programme.

Statement of the problem

The problem of falling standard of education has become a major concern for both the government and the general public. This manifest in various ways which include poor performance in both schools and external examinations, which exemplified the poor performance of students of FCE, Yola in NCE Examinations. Such factors as student's entry qualification and mode of admission among others have been adduced. Since two different modes of admission of students of non-uniform entry qualification, the present study investigated/compared the performance of the two categories of student (based mode of admission) in the final NCE examination in the institution.

Purpose of the study

The purpose of the study is to:

Collect data relating to the performance of Pre-NCE and Direct entry students in their final examination for the (2006/2007 – 2008/2009) academic sessions.

Compare the performance of Pre-NCE and Direct entry students in their final NCE examination.

Ascertain whether the performance of Pre-NCE and Direct entry students in final NCE exams relate to their entry qualification.

Research questions

The study was guided by the following research questions:

What is the mean performance score of students admitted through Pre-NCE programme in the NCE Final examination?

What is the mean performance score of direct entry students in the NCE Final examination?

Hypothesis

The following hypothesis was formulated for the study: -

There is no significant difference between the performances of students admitted through Pre-NCE and those admitted through direct entry.

Significance of the study

The findings of this study will provide vital information to the college authority on the need to review the admission policy in the college. The findings of this study would assist the prospective students to have the requisite entry qualification before applying or admission into the college.

The study would assist the college authority in knowing which category of students perform better between those admitted through Pre-NCE and Direct entry in order to plan for improvement in the academic standard.

Delimitation of the study

The study was delimited to Federal College of Education, Yola and to the performing of English students admitted through Pre-NCE program and those admitted through Direct entry or JAMB in final NCE examination for the period: 2006/2007 – 2008/2009 academic session.

Research method

In other to find out which category of students based on their entry qualification perform better than the other, a co-relational research was designed in order to compare the performance of the two categories of the students in their final NCE programme examination

Population

The target population for the study were all the students admitted through the Pre-NCE and direct entry process in the Department of English F.C.E, Yola between 2006/2007 – 2008/2009 academic sessions, which were 314 candidates.

Sample and sampling techniques

There was no sampling since the entire population of 314 students who graduates from the department of English, admitted through Pre-NCE and direct entry for the period 2006/2007 – 2008/2009: academic session was involved in the study this was because the population was not too large to be handled.

Instrument for data collection

Recorded data (document exams results) was the source of data for the study. I mean that no special instrument was used to collect data for the study.

Method for data collection

The relevant data for this study were collected from NCE results of the two groups students namely those admitted through Pre-NCE and those admitted through direct entry.

Method of data analysis

The two sets of data were analysed using the two tailed Z-test statistic to test the hypothesis at 0.05 or 5% level of significance. The Z-statics is usually adopted in testing two populations when the sample size is large. Therefore, Z-test statistics a given by this formula: $\frac{X1-X2}{SDX}$

Thus the data collected from the college academic division were grouped into those admitted through Pre-NCE and Direct entry. This was to enable the researchers to determine which of the two groups of graduates performed significantly higher than the other.

Table I: Final CGPA of graduates for the year 2006/2009 admitted through Pre-NCE.

2.8	2.8	1.1	3.4	1.1	0.0	2.5	0.2	2.5	2.5
4.0	1.7	4.1	1.8	3.3	2.6	1.8	2.1	3.1	1.0
2.8	2.8	1.1	3.4	1.1	0.0	2.5	0.2	2.5	2.5
4.0	1.7	4.1	1.8	3.3	2.6	1.8	2.1	3.1	1.0
1.0	0.5	1.0	1.6	1.9	0.4	0.5	2.2	2.3	3.3
1.7	1.1	2.7	3.1	0.5	3.6	2.6	1.0	1.4	1.0
2.5	0.5	2.1	1.9	0.4	6.1	1.1	1.0	0.5	3.3
1.3	2.3	0.4	1.9	2.9	1.3	3.4	0.0	0.1	0.3
2.3	2.0	0.9	0.7	1.3	1.2	2.0	3.4	2.4	2.5
3.0	2.3	1.3	1.4	1.2	0.9	0.8	2.4	2.5	1.3
3.2	1.7	1.8	1.8	0.0	0.4	0.5	1.9	1.6	1.7
4.0	3.9	3.2	1.4	2.3	2.4	1.7	1.6	1.2	2.0
3.9	1.6	1.7	0.9	0.4	1.0	0.9	1.4	1.3	1.2
2.8	0.6	0.5	1.9	1.5	1.2	0.4	0.5	1.2	1.3
1.9	2.0	2.1	2.0	1.7	0.8	0.7	2.6	2.7	0.2
1.7	0.3	1.3	3.1	2.0	0.9	0.1	0.0	1.1	1.4
0.9	2.0	2.1	2.0	1.7	0.8	0.7	2.6	2.7	0.2
1.7	0.3	1.3	3.1	2.0	0.9	0.1	0.0	1.1	1.4
0.9	0.3	2.3	3.2	1.0	1.1	1.2	0.6	1.3	0.6

N1 = 190

Table 11. Final CGPA of graduates for the year 2006 – 2009 admitted through Pre-NCE.

1.5	1.9	3.4	0.7	3.6	3.5	2.7	1.9	1.6	2.0
1.5	2.0	1.0	2.4	4.0	3.9	3.2	3.8	2.0	3.6
3.2	1.9	1.2	0.0	2.5	2.8	1.5	1.2	3.5	3.8
2.1	1.9	1,6	3.5	3.3	3.9	1.4	2.8	3.7	3.8
3.0	2.9	1.9	2.6	1.6	2.6	2.4	2.7	2.4	2.1
3.6	3.1	3.2	1.7	2.9	1.9	0.9	1.7	0.7	2.1
4.0	3.1	3.7	4.0	1.8	1.8	2.5	4.1	1.8	1.9
2.9	3.4	3.3	3.5	3.7	3.7	2.8	3.7	1.6	1.8
3.7	0.7	1.7	1.6	3.3	2.9	1.2	1.9	3.5	3.6
1.9	4.5	3.4	4.6	3.2	2.8	3.1	3.4	3.2	2.3
1.5	2.4	1.4	2.6	1.6	3.8	4.0	3.9	1.9	2.9
2.9	4.0	1.6	4.0	2.1	3.1	1.1	1.9	1.8	2.8
2.8	2.4	2.3	2.2	2.9	3.2	3.1	3.2	2.5	1.6
1.6	1.5	1.6	1.9	0.8	3.3	2.1	2.4	2.7	1.9
2.5	3.5	3.1	3.0	1.8	1.5	2.5	0.9	1.4	0.9
1.9	3.2	4.6	2.9	1.4	1.6	3.2	1.6	2.9	1.2
3.9	4.0								

N1 = 162

Hypothesis Testing

Table 3: Below shows the mean and standard deviations of final CGPA for students admitted through Pre-NCE and Direct entry Modes.

	N	X	SD.	Crit.	Zeal
Pre-NCE	150	1.66	0.99	1.96	7.852
Direct Entry	164	2.52	0.97		

The analysis shows that the mean scores of graduate admitted through Pre-NCE is 1.66 with a standard deviation of 0.99 against the means scores of 2.53 obtained by those admitted through Direct Entry with a standard deviation 0.97

Hypothesis. 1

It could be observed from the foregoing that a calculated Z value of 7.852 is obtained against critical value of 1.96 at 5% or 0.05 two tailed level of significant thereby rejection the null hypothesis which states that there is no significant difference between the performance of students admitted through Pre-NCE and those admitted through Direct Entry in English Department Federal College of Education, Yola.

Discussion

As observed from the findings of this research the mean score for graduate admitted through Pre-NCE is 1.66 with standard deviation of 0.99, while the mean score of graduates admitted through the direct entry is 2.53 with a standard deviation 0.07. therefore, the findings of this research shows that the performance of students admitted through the direct entry is greatly higher than those admitted through the Pre-NCE programme, because in the first place most of those admitted through the Pre-NCE programme lack the minimum entry requirement for Direct admission that was they were offered the Pre-NCE. More over the duration of one academic session is enough to breach the gap existing between those admitted through Pre-NCE and Direct entry graduates.

Summary

Education is considered as one of the most important factors that enhances programme and development in all human societies, therefore, the need for education has been repeatedly emphasized by both individuals and governments at all levels the purpose of the research work was to compare the performance of students admitted through Pre-NCE and Direct entry. In view of this, a correlation research was therefore designed to find out the difference between the two sets of students. In all 314 graduates were used as the total population for the study 150 are those admitted through Pre-NCE and 164 through Direct Entry process, the Cumulative Grade Point Average (CGPA) was the yard stick used for measuring the performance among the two sets of students, and the Z-statistics was used to test the hypothesis. The result shows that, those admitted through direct entry performed significantly higher than those admitted through the Pre-NCE programme in their final NCE Examinations.

RECOMMENDATION

In the light of above findings and conclusion, the following recommendations are proffer to the college authority:

There is need for college authority to be alert, in order to check personal interest in the admission process in the college.

There is need to review the admission guidelines of the college, so as to ensure only qualified candidates are considered for admission into college.(if possible aptitude test should be conducted to the students).

Moreover, the college should re-introduce or maintain the probation system of promotion so that candidates with less than (1.5) CGPA should remain in their classes for a year before promotion. And a new formula of degree in education should be introduced by the government to the colleges of education. Additional two years should be given to students after NCE to enable them acquire Bachelor degree in education. And all federal colleges of education should be converted to federal university of education.

References

Abdullahi, I.M. (2005). A Survey of the contributions of large-scale textile industry to the Development of Kano State. M.A. Research Proposals. A.B.U, Zaria

Federal College of Education, Yola (2009) Students Handbook.

Federal Republic of Nigeria (1997) National Policy on Education. Lagos: Federal Ministry of Information Printing Division.

Hans, N. and Correh (1970). Comparative Education. Location Cambridge Press.

Mbahi, A.A. (2001). Research Methodology: A practical Guide to Research in Fine Art, Applied Arts and Performance Art. Research in Computer Graphics and Print. Maiduguri.

Mustapha D. Husain and Abdullahi I. Musa (2007), Vol. 1. African Journal of Allied Enugu State.

Nicolas Hon. (1949). Comparative Education: Mathematics and Sciences in Secondary School. Britain and U.S.A. for the First Generation

Technical Vocational Education And Training Institutions' Contribution To Promoting Sustainable Development

Denis Kintu

Kyambogo University-Uganda

Department of Mechanical and Production Engineering

P.O Box 1 Kyambogo

dkintu@kyu.ac.ug; kintudenis@gmail.com

+256754034200

+256772696412

Abstract

The concept of sustainable development can be possible if people possess the necessary skills and competences for work in a sustainable manner. Technical, Vocational Education and Training (TVET) has been identified as the type of education that can contribute to the development of a workforce that is skilled and can embrace the ideas of sustainability. In this paper, the researcher presents ideas developed through a plenary discussion with 12 master's students at his university about the role TVET institutions can play through their traditional roles of teaching and research. The paper reviews literature and explores the concept and concerns for sustainable development, the models for sustainability and sustainable development, and identifies the role TVET institutions can play in the transformation to sustainable societies. Further, the paper identifies the challenges TVET institutions face in imparting sustainability skills and concludes by suggesting possible solutions to the challenges.

Keywords: Technical, Vocational Education and Training, Sustainable Development.

Introduction

1.0 Definition and Concept of Sustainable Development (SD)

A widely used definition of sustainable development is from the World Commission on Environment and Development (WCED) (1987), in the report "Our Common Future" also known as the Bruntland report. According to WCED, *"sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations, 1987).*

At the United Nations (UN) earth summit held by the United Nations Environment Program (UNEP) in Rio de Janeiro (1992), sustainable development was further defined as *"Improving the quality of human life while living within the carrying*

capacity of supporting eco systems". Depending on the context in which it is used, sustainability can best be implemented in the planning approval where the sustainability issues can be delivered to the people that is affected by the socio-economic development (United Nations, 1992).

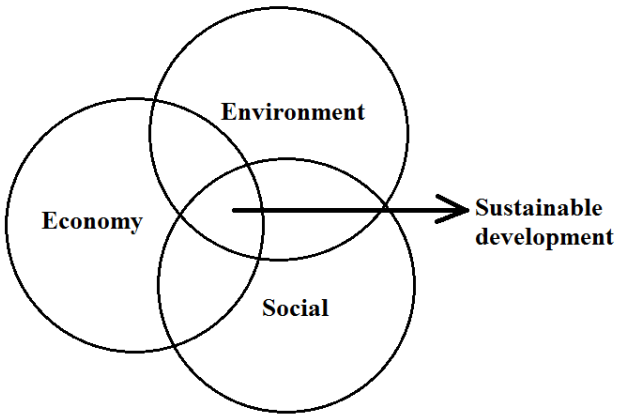
UNESCO-UNEVOC (2005), noted that sustainable development is not a fixed concept; rather it is a culturally-directed search for a dynamic balance in the relationships between social, economic and natural systems. A balance seeks to promote equity between present and future, countries, social classes, genders, and races (UNESCO-UNEVOC, 2005). Sustainable development therefore, is to satisfy the needs of the present generation, balancing public welfare and environmental and economic development interests and concurrently ensuring the observation of the environmental requirements and the preservation of natural diversity in order to avoid the reduction of possibilities to satisfy the needs of future generations (Ademola, Oloruntoba, & Clara, 2017).

Regarding sustainable development, former UN Secretary-General Ban Ki-moon, 2007 (cited in UNESCO, 2012) had this to say;

"We hold the future in our hands. Together, we must ensure that our grandchildren will not have to ask why we failed to do the right thing, and let them suffer the consequences." (UNESCO, 2012).

Fundamentally, sustainable development is a concept based on the integration of economic, social and environmental concerns. The concept promotes economic growth, maintains social integrity and minimizes environmental impact (Tovey, 2009).

Figure 1: Sustainable Development Concept



Source: (Mohamed S., B., H., 2014)

1.1 Concerns about Sustainable Development (SD)

Sustainable development (SD) is driven by evidence that, despite living in a world that is richer than ever before, environmental damage escalates and poverty and inequality persist (Wals, 2009). A Living Planet Report by Leape (2008), notes that

our global mark surpasses the world's capacity to regenerate by about 30 percent and cautions that if society's demand for natural resources continues to increase at the same rate, by the decade of 2030, we would need the equivalent of two planets to maintain our lifestyles (Leape, 2008).

Diesendorf (2000), highlights the principal impacts of humans on the environment. These are:

changes, possibly irreversible, to the composition of the atmosphere and therefore to earth's climate;

destruction of stratospheric ozone and therefore increased damage to living organisms from ultraviolet light in sunshine;

degradation of topsoil and increases in desertification;

loss of biological diversity;

damage to photosynthesis and nutrient cycles;

widespread pollution of air, rivers and oceans; and

depletion of artesian water storages.

Further, Diesendorf (2000), highlights several areas of concern relating to the socio-economic aspects of sustainability. These are:

A large body of evidence that the gap between the rich and the poor has been increasing, both between countries and within many countries.

Human rights violations are still endemic in many countries.

Debt and economic slavery are still prevalent with the erosion of minimum working conditions and wages in several countries.

A large proportion of the world's population has inadequate diet, nutrition and access to drinking water.

A large proportion of the world's children live in poverty. Ethnic groups, indigenous people and other minorities in nominally rich countries are generally at risk.

Preventable and treatable diseases are prevalent in both developed and developing countries.

A large proportion of the world's population is still illiterate.

There are still many refugees, resulting from war, political persecution, environmental destruction and economic hardship.

Despite significant overall advances during the 20th century, the status of women is still not clear.

It's therefore evident from the above concerns that sustainable development is needed internationally (Diesendorf, 2000).

1.2 Models for Sustainability and Sustainable Development

1.2.1 Diesendorf Model or Framework

Diesendorf (1998), developed a model or framework for sustainability and sustainable development. The framework answers the questions "What is the scope of sustainability? How can we present it in a systematic manner, distinguishing between ethical principles, broad goals and objectives which are actionable and measurable?" The framework comprises of four logical levels:

Level 0, comprising the broad ethical principles;

At Level 0, there are three principles. These are; respect for nature; respect for humans; and to be generous in our respect and kindness.

Level 1, comprising broad goals arising from these principles;

Included at Level 1 are the broad goals to conserve inter- and intra-generational equity (basis for the definition of sustainable development in the Bruntland report), human well-being, biodiversity and ecological integrity.

Level 2, comprising measurable objectives or indicators

The indicators should be measurable, relevant, simple to use and understand, reliable, reproducible, and timely for decision-making.

Diesendorf (1998), further elaborated on these indicators in table 2 below.
Table 1: Examples of some measurable objectives or sustainability indicators

'Ecological'	'Economic'	'Social'
Rate of materials' flow; Rate of energy use; Total & per capita rate of greenhouse gas emissions; Vehicle kilometres travelled per capita; Human population & growth; rate; Area of land degraded & polluted; Water pollution; Air pollution	'Genuine progress indicator' Distribution of household & personal income; Percent of income needed to pay for basic 'needs' of a person; Percent of children living in households with no adult earner; Mortgage repayments & rents relative to median income in region; Employment by top 5 companies in the region.	Basic services within walking and cycling distances of dwellings; Availability of day care for under 5s. Levels of education, including literacy & numeracy; Life expectancies at birth and at age 20; Morbidity rates; Crime rates; Homelessness; Teaching of indigenous languages in schools.

Source: Diesendorf (1998)

Sustainability indicators have an important place in the concept of sustainability and the process of sustainable development. Indicators are required for monitoring progress and are valuable for motivating action. However, they do not in themselves produce good policy and actions to implement it.

Level 3, comprises the action plan for implementation of education for sustainable development. According to the Ottawa Charter (1986) and the Bellagio Principles (1998) cited by Diesendorf (2000), the following steps towards the implementation of ESD are proposed.

Present a guiding vision, goals and scenarios

Develop sustainability policy in all sectors, at all levels, with all types of instrument

Create supportive environments

Strengthen community action

Develop personal and organizational skills

Re-orient the system

1.2.2 *I=PCT*

The formula: *Impact = Population * Consumption/person * Impact/unit of consumption* (*I = PCT*) is another model often used in sustainable development. It is inspired by economics and its attention is focused on the impact of consumption. However, this model is often critiqued for emphasizing environmental management while down playing the social and economic aspects of sustainable development (Johnston, 2007).

1.2.3 Main Prism of Sustainable Development

Kain (2000) proposed a prism for sustainable development which comprises of Mind, Artefact, Institution and Nature (MAIN).

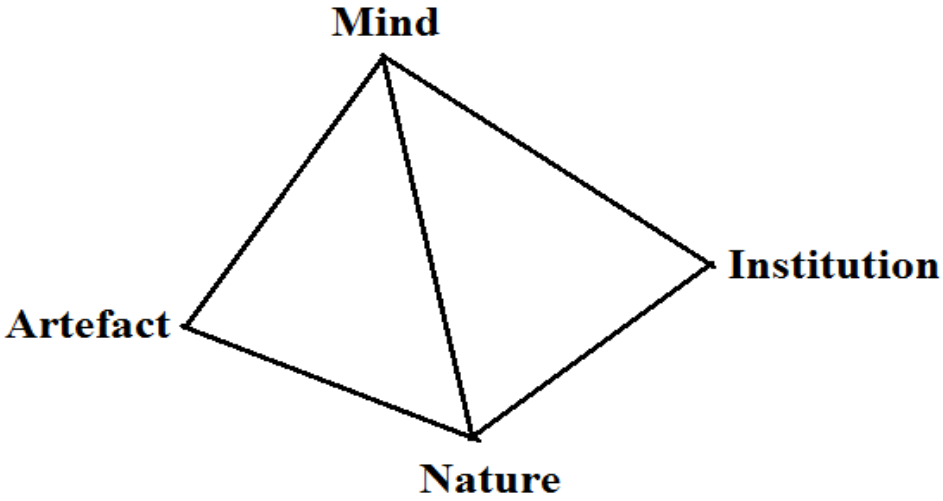
The environmental dimension (nature) includes stocks of non-renewable and stocks of renewable resources.

The economic dimension (artefacts) includes all man-made material assets such as buildings and roads.

The social dimension (mind) is the awareness of individual subject (worldview, knowledge, and experience).

The institutional dimension relates to the organization of our society and the relation between people.

The model is however critiqued for downplaying the environmental dimension (natural capital), which is a pre-condition for the development of human well-being.



Source: Kain, 2000

1.2.4 Five Capitals Model

The five capitals model uses economics as the starting point. The model maintains that governments have five capitals or stocks to manage: natural, social, human, and financial and manufactured (Forum for the future, 2003). Each of these capitals can be defined and the stocks evaluated, as seen in table 1 below.

Table 1: Capitals, Stocks and Flow

Capital/Resource	Stock	Flow
Natural	Land, sea, air, vegetation, ecological systems	Food, water, energy, waste, disposal, climate
Human	Knowledge, skills, health, motivation, spiritual ease	Happiness, creativity, innovation, work, energy, participation
Social	Families, communities, organizations, governance systems, schools	Security, shared goods (e.g., culture, education) inclusion, justice
Manufactured	Infrastructure, roads, buildings, tools, fixed assets	Living/working space, access, distribution
Financial	Money, stocks, bonds, banknotes	Means of valuing, owning or exchanging other four capitals

Source: Forum for the Future, 2003

According to this model, sustainability is achievable if we lived from the flows of benefits that the stocks provide rather than eroding the stock.

1.3 Education for Sustainable Development (ESD)

Education for sustainable development (ESD), sometimes known as Education for Sustainability (EfS), is an orientation to essential aspects of education such as access, relevance, equity and inclusivity. It also includes planning, policy development, programme implementation, finance, curricula, teaching, learning, assessment, administration. ESD aims to provide a clear interaction between education, public awareness, and training with a view to creating a more sustainable future (UNESCO, 2012). The Australian Government (2009), in their national action plan for education for sustainability, defined ESD by the following principles: transformation and change; education for all and lifelong learning; systems thinking; envisioning a better future; critical thinking and reflection; participation; and partnerships for change. "Education for sustainable development therefore aims to help people to develop the attitudes, skills and knowledge to make informed decisions for the benefit of themselves and others, now and in the future, and to act upon these decisions" (UNESCO, 2010).

1.3.1 Characteristics of Education for Sustainable Development (ESD)

According to United Nations decade of education for sustainable development (2005-2014), international implementation scheme (UNESCO, 2005), ESD:

is based on the principles and values that underlie sustainable development;

includes all three spheres of sustainability-environment, society, and economy with an underlying dimension of culture;

uses a variety of pedagogical techniques that promote participatory learning and higher-order thinking skills;

promotes life-long learning;

is locally relevant and culturally appropriate;

is based on local needs, perceptions and conditions, but acknowledges that fulfilling local needs often has international effects and consequences;

engages formal, non-formal and informal education;

accommodates the evolving nature of the concept of sustainability;

addresses content, taking into account context, global issues and local priorities;

builds civil capacity for community-based decision making, tolerance, environmental stewardship, workforce adaptability and quality of life;

is interdisciplinary: no single discipline can claim ESD for itself alone, but all disciplines can contribute to ESD (UNESCO, 2005).

To further highlight the relevance of ESD, the UNESCO World Conference on Education for Sustainable Development (UNESCO, 2009) noted that.

"ESD, which is relevant to all types, levels and settings of education, is an approach to teaching and learning based on the ideals and principles that underlie sustainability. Since ESD engages with such key issues as human rights, poverty reduction, sustainable livelihoods, climate change, gender equality, corporate social responsibility and protection of indigenous cultures in an integral way, it constitutes a comprehensive approach to quality education and learning. By dealing with the problems faced by humanity in a globalized world, ESD will shape the purposes and content of all education in the period ahead – ESD is, indeed, education for the future" (UNESCO, 2009, p.8).

1.3.2 TVET for Sustainable Development

Technical and Vocational Education and training (TVET) have been recognized the world over as tools for empowering people, especially the youth, for sustainable livelihood and social economic development (Ajibola & Jumoke, 2012). The United Nations Educational Scientific and Cultural Organization (UNESCO) and the International Labour Organization (ILO) recommendations of 2000 on TVET for the twenty-first century, defined TVET as those aspects of education process involving, in addition, to general education, the study of technologies and related sciences, and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life. TVET is further understood to be: an integral part of general education; a means of preparing for occupational fields and for effective participation in the world of work; an aspect of lifelong learning and a preparation for responsible citizenship; an instrument for promoting environmentally sound suitable development and a method of alleviating poverty (Kerre, 2010). However, it has been noted that especially in least developed countries, the skills necessary for manufacturing processes and services in a sustainable manner are not yet available in education institutions (Fien, Maclean and Park 2009). People with the right skills, knowledge, competencies, frame of mind, attitude and motivation remains the most enduring strategy for the pursuit of sustainable development. The only way to provide people with the capacity knowledge, skills, attitudes and motivation to reduce the harmful influence of society on the environment and to protect and preserve the globe for future generations is through education (Ajibade, 2013). TVET, as an integral component of lifelong learning, has a crucial role to play in this new era as an effective tool to realize the objectives of a culture of peace, environmentally sound sustainable development, social cohesion and international citizenship (UNESCO-UNEVOC, 2006). Therefore, the role of TVET is to provide young people and adults with the life-skills necessary for the labor market and also to provide support to keep up with the fast changing market by expanding necessary skills and competencies (Wals, 2009).

1.3.3 TVET institutions' contribution to sustainable development

The world over TVET suffers from a subordinated role in comparison to the tertiary education sector. Nonetheless, TVET has the potential to address social, economic and environmental challenges in a sustainable way if implemented carefully through their

traditional functions of teaching, research and knowledge dissemination (Thienemann, 2014).

Examples of TVET institutions' contribution to sustainable development are discussed below.

Conducting research and development

Conducting research is one of the traditional roles of TVET institutions. Research can be conducted about sustainable technologies. Students and trainers can be stimulated to conduct research by putting in place competitive research funds about sustainable technologies. Such sustainable technologies could be about:

alternative energy technologies like geothermal, water turbine generation, biodiesels etc.;

new materials for building construction;

developing reusable, recyclable or compostable packaging materials for manufactured products;

development of disease resistant varieties of plants and animals;

development of environmental friendly agricultural inputs such as pesticides, and fertilizers;

development of sustainable transport means like hybrid and electrical cars;

disease control among humankind;

TVET curriculum for sustainability

According to Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) (2011), the term "curriculum" refers to the teaching-learning content, structure and processes provided by teaching institutions or training centres. Curriculum specifies what kind of knowledge, skills and values should be taught to students and why is that so, but it may also specify the desired ways of how students should be taught (Kärkkäinen, 2012). The TVET curriculum for sustainable development, on top of the general and technical subjects should include such aspects as:

extra-curricular activities that enhance learning about sustainability for instance environmental fairs, music, art and drama competitions etc.;

sustainable development issues; for example, climate change, disaster risk reduction, biodiversity, poverty reduction, and sustainable consumption;

sustainability ethos about the treatment of others such as mob justice;

includes real-life sustainable development issues to enhance learners' motivation and learning;

sustainability programs designed for life-long learning;

multi-disciplinary approaches to problem solving

be flexible to address issues of the ever changing technological advancement;

promotion of an entrepreneurial mindset;

Information and Communication Technology (ICT);

development and utilization of learners' talents in ways that enable them to live happy healthy and fulfilled lives irrespective of gender and ethnicity;

A number of new subjects (issues) therefore need to be incorporated into TVET curriculum for the sake of enhancing sustainable development.

New training methods for TVET

In teaching and learning, some learners prefer certain learning methods and some trainers prefer certain teaching methods. The TVET trainers should choose the right methods for their learners. The teaching and learning methods in TVET should stimulate and enable learners to change their behaviour and take action for sustainable development. Learners have specific, challenging, practical, goals in mind. Learning tasks should be constructed with those goals in mind so that they are useful to enable learners to progress to higher levels of expertise in their chosen field (Lucas, Spencer, & Claxton, 2012). To further emphasize the importance of training methods, Fien, Maclean and Park (2009) urge that the way TVET is delivered has great influence in the adoption of sustainability attitudes. In the table 2 below, they identify the important attitudes which TVET institutions can develop amongst their students.

Table 2: Attitudes for Sustainability

Work by oneself (self-discipline)	Engage in self-assessment, self-reflection, and analysis
Work with others in teams	Manage change
Work with integrity and honour, with honesty, punctuality and responsibility;	Create a stimulating and supportive environment
Adapt to varying situations; know and understand problems and issues; and work out solutions creatively	Appreciation of the importance of social, environmental and economic contexts
Peacefully resolve of conflicts	Ownership and entitlements
Have a good grasp of the reality of the world, of oneself and of others	Quality consciousness and appreciation of quality
Continue learning and pursue lifelong education in a learning society	Passion
Persistence	Entrepreneurial spirit

Source: Fien, Maclean and Park (2009)

TVET institutions as role models of sustainable practices

TVET is not only about skills training but can lead by example in practicing sustainable development through its policies and practices. Such policies and practices could be:

zero tolerance to corruption

interactions between the school and the community

responsible management of waste (dumping or recycling);

energy and water saving at the school;

use biodegradable materials

display of safety instructions in the laboratories, electrical works, hazardous waste sites, at construction sites, open pits etc.;

adhering to standard procurement of goods and supplies in ways that support sustainable development principles;

conflict resolutions at all management, academic and non-academic levels;

treatment and recycling of waste water;

creating a healthy and non-toxic environment by proper ventilation of buildings, planting trees;

use innovative pedagogies to flexibly deliver TVET programs;

financial accountability;

environmental auditing through ISO quality assurance systems

Furthermore, TVET institutions can develop their own sustainable development implementation models for their particular situations. An example is the one which was developed by the University of Plymouth known as the four "C" approach:

Making the CAMPUS more sustainable and inclusive

Including sustainability ideas and issues in CURRICULUM, teaching and learning

Joint initiatives for sustainability with COMMUNITIES in the South West

Creating a sustainability CULTURE within the University as a whole

These aspects when practiced at the institutions can be inculcated into the learners and later to the wider communities.

Greening TVET

Greening is regarded as a process of adapting knowledge and practices with the aim of aligning them with the overall concept of sustainability (UNESCO-UNEVOC, 2017). A green economy is one 'that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities'. This is crucial if we are to move towards sustainable societies (UNEP, 2011). TVET institutions have an obligation of producing a workforce with green skills. Green jobs are found in many sectors of the economy from energy supply to recycling and from agriculture and construction to transportation. They help to cut the consumption of energy, raw materials and water through high-efficiency strategies, to de-carbonize the economy and reduce greenhouse- gas emissions, to minimize or avoid altogether all forms of waste and pollution, to protect and restore ecosystems and biodiversity (UNEP, 2008).

Partnering with key stakeholders

TVET institutions can contribute to sustainable development by encouraging partnerships and facilitating cooperation among TVET stakeholders on issues concerning sustainable development. The stakeholders could be the employers from the private sector, government and Non-Governmental Organizations (NGOs) and Community Based Organizations (CBOs). Information from these stakeholders is vital in forecasting future sustainability skills needs of employers. Also, international or regional networks can be fostered to share on issues relating to sustainability.

1.4 Challenges of Integrating Sustainable Development in TVET Institutions

TVET institutions, especially those in the developing countries face a lot of challenges in their attempt to integrate sustainable development aspects in training. The following challenges have been identified:

Lack of sustainability policy and strategies for TVET. Policy guides TVET institutional behaviour and actions. It can be explicit and implicit single decisions or group of decisions, which may set out directions for guiding the future actions of TVET institutions. In many countries, TVET has not been integrated into national sustainability policies and strategies. Even in cases where the policies have been integrated, their implementation has been poor. This is a very big challenge of integrating sustainable development in TVET Institutions.

Lack of funds to update training equipment. TVET students need to practice on new equipment that meet environmental standards for them to acquire sustainability skills. However, many TVET institutions, especially those in developing countries lack funds to continuously update their training facilities. In his research about automotive training in Kenya, Kitainge (2016) concluded that training facilities should be as close as possible to the work place facilities (Kitainge, 2016). If students continue to be trained using less sustainable machines, they will be unable to acquire the skills that would enable them to work in a sustainable way.

There is a lack of knowledge on the part of TVET trainers. As TVET becomes increasingly more knowledge-oriented, the role of teachers and instructors must change from the didactic imparting of skills and knowledge to the facilitation of learning in a sustainable manner. The increasing use of Information Communication and Technology (ICT) and other media also contributes to this shift in teaching and

learning methodologies. The implementation of such strategies depends on qualified mentors and supervisors in TVET training programmes. In order to improve the quality of teaching and training in TVET institutions, it is important to raise the standard of professionalism for vocational teachers and instructors by identifying a set of national standards that can be applied across the system (Euler, D. (n.d.)).

Lack of skills and competencies among youth and women to work in a sustainable manner hinders the transition to greener economies. This has highlighted the importance of reforming the teaching and learning methods of TVET systems of many countries. For instance, in China, Bai & Geng (2014) in their paper about transferable skills in technical and vocational education and training noted that one of the policies, the secondary vocational education reform and innovation action plan emphasized the importance of reform and innovation in teaching methods. It encouraged schools to explore project-based teaching, case teaching, situated teaching and virtual and simulated teaching, so as to promote the all-rounded development of students. The action plan highlighted the importance of comprehensive competencies and transferable skills for student development (Bai, B. & Geng, X. 2014).

1.5 Suggested solutions to the challenges

Proper preparation of TVET trainers. The trainers inculcate the skills and values necessary for sustainable development at all levels. Additionally, they originate and develop the teaching curriculum, transfer knowledge to society through research dissemination and community outreach. This can be improved if existing trainers are re-trained through continuous refresher courses about sustainability.

Stimulate staff and student research by introducing competitive research grants for sustainable development projects. The research findings can be disseminated in conferences or seminars and published in journals at a cost. The funds generated can be ploughed back to make research grant more attractive.

Efficient and responsible resource utilization in the TVET institutions by recycling and proper disposal of non-recyclable materials. This can be through household solid waste recycling and waste water recycling before it's released back in the environment.

TVET institutions should mobilize for funds to acquire new equipment that meet environmental standards to enable students practice on them to acquire sustainability skills. Funds should be mobilized by:

emphasizing training with production, such that the products are exhibited and sold for a profit;

involvement of Non-Government Organizations (NGOs) and Voluntary Organizations in the cost sharing or financing of vocational programmes;

engaging in consultancy activities for the TVET institutions themselves and other private and public enterprises;

Vocational training funds. In many countries where employers are active participants in VET a training fund for financing vocational training has been set up. Tax contributions from the employers collected through pay- roll levies or subsidies from the government are transferred to the Training Fund.

Involvement of international donor agencies such as the World Bank, UNESCO, UNICEF and so on, to fund TVET activities

TVET personnel are expensive to train and hire. They should be highly motivated by offering them a good pay package, promoted at work and insured together with dependants in health insurance schemes. This ensures that they will be settled and highly effective with their work.

TVET institutions can invite guest speakers with knowledge in sustainability to raise awareness among staff regarding consumption of resources such as energy, water and paper, alternative energy technologies, waste management, human rights, good governance and employer future skills needs.

Display of safety instructions posters for the laboratories, for electrical works, for handling hazardous waste, for construction works in progress, open pits and walk ways. This instills a culture of safety for all the staff and students in the TVET institutions and sustainability can be enhanced in that regard.

Efficient use of energy by use of power saving equipment in the TVET institutions and where possible applying renewable energy technologies. A clear example can be the use of solar power for the lighting system within the institution premises. Also, using energy saving bulbs in the laboratories and lecture rooms.

Benchmarking sustainability practices with other TVET institutions already implementing sustainability training. This can involve studying sustainability practices from other TVET institutions and finding ways to meet or improve upon them. Benchmarking is vital in gauging successes and identifying weaknesses. The TVET institutions can start by identifying problem areas, selecting top competitors who are excelling and making the necessary changes.

Staff in TVET institutions need to have a strong financial base. They should be supported to invest through pension schemes, Savings and Credit Cooperative Organizations (SACCOs), and other investment clubs. This improves their social status and young people can look at them as their role models.

TVET institutions should develop and deliver courses that meet the local labor market skills demands in a sustainable way. The courses can include such aspects as re-designing unsustainable production processes, information technology, natural sciences and green technology.

TVET institutions should establish well facilitated collaboration centres within their campuses to coordinate issues relating to sustainable development. The coordinators for these centres should be people knowledgeable and enthusiastic with sustainability issues to mentor others and advocate for their inclusion in the institutions' strategic plans.

1.6 Conclusion

The process to re-orient TVET to sustainable development already exists in most TVET institutions but there are no clear guidelines or principles to point it in the right direction. This paper is anchored on Diesendorf (1998), model or framework for sustainability and sustainable development. The framework answers the questions "What is the scope of sustainability? How can we present it in a systematic manner,

distinguishing between ethical principles, broad goals and objectives which are actionable and measurable?" TVET institutions can follow this model by emphasizing the measurable objectives or indicators of sustainable development at Level 2 and the action plan for their implementation to achieve education for sustainable development as indicated at Level 3. In this way, TVET institutions can therefore contribute to the promotion of sustainable development by preparing a generation of workers with sustainability skills, knowledge, values and attitudes that support sustainable development.

REFERENCES

[1] Ademola. S.S., Oloruntoba. O., Clara. O. M., (2017). Investing in Human Capital: An Alternative Paradigm for Sustainable Development in Nigeria. A paper presented at first International Conference on management, technology and Sustainable Development. Federal University of Technology, AKure, Nigeria. 28th-31st March, 2017.

[2] Ajibade A. P. (2013), Building Human Capital for Sustainable Development: Role of the University. A Paper delivered on the occasion of the 2013 University of Ibadan registry discourse on Thursday, 26th September, 2013

[3] Ajibola, Y., M. & Jumoke, S. (2012). *Achieving Sustainable Economic Development in Nigeria through Technical and Vocational Education and Training: The Missing Link.* International Journal of Academic Research in Business and Social Sciences. February 2012, Vol. 2, No. 2 ISSN: 2222-6990.

[4] Australian Government. 2009. Living Sustainably: the Australian Government's National Action Plan for Education for Sustainability. Canberra: Common Wealth of Australia.

[5] Bai, B. & Geng, X. (2014). *Transferable skills in technical and vocational education and training (TVET):* Policy and practice in China. www.tvet-online.asia Issue 3.

[6] Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) (2011), Curricular Design and Development. Human Capacity Development (HCD) for Vocational Education and Training (Mannheim) Käthe-Kollwitz-Str. 15 68169 Mannheim, Germany.

[7] Diesendorf, M., 1998. Models of sustainability and sustainable development. Proc. 'Beyond growth: policies & institutions for sustainability', 5th Biennial Conference of International Society for Ecological Economics, Santiago, November 1998.

[8] Diesendorf, M., 2000, 'Sustainability and sustainable development', in Dunphy, D, Benveniste, J, Griffiths, A and Sutton, P (eds) Sustainability: The corporate challenge of the 21st century, Sydney: Allen & Unwin, chap. 2, 19-37.

[9] Euler, D. (n.d.) *Position Paper on TVET Personnel Development within the Framework of ASEAN Integration*, University St. Gallen.

[10] Fien, John, Rupert Maclean, and Man-Gon Park. 2009. *Work, Learning and Sustainable Development: Opportunities and Challenges.* Dordrech: Springer.

[11] Forum for the Future (2003), *Reporting for Sustainability: Guidance for Higher Education Institutions*, Forum for the Future, London.

[12] Forum for the Future (2003), *Reporting for Sustainability: Guidance for Higher Education Institutions*, Forum for the Future, London.

[13] Harris, J. M. (2000) Basic Principles of sustainable development. *Global Development and Environmental Institute, Working Paper 00-04.*Tufts University.

[14] Interagency Working Group's Initiatives (nd). Greening Technical Vocational Education and Training (TVET) and Skills Development: Challenges and Opportunities

[15]Johnston. A. (2007). Higher Education for Sustainable Development. Final Report of International Action Research Project, October 2006 – March 2007.Forum for the future

[16]Kain, J.-H. (2000): Urban support systems-social and technical, socio-technical or sociotechnical.

[17] Kärkkäinen, K. (2012), "Bringing About Curriculum Innovations: Implicit Approaches in the OECD Area", OECD Education Working Papers, No. 82, OECD Publishing. http://dx.doi.org/10.1787/5k95qw8xzl8s-en

[18] Kerre, B.W. (2010). *Technology and Vocational Education and Training (TVET): A Strategy for National Sustainable Developmen*t. Eldoret, Kenya. Moi University Press.

[19] Kitainge, K., M. (2016).*Training for the Future? A Case of Automotive Training in TVET Institutions in Kenya*. British Journal of Applied Science & Technology 16(4): 1-10, 2016, Article no.BJAST.25391 ISSN: 2231-0843, NLM ID: 101664541

[20] Leape, James. 2008. *Living Planet Report.* Switzerland: World Wildlife Fund International.

[21] Lucas, B., Spencer, E., Claxton, G. (2012). *How to teach vocational education: A theory of vocational pedagogy.* Centre for Skills Development. City & Guilds

[22] Majumdar, S. (2010a). Greening TVET: Connecting the dots in TVET for sustainable development. Retrieved from http://iveta2010.cpsctech.org/downloads/materials/full%20papers/1.%20Greening%20TVET.pdf

[23] Mohamed S., B., H. (2014), Malaysian Local Governments' Role towards Sustainable Development Focusing on Knowledge Transfer Practices Framework. Phd Thesis Universiti Tun Hussein Onn Malaysia.

[24] Redclift, M., 2005. Sustainable Development (1987--2005): An Oxymoron Comes of Age. Sustainable Development, 13(4), pp.212–227.

[25] Sampson, E. (2013), "Sustainable Development: Issues, Strategies and Goals. Zenith Economic Quarterly, Vol.7, No. 2, April,

[26] Thienemann, E., R., C. (2014), Education for Sustainable Development in Technical and Vocational Education and Training. A qualitative case study on the integration of Education for Sustainable Development in a Philippine TVET institution.

Masters' thesis, Institute of International Education, Department of Education. September, 2014 Stockholm University

[27] Tovey, H., 2009. Sustainability: A Platform for Debate. Sustainability, 1, pp.14–18.

[28] UN, United Nations. 1992. The Rio Declaration on Environment and Development (1992), Rio de Janeiro: United Nations Department of Public Information.

[29] UNEP (United Nations Environment Programme). 2008. Green Jobs: Towards decent work in a sustainable, low-carbon world. United Nations Environment Programme September 2008, Nairobi, Kenya.

[30] UNEP (United Nations Environment Programme). 2011. *Towards a Green Economy: Pathways to sustainable development and poverty eradication*. Nairobi, UNEP.

[31] UNESCO (2006). Orienting Technical and Vocational Education and Training for Sustainable Development. A discussion paper. Retrieved from http://www.unevoc.unesco.org/fileadmin/user_upload/pubs//SD_DiscussionPaper_e.pdf

[32] UNESCO (2009). World Conference on Education for Sustainable Development. Proceedings. Bonn, Germany, 31 March-2 April 2009. Retrieved from http://www.esd-world-conference-2009.org/fileadmin/download/ESD2009ProceedingsEnglishFINAL.pdf

[33] UNESCO (2012). Education for Sustainable Development in Action Sourcebook, Learning & Training Tools No4 Paris, France. ISBN 978-92-3-001063-8

[34] UNESCO. 2005. United Nations Decade of Education for Sustainable Development (2005 – 2014): International Implementation Scheme. Paris: UNESCO. http://unesdoc. unesco.org/images/0014/001486/148650E.pdf

[35]UNESCO. (2010). Education for sustainable development (ESD). http://www.unesco.org/en/esd/ (Accessed 28th November, 2017).

[36] UNESCO-UNEVOC (2006). Orienting Technical and Vocational Education and Training for Sustainable Development, a Discussion Paper Series 1, Bonn Germany

[37] UNESCO-UNEVOC (2017). Greening Technical and Vocational Education and Training: A practical guide for institutions. UNESCO-UNEVOC International Centre, Bonn Germany.

[38] UNESCO-UNEVOC, (2005). The Bonn Declaration in sustainable development and TVET. Meeting on "Learning for Work, Citizenship and Sustainability" (Seoul + 5) hosted by the UNESCO-UNEVOC International Centre for TVET, in Bonn, Germany.

[39] United Nations (1987). Our Common Future. Report of the World Commission on Environment and Development. Retrieved from http://conspect.nl/pdf/Our_Common_Future-Brundtland_Report_1987.pdf

[40] Wals, A. (2009). Education for sustainable development. UNESCO. Retrieved on 32 October, 2016 from, http://www.unesco.org/education/justpublished_desd2009.pdf.

[41] Wals, Arjen. (2009). *Review of Contexts and Structures for Education for Sustainable Development 2009.* Paris: UNESCO.

Influence of Teacher's Preparation Of Professional Documents On Students' Academic Achievement Of Kiswahili Language In Public Secondary Schools In Kathonzweni Sub-County, Kenya

[1]Elizabeth Welu Kiamba, PhD student.

School of Education, Department of Educational Communication and Technology, Machakos University in Kenya. Email: kiambaelizabeth@yahoo.com. Tel. 0729817995

[2] Dr. Francis Mutua, Lecturer

School of Education, Department of Educational Communication and Technology, Machakos University in Kenya. Email: bfmutua50@yahoo.com . Tel. 0791679945

[3] Dr. David Mulwa, Senior Lecturer

School of Education, Department of Educational Management and Curriculum Studies, Machakos University in Kenya. Email:davimulwa@gmail.com. Tel. 0729482924

Abstract

Poor performance in the Kenya Certificate of Secondary Education (KCSE) Examination has been of a great concern by all stakeholders particularly the students' academic achievement of Kiswahili language. For five years Kathonzweni Sub County has been posting poor results in Kiswahili language. The purpose of the study was to establish the influence of teacher's preparation of professional documents on students' academic achievement in Kiswahili language. This study was guided by Teacher Efficacy theory. The study was conducted in Kathonzweni Sub County, Kenya. The target population comprised of 60 Kiswahili language teachers and 39 principals in all the 39 public secondary schools in the Sub County. The Kiswahili language teachers and the principals were purposively sampled. The sample size was all the 39 principals and 60 Kiswahili language teachers hence Census Survey. Questionnaires for principals and teachers were used as instruments of data collection. The objective of the study was; to establish the influence of the teacher's preparation of professional documents on students' academic achievement in Kiswahili language on students' academic achievement in Kiswahili language in public secondary schools in the Sub County. Both questionnaires were piloted for reliability and yielded Chronbach Alpha Coefficient of 0.833 for principal's questionnaire and 0.838 for teachers' questionnaire. The data collected was quantitatively analyzed using Statistical package of Social Sciences (SPSS). Frequencies and percentages were used to summarize and describe data whereas Pearson correlation was used to establish relationships. The findings established that; teacher's preparation of professional documents did not have a significant influence (r=0.273, p-value=0.649).The findings of the study will be useful in advising the Ministry of Education (MOE) on ensuring thorough grounding of teachers in teacher training colleges and universities to produce fully baked Kiswahili teachers. It may be used for future researches on related studies.

KEYWORDS: Teacher Preparedness, Student Achievement, Professional documents, Kiswahili Language.

Introduction

Brown (1994) states that teaching is extremely complex endeavor which involves classroom management, lesson preparation, and organization of teaching and learning activities for effective classroom instruction. Rosenshine (1995) advises that planning to teach should be the first thing a teacher should do when beginning to teach in order to achieve educational goals intended. Marino (2007) indicated that teachers need initial and continuing professional development and training to have a very positive impact on students' academic achievement in the teaching and learning process. Adegoroye (2004) asserted that improving performance depends on improvement of quality of classroom practices of the subject teacher and the more organized the teacher is the better the academic achievement. Kimosop (2015) explains that teachers are required to prepare all stages of the implementation of curriculum documents before they are actually the students' use through their assistance. Kiswahili language academic achievement has been affected by the belief that it is a native language hence lacks the seriousness it deserves from teachers and students. Odhiambo (2005) indicates that there is extremely growing demand and desire from the Kenyan government and public for accountability from the classroom teachers.

Statement of the Problem

Students' academic achievement in the KCSE at national level has been dismal over the years. Students' academic achievement in Kathonzweni Sub County has been poor in the last 5 years as shown in the Table 1.1 below. The table shows that the number of candidates in this Sub County has significantly increased from 1580 to 2070 over the years but the mean scores have decreased over the last five years. They are not only low but very poor given that the maximum mean score should be 12.00 (A).

Table: 1.1 General analyzed KNEC Results for Kathonzweni Sub County.

Year	2013	2014	2015	2016	2017
Entry	1580	1643	1723	1949	2070
Mean scores	5.200 C-	4.491 D+	4.662 C-	3.480 D	3.353 D

Source: Kathonzweni Sub County Examinations Office

The performance of Kiswahili language in the Sub County has been increasingly dropping for the last five years as shown in Table 1.2 below

Table: 1.2 Kiswahili Language analyzed KNEC Results for Kathonzweni Sub- County

Year	2013	2014	2015	2016	2017
Entry	1580	1643	1723	1949	2070
Mean scores	5.943 C	5.531 C	5.242 C-	4.112 D^+	3.719 D^+

Source: Kathonzweni Sub County of Education Examinations Office

The low academic achievement in Table 1.2 above is worrying despite the infrastructure as well as technical support from the government and other development partnerships as well as other stakeholders. This dismal academic achievement is of great concern to parents; the government and general public since each of them expect very good results especially after making a huge investment in the secondary education in terms of money and human resources.

Purpose of the Study

The purpose of the study was to investigate the influence of teacher's preparation of professional documents on students' academic achievement of Kiswahili language in public secondary schools in Kathonzweni Sub County, Kenya.

Theoretical Framework

The study adopted Teacher Efficacy theory. This theory was first developed by RAND researchers in 1960's. According to Berman, McLaughlin, Bass, Pauly and Zelman (1977) teacher efficacy has been defined as the extent to which the teacher believes he or she has the capacity to affect student academic achievement. This can be done or achieved mainly through confidence in content delivery, class management and other teaching practices. Gusky and Passaro (1994) indicate that it can also mean the teachers believe or conviction that they can influence how well students learn, how they retain the subject matter, even those who may have difficulties or unmotivated. Teacher efficacy correlates with teacher preparedness and actually suggests strategies which are used for improving the efficacy of in- service teachers (Rotter, 1966). Teacher preparation according to him includes the teacher's ability to be able to deliver instructional process with confidence and be able to prepare the recommended documentation. In this case therefore documentation needed may include lesson plan, schemes of work, lesson notes, and records of work. Implementation of teaching practices as discussed by Gusky (1982) are parameters used to measure teacher efficacy. Therefore, this theory was well connected with the study carried.

Literature Review

Teacher's Preparation of Professional Documents

Urevbu (1985) indicates that the teacher needs teaching documents which are items any serious and committed teacher must know, is able to develop and use in teaching and learning process. They spell out the teaching professionalism. Any serious teacher should take the following measures before beginning to teach ;(a) Read the official syllabus description of the subject. (a) Select the broad content areas to be covered by the teacher (c) Consider teaching within the stipulated time (Oketch & Asiach, 1986). Kimosop (2015) states that a syllabus book is a document that guides a teacher to plan for effective classroom instruction where they should use it to identify objectives, write schemes of work and lesson plan. Kimosop (2015) states that effective classroom instruction entails 3 main stages. One of the stages include; preparation stage (planning stage) which involves identification of the content to be covered, identification of objectives, scheming of the content, and lesson planning. According to KICD (2017) professional documents are documents which are used by the teacher in the preparation, implementation and evaluation of teaching and learning process. They include; schemes of work, lessons plan, records of work, progress reports and Individualized Education Program (IEP).

Eshiwani (1985) that good administration practices of principals like checking of teachers' professional records are always reflected in the good performance of the school and administration have impact in teaching and learning of a given subject.

Students' Academic Achievement

Stolp and Smith (1994) defines academic achievement as the extent to which a student, teacher or institution has achieved their intended educational goals. Darling-Hammond (2006) says that classroom teachers are primary responsible for student academic achievement. They should work towards that primary goal; academic achievement. Bass (2009) on his study on under achievement in schools and colleges found that overpopulated class, teaching and learning resources as well as teachers' pedagogy significantly related to learners' academic achievement. Heneveld (1994) notes that heads of institutions should be able to supervise and support teachers' work through lesson observation, schemes work, lesson plan and work records. Dessarollo (2008) states that academic achievement is dependent of various factors including the institutional leadership, teacher motivation, student attitude and availability of resources.

Summary of the Literature Review and Gaps

From the studies cited above it is clear that teacher's preparation of professional documents and students' academic performance is dependent on other several factors including overpopulated class, teacher motivation, institutional leadership, availability of instructional materials for teaching learning process and teachers' pedagogy. The academic achievement of students in Kiswahili language Kathonzweni Sub County in the KNEC examinations has not been promising in the last five years.

Research Methodology

The study adopted mixed method research design. The target population was the 39 principals and 60 Kiswahili teachers in the 39 public secondary schools in Kathonzweni Sub County. The sample size was all the 39 principals and 60 Kiswahili language teachers hence census survey. Questionnaires for the principals and Kiswahili teachers were used as the main instruments of data collection. A Pilot study was done in accordance to a recommendation by Mugenda and Mugenda (2008) that 1% of target population is examined to ensure reliability of the instruments before the actual study. One school was selected for the study. The collected data was quantitatively analyzed using Statistical Package of Social Sciences (SPSS).

Research Findings

Influence of Teacher's Preparation of Professional Documents on Students'

Academic Achievement in Kiswahili language.

The main objective of the study was to establish the influence of teacher's preparation of professional documents on students' academic achievement on Kiswahili language in public secondary schools in Kathonzweni Sub County. The principals and teachers were asked to tick on their level of agreement on listed statements on influence of teacher's preparation of professional documents. The data were analyzed in form of percentages and frequencies. Table 1.3 Presents principals' agreement level on

influence of teacher's preparation of professional documents on students' academic achievement in Kiswahili language

Table 1.3: Principals' Level of Agreement on influence of Teacher's Preparation of Professional Documents on students' academic achievement in Kiswahili language.

NO	Statement	SA %	A %	U %	D %	SD %
1	My Kiswahili language teachers prepare the professional documents always.	68.6	31.4	0.0	0.0	0.0
2	Preparation of professional documents has influence on students' academic achievement.	40.0	57.1	2.9	0.0	0.0
3	Kiswahili language teachers take preparation of professional document seriously.	28.6	68.6	2.8	0	0
4	Institutional leadership supervises the preparation of professional documents.	65.7	34.3	0	0	0
5	All the professional documents are prepared in time and well used in preparation for classroom instruction.	17.1	51.4	8.6	22.9	0
	N=35					

Findings in Table 1.3 show that: 68.6% of the principals strongly agreed that Kiswahili language teachers prepare the professional documents always and 31.4% disagreed; 57.1% agreed that preparation of professional documents has influence on students' academic achievement, 40% strongly agreed and 2.9% were undecided; 68.6% agreed that Kiswahili language teachers take preparation of professional document seriously, 28.6% strongly disagreed and 2.8% were undecided; 65.7% strongly agreed that institutional leadership supervises the preparation of professional documents and 34.3% agreed. 51.4% of the principals strongly agreed that all the professional documents are prepared in time and well used in preparation for classroom instruction, 17.1% strongly agreed, 8.6 % were undecided and 22.9% disagreed. This implies that the principals always play their role of supervising their teachers' preparation of their professional documents. Timely preparation of professional documents ensures that teachers are well prepared to teach which have an impact on students' academic achievement. The findings concur with Adegoroye (2004) that improving performance depends on improvement of quality of classroom practices of the subject teacher and the more organized the teacher is the better the academic achievement. Table 1.4 Presents teachers' agreement level on influence of teacher's preparation of professional documents on students' academic achievement in Kiswahili language.

Table 1.4: Teachers' Level of Agreement on teacher's Preparation of

Professional Documents in Kiswahili language.

No	Statement	SA %	A %	U %	D %	SD %
1	Preparation of schemes of work has influence on performance of Kiswahili language.	36.0	54.0	4.0	6.0	0.0
2	Reference to the syllabus in preparation of schemes of work has influence on performance in Kiswahili language.	42.0	56.0	2.0	0.0	0.0
3	Preparation of lesson plan has influence on performance of Kiswahili language.	28.0	58.0	4.0	10.0	0.0
4	Preparation of lesson notes has influence on the performance of Kiswahili language.	46.0	52.0	2.0	0.0	0.0
5	Preparation of records of work has influence on the performance of Kiswahili language.	28.0	32.0	36.0	4.0	0.0
6	Preparation of the progress records has influence on students' academic achievement in Kiswahili language.	38.0	56.0	6.0	0.0	0.0
	N=50					

Findings in Table 1.4 show that: 54% of the teachers agreed that preparation of schemes of work has influence on academic achievement of Kiswahili language,36% strongly agreed, 4% were undecided and 6% disagreed; 56% agreed that reference to the syllabus in preparation of schemes of work has influence on academic achievement in Kiswahili language, 38% strongly agreed and 6% were undecided; 58% agreed that preparation of lesson plan has influence on academic achievement of Kiswahili language, 28% strongly agreed, 4% were undecided and 10% disagreed; 52% agreed that preparation of lesson notes have influence on the academic achievement of Kiswahili language, 46% strongly disagreed and 2% were undecided; 36% were undecided on whether preparation of records of work has influence on the academic achievement in Kiswahili language, 28% strongly agreed, 32% agreed and 4% strongly disagreed; 56% of the teachers agreed that preparation of progress records has influence on students' academic achievement in Kiswahili language, 38% strongly agreed and 6% were undecided. This implies that teacher's preparation of professional documents have an influence on achievement in Kiswahili language. The finding in line with Urevbu (1985) who asserted that the teacher needs teaching documents which helps them in teaching and learning process.

Summary of the Findings

In line with the objective of the study; findings established that teacher's preparation of professional documents did not have a significant influence on student's

performance in Kiswahili language (r=0.273, p-value=0.649). However, teachers were in agreement that preparation of schemes of work has influence on performance of Kiswahili language; reference to the syllabus in preparation of schemes of work has influence on performance in Kiswahili language; preparation of lesson plan has influence on performance of Kiswahili language; preparation of lesson notes have influence on the performance of Kiswahili language; preparation of progress records has influence on students' academic achievement in Kiswahili language. The finding concurs with Eshiwani (1993) that good administration practices of principals like checking of teachers' professional records are always reflected in the good performance of the school and that good administration have impact in their teaching and learning process.

Conclusion and Recommendations

Teacher's preparation of professional documents was found to have influence though insignificant on the quality of education standards and schools where teachers prepare their professional documents without supervision. A well done lesson helps the teacher to organize the content, plan and prepare learning resources, present concepts and skills systematically, manage time well, select and design appropriate assessment methods and make connections between components. The study suggests that a research on the role of principals in ensuring effective supervisory functions in public secondary schools could be done to find out how the principals ensure the effective supervision of the schools they head.

References

Adegoroye,B.S.(2004). *Influence of some Nigeria principals' personnel attributes on Job fulfillment and satisfaction*. Edu.Perspectives.7 (2):54

Bass, I.W. (2009). Student Under Achievement in Schools and Colleges. *The simulation; J. Nigeria Air Force Education.*

Berman, P., McLaughlin., Bass, G,Pauly,E.,and Zellman ,G.(1977).*Federal programs supporting educational change:Vol.II. Factors affecting implementation and continuation (Rep. No .R-158917-Hew).*Santa Monica, CA: RAND. (Eric document reproduction service no.140432.

Brown (1994).*Curriculum and Instruction. An introduction to methods of teaching. Accra:* Macmillan Education Ltd.

Darling –Hammond, L. (2006). Teacher Quality and Student Achievement: A review of state policy Evidence. *Education policy Analysis Archives .8(1).31.*

Dessarollo, L. (2008). *The Quality* of *Education in Latin America and Caribbean Latin America*. Research Work Institute, Paraguay.

Eshiwani,G.S.(1993).*Factors influencing performance among primary and secondary schools in western province of Kenya*, Unpublished paper, Department of Education Foundation, Kenyatta University.

Gusky,T.R., and Passaro, P.D. (1994). Teacher efficacy. A study of construct dimension. *American Educational Research Journal, 31,627-643*

Gusky, T.R. (1982).The influence in instructional effectiveness upon the effective characteristics of teachers. *American education Research Journal, 21-245-259.*

Heneveld ,W.(1994). *Planning and monitoring the quality of primary Education in Sub – Saharan Africa.*Washing D C,World Bank, Human Resource and Poverty Division.

KICD (2017). *Facilitators Manual for Early Years Education Curriculum*. Nairobi, Kenya

Kimosop, E. (2015).Teacher preparedness for effective classroom instruction of secondary school CRE curriculum in Kenya: *IJSRIT ISSN: 2313-3759 VOL .2 NO .12.*

Marino ,J.J(2007). A new paradigm for Organizational change: involving Customers and Stakeholders in the improvement process. *Journal for Quality &Participation,30(1),10-12.*

Mugenda, O.M., and Mugenda, A.G. (2008).Research *methods: Quantitative and Qualitative Approaches.* Nairobi: Acts press.

Odhiambo, G. (2005). Elusive search for Quality Education. The case of Quality Assurance and of Social Science 1(3), 84-92

Oketch, J. G., and Asiachi, A.J. (1986).*Curriculum development for primary schools.* Nairobi. Kenyatta University.

Roshenshine, B.(1995).Direct instruction.*International Encyclopedia of Education.(Eds)Torsten Huses and T.Neville postlethwaite Oxford: Pergamon press, vol.3.*

Rotter, J. B (1966). Generalized expectation for internal versus external control of Reinforcement, *psychological monography 80, 1-28*

Stolp,S.,and Smith,C.S.(1994).*Transforming school Culture stories, values and leaders roles*, Eugene, University of Oregon.

Urevbu, A.O. (1985). *Curriculum studies, Keja:* Longman

Influence of participation of student councils in conflict resolution in management of public boys' and girls' boarding secondary schools, nyeri county, kenya.

Eustace Murage Muthui[1], George M. Muthaa[2], Barchok K. Hillary[3] & David K. Wamukuru[4]

[1,2,3]Department of Education, Chuka University, Meru- Kenya

[4]Department of Curriculum, Instruction and Educational Management, Egerton University,Kenya

Email: emmuthoi@yahoo.com

Abstract

The purpose of this study was to determine the influence of students' council's participation in conflict resolution on management in boys' and girls' public boarding secondary schools. The study adopted the descriptive survey and correlation research designs. The study was conducted in 12 boys' and 12 girls' public boarding secondary schools in Nyeri County that were identified using purposive sampling technique. A sample of 384 respondents was used. Data was collected using questionnaires. Data was analysed using both descriptive and inferential statistics. The study found that participation of student council in conflicts resolution had statistically significant influence on management of public boys' and girls' boarding secondary schools. The study concluded that a unit increase in participation of student councils in conflict resolution enhances school management by a factor of 0.887. The study recommended that there is need to enhance guidance and counselling among students, organize forums to train student councils on conflict resolution strategies and promote moral behaviour and characters in order to be trusted in resolving conflicts among students

Keyword: School management; Students Council; Conflict resolution; Secondary School

1.0 Introduction

1.1 Background of the Study

The student council policy was embraced by secondary schools management because it was expected to address issues that made students and teachers unhappy about prefects (Indimuli, 2012). Therefore, the student councils were implemented with enthusiasm that by the beginning of 2012, 77% of schools had transited from the prefects to student councils leadership (Tirop, 2012). The establishment of student councils created democratic space among the students that was credited for the relative peace that was marked by decline in student unrest from a high prevalence of 7.4% in 2008 to 0.4% in 2011 in secondary schools in Kenya (Tirop, 2012). However, in year 2013, cases of student unrests rose to 0.49% of the number of secondary schools in Kenya. The only difference with student unrests in 2014

compared to those in 2008 were that they were accompanied with arson attacks (Republic of Kenya, 2014). In 2015 the situation was worse as 51 boys and 12 girls' public boarding secondary schools which constituted about 1% of schools in Kenya were affected by student unrests (Masese, 2015). In 2016 the situation of student unrests had deteriorated from that of 2015. In total, 126 secondary schools which was rated 1.9 % of all secondary schools in Kenya were affected (MOE, 2016). According to Ouma and Muide (2016) nationally, student unrests had affected 98 boys and 28 girls' secondary school resulting to suspension of studies for about 6000 students in the affected schools. This show more cases of student unrest among boys schools compared to the girls' schools.

The student unrests continued to be a matter of concern to education stakeholders despite the fact that there were elected student councils in those schools whose responsibility included prevention of student unrests to enhance management of secondary schools as per the expectations of the MOE when the student councils were introduced (Ndungu & Kwasira, 2015). Student unrests often caught the school administration unaware despite fact that student council were expected to have known and presented the student grievances and negotiated a compromise in good time (Abuya & Muhia, 2016).

In 2016, student unrests were recorded in five public boarding secondary schools in Nyeri County as at 30th July where three were in boys and two were in girls' public boarding secondary schools (Ouma & Muide, 2016). It is inquisitive whether the prevalence of fewer student unrests in girls' public boarding secondary school compared to the boys' schools is as a result of well-established and effective student councils in girls than in the boys' schools. This study sought to fill the literature gap by conducting a comparative study on the participation of student councils in public boys and girls public boarding secondary schools. The study aimed at determining the influence of student council participation in conflict resolution on management of public boys' and girls' boarding secondary schools.

2.0 LITERATURE REVIEW

2.1 Student Leadership in School Management

According to Leithwood, et al, 2004), student leadership is the exercise of power by a few students over the other students by setting up targets, giving direction, establishing interpersonal influence and motivation geared towards accomplishment of planned goals for the benefit of the whole school. The student leadership in secondary school management is involved in planning, organizing, directing and controlling student activities to conform to the school routine (Keogh & Whyte, 2005). According to Huddleston (2007) student leadership provides a unique opportunity for students to acquire and practice management skills in welfare, boarding, accommodation, sports, health, environment and academics depending on the establishment of their school. School management borrows heavily from Likert's Management Systems that were developed after 30 years of extensive research on how good leadership would improve efficiency in an organization. Likert's research covered various firms and organizations, including schools and universities, and involving head teacher, teachers and students. The Likert's findings revealed that leaders us a combination of authoritative, benevolent, consultative and participative styles of management to achieve their institutional goals.

In school management according to Modaff, et al. (2008) there are consultative student leader has substantial but not complete confidence with his/her ideas. As a result the general decisions are made by the student leader and then sought the opinions of the students, and makes the finally decision. The student develops positive attitudes toward the school management and the student leaders when they are consulted. If the students feel that enough consultation has not taken place, they may publicly resist orders from the student leaders and the school administration and that becomes conflict which requires quick intervention in terms of decisions for normalcy to be restored in the institution. Communication flows from top to the bottom of the hierarchy. The student leader consults through relevant channels, with students on matters they would like to bring to the attention of the school administration. The school management usually delegates tasks to control students at lower levels which is done in terms of supervision and perceived as a way of maintaining the set standard.

Student councils in school management were expected to promote peace through participation in conflict resolution. Therefore the re-emergence of devastating student unrests in public boarding secondary schools in 2015 and 2016 show that there was a gap in implementation of the policy on participation of student council in school management. This study therefore, investigated the influence of student councils participation in conflict resolution to enhance effective management of public boarding secondary schools in Nyeri County.

2.2 Participation of Student Councils in Conflict Resolution

Conflict resolution is the processes of facilitating peaceful ending of differences and restoring respect among people (Welsh & Black, 2011). According to Kerzner (1998) conflict is part of social change which is inevitable in schools and has the potential to destroy teamwork and therefore if they are not resolved effectively, real and legitimate differences between teachers, students and school administration would get out of control, and result in an irretrievable breakdown in communication, resulting to unrest and destruction of property.

According to Gebretensay (2002) conflict in secondary schools is manifestation of hostility and antagonism where it is expected to be harmonious but caused by the fact that two people are different from one another (inter-personal). There are also conflicts that are psychological and involves the ones thoughts, values, principles and emotions (intra-personal). Also common is the intra-group conflict that develops among individuals in a team and expressed in incompatibilities and misunderstandings among these individuals and (inter-group) conflict that takes place when there are misunderstanding among different teams in a school.

In developed countries such as the USA the student councils face challenges in their effort to enhance school management. According to Leithwood, et al (2004) student councils face challenges emanating from conflict in conducting democratic student elections due to interference from students, teachers and the school administration. The conflicts emanating from failure of the student councils to conduct democratic elections make student leadership a weak entity for directly representing the students in school, community and national activities.

Besides, Oku, Emenalo and Okeke (2008) identified five types of conflict which include role conflict where a person conforms to two or more contradictory sets of roles at the same time. There is also personality conflict where what a person by principle want does not match what the counterpart wants. In such a scenario a

democratic student leader finds himself operating with an autocratic principal. In school there is also a role personality conflict that exists where a student council role expectation is at variance with his or her academic need disposition. In addition there is cognitive conflict which is on play when there are differences in perspectives resulting to emergence of new approaches of solving problems (Department of Education and Early Childhood Development, 2009). Finally there is the affective conflict where student leader emotions are directed against other students' interests leading to anger, bitterness, goal displacement and outright conflict in school management.

According to Woods and Cribbs (2001) in USA and India the student council has conflict resolution councils whose responsibility is to offer peer mentorship, personal support and encouragement to fellow students who are struggling with the challenges of secondary school life. In Britain student conflict resolution councils were formed to give students opportunities to dialogue on specific issues of conflict with teachers outside the class and helped eliminate student conflict associated with bullying (Botti, 2010). Oluand and Abosede (2003) conducted a study in Nigeria that concluded that the most common types of conflicts in schools occur between the students on one hand and the school authorities on the other while other forms of conflict include interpersonal among staff and as well as the students in different classes. The studies conducted in South Africa by Mabena (2002) concluded that student councils participation in school management has more influence when the student leaders are free from the ridicule of the school administration, teachers and students. Studies conducted in Nigeria by Otegbulu (2014) established that training the student councils on guidance and counselling is one of the sure ways of enhancing their impact in conflicts resolution among students for realization of effective school management.

In Kenya, conflicts between students and the management in secondary school are caused by misunderstanding among the students and teachers (MOE, 2010). The MOE (2010) recommended that conflict resolutions in schools should be interest based where courteous and non-confrontational approach that focus on issues rather than individuals, and listening carefully to each student's point of view is followed. In secondary schools conflict issues should be addressed in open forums where the students are supposed to openly express themselves in either English or Kiswahili which are the official languages to accommodate individual differences of students from diverse ethnic backgrounds (MOE, 2013). When people listen and explore the causes of conflict and possible solutions carefully, the conflict can be resolved thus promoting condusive learning environment in the school.

The main reason why students are in a school is to excel in their academic performance (Kamuri, 2014). Failure of a school to shine in academic performance especially national examinations has also caused conflicts, getters, desperation and low self-esteem among student leaders (Republic of Kenya, 2014). According to Tirop (2012) after results for national examinations are released the students' councils raise issues with the teachers whose subjects are being performed poorly and would challenge the school administration to promise that results will improve and as a result improve in school management.

The student councils are designed with a justice and conflict resolution secretary who is a student with s a thorough understanding of the school rules and regulations which are emphasized in every student forum. The justice officer in the student council uses the school rules to arbitrate cases of conflict between the school management and the students. The justice officer should also assist in the distribution

of duties to the student by the student leaders to ensure that they are fairly distributed. In the event of conflicts involving the students, the student council should play its conflict resolution role for peace to prevail in school (Otieno, 2010).

There are rare situations where there are unresolved conflicts between some student leaders and the fellow students Indimuli (2012). If the school administration does not work to resolve such a conflict, the student leaders affected may face hostility from fellow students that at times turns tragic to claim innocent lives in brutal or arson attacks at school. At a worst case scenario such a situation may escalate to a full scale student unrest and completely put the school management off the balance. An emerging cause of conflicts in school management is worship of the students and how it is managed in the school. In the student council structure worship is managed by the directorate of student welfare. Since it is not possible for all students' faiths to worship separately, many schools have organized for four worship groups which have separate leadership structure from the student council. These are often the Catholics; Christian Union (CU); Sevens Day Adventists and Muslims (SDA). The school administration should monitor the spiritual groups' activities through patrons and leaders students to check on any emerging conflict between the religious groups in schools. Inadequate management of students' religious conflicts were responsible for the 2015, student unrest in St. Phillips High School Siakago and Kegonge (Masese, 2015).

It important that secondary school establish a conflict resolution corner where conflicts issues are discussed and in case an offender is found and is remorseful, one is forgiven and cautioned, (Kimuri, 2014). The justice and conflict resolution wing of the student councils should initiate regular dialogue with the school management on all issues affecting the students besides confirming to all the facts and listens before passing judgment which helps to build effective teams and earn respect from all students (Otieno, 2010). Student councils justice wing should also listen settle disputes and reach a compromise with the students without necessarily involving the school management. However, all difficult issues should be presented to the school management. The student councils must behave responsibly while resolving conflicts and observe tolerance with the students to win their trust and confidence and enable them to avert student unrests in secondary schools and by so doing enhance school management (Gesito, 2005).

Studies conducted by Kinyua (2015) established that student leaders may at times find themselves in awkward situations when their interests are in conflict with that of the school administration. When such a conflict is not resolved amicably the student council members may seek sympathy from their fellow students and incite them against the school administration. If such a conflict is not resolved in time and the situation escalates to a student unrest the student leaders may passively or actively participating in student mass indiscipline.

The student councils have a duty of peer mentoring and counseling of students to enable them develop a positive attitude towards their school and orients new student to school rules and regulations to enable them settle down as fast as possible for their studies (Murage, 2014). On conflict resolution, the student councils should participate in interactive and consultative meetings (barazas) with teachers, students and MOE officials from schools, counties, regions and nationally meet to discuss emerging issues affecting students are addressed with unity of purpose being to reduce student unrests (UNICEF, 2011).

According to Giulia (2010), mediation based on the idea of peer counseling, active listening and facilitation of communication make student leaders talk about conflicts and finding their own solutions to management of conflicts. In that regard peer mediation is used as a preventive method to solve smaller conflicts before they turn to larger ones between the students and the school management. That creates a solution-oriented atmosphere where conflicts are seen as a part of everyday life and their resolution as a positive challenge more than a difficult and unpleasant task. However, according to Ndiritu (2011) student councils lack adequate peer mentorship, guidance and counseling skills. Such skills would be necessary to enable the student councils help fellow students to tone down their activism when there are issues which may results to student unrests and instead directs their energies to pursuance of academic and non-academic dreams thus managing conflict among students and the school administration which inclusively enhance school management.

From the foregoing discussion it is clear that the student councils participation in conflict resolution play a critical role in influencing management of schools. However, there is no empirical study that has been done to establish the influence of the participation student councils in conflict resolution on the management of public boys' and girls' boarding secondary schools. This researcher therefore identified that gap in knowledge that is left thereof. It is the endeavor of the researcher in this study to establish the influence of student councils in conflict resolution on the management of girls' and boys' public boarding secondary schools.

2.3 Theoretical Framework

Contingency Theory

According to (Dubrin, 2007) the contingency theory emphasizes the importance of the leadership keeping situation under control. However, matching the situation with the leader may create problems, because the amount of control the leader exercises varies from time to time. For example, if a relationship-oriented leader finds a good leader-follower situation for exercising control, it is almost certain that the leader would attempt to make the situation less favorable. As a result, the set goals may not be accomplished by a leader who has made the situation less favorable Virkus (2009). That is in agreement with assertion that good relationship between the leader and followers is important for making it easy for the leader to have influence and exercise control over the situation for achievement of the set goals of the organization. According to Virkus 2009 the contingency theory also explains that the difference in the participation of the student council in the management of public boys' and girls' boarding secondary schools emanate from lack of motivation, poor task structures of the student council where the tasks for the students has not been clearly specified and which is central to task accomplishment. The contingency theory also explains that the conflicts in both public boys' and girls' boarding secondary schools are as a result of the internal climate / culture of the school lacking cohesive and harmonious co-existence.

2.4 Conceptual Framework

The study adopted the conceptual framework as shown below.

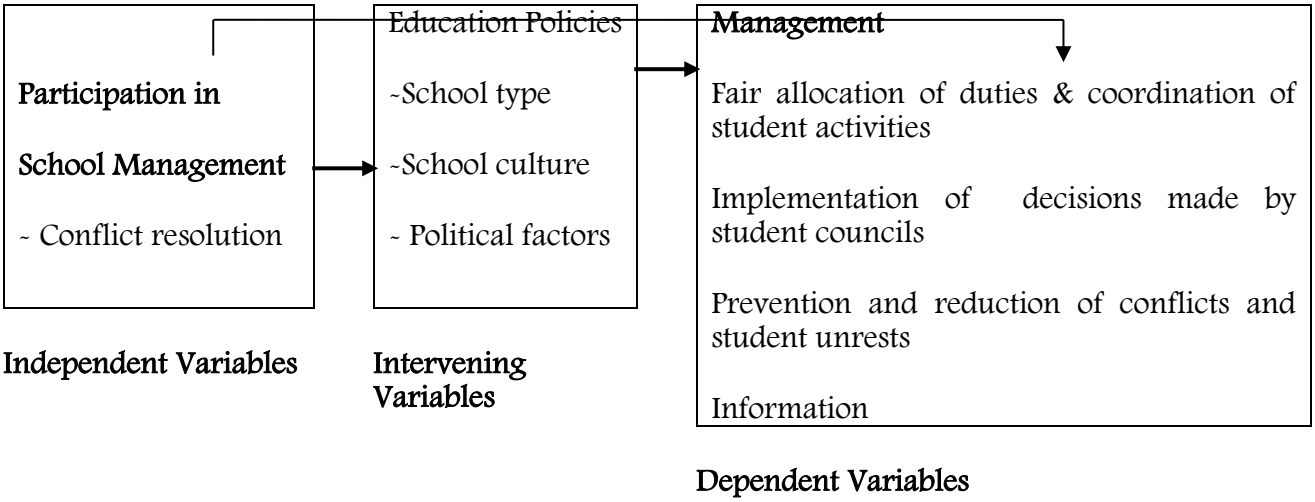


Figure 1: Participation of student councils in schools Management

3.0 METHODOLOGY

3.1 Research Design

This study adopted the descriptive survey research design. This design was appropriate in establishing, comparing and describing the relationships and the influence among the variables of the study (Kathuri & Pals, 1993) and (Mugenda & Mugenda, 2013). The design allowed descriptions and comparison of the current status of the participation of student councils in conflict resolution, to enhance management of public boys and girls in boarding secondary schools.

3.2 Location of Study

The study was conducted in the Nyeri County which neighbors Laikipia, Meru, Kirinyaga, Muranga and Nyandarua counties (Institute of Economic Affairs (IEA), 2012). Nyeri County has six sub-counties which include Nyeri Town, Tetu, Mukurweini, Othaya, Mathira and Kieni with a total of 71 public boarding secondary schools. The county has a total of 28 boys' and 43 girls' public boarding secondary schools which the researcher needed to conduct a descriptive survey between boys and girls secondary schools (Republic of Kenya, 2013). Nyeri County had also been affected by persistent and devastating student unrests over the years mainly affecting boarding public secondary schools (MOE, 2008; 2015).

3.3 Samples Size and Sampling Procedures

Sampling is the process of selecting a representative group from the target population to participate in the study for generalization of results (Mugenda & Mugenda (2013). A sample size of 384 respondents was drawn from a target population of 10,388 target population in 71 boys' and girls' public boarding secondary schools in Nyeri County as recommended by Kathuri and Pals (1993). The study used systematic random sampling to select 72 Form 3 boys and 72 Form three girls from their entry in the class registers to participate in the study. Purposive sampling was used to select a total of 192 student council members comprising of 96 boys and 96 girls from 12 boys' and 12 girls' secondary schools. Purposive sampling was used to select one Form 3 class teacher and one deputy principal in each of the 24 schools. Purposive sampling

was chosen because it allowed the researcher to reach the respondents that had the required information with respect to the objectives of study.

Table 1: Summary of the Sample Size

Variable	Target Population (N)	Sample Size (n)
Form 3 boys	3386	72
Form 3 girls	3948	72
Student Council- Boys	532	96
Student Council- Girls	533	96
Class Teachers	1917	24
Deputy Principals	71	24
Total	10388	384

3.4 Research Instrument

The research instruments that were used to collect data to establish the influence of student councils participation in conflict resolution to management of public boys and girls boarding secondary schools were questionnaires.

3.5 Data Analysis

Computations were made for the data using the Statistical Package for Social Sciences (SPSS) version 23. Descriptive statistics namely frequencies, percentages and measures of central tendency especially the mean and standard deviation were used to describe the characteristics of the collected data. To establish the influence of the participation of student council in conflict resolution on schools management and also test the hypothesized influence, correlation and regression analysis were used. The regression equation to estimate effective management of public boarding secondary schools in Nyeri County was stated as:

$Y=\beta_0+\beta_1X_1+e$

Where Y= School Management; X_1=Conflict resolution; β_0=Constant

β_1=Regression coefficient of conflict resolution

e=Error term (identically, independent and normally distributed with a mean of zero (0) and variance of one (1). The independent sample t-test was chosen for this study because it was a comparison between means of variables in boys' and girls' schools. The results were presented using percentages distribution tables.

RESULTS AND DISCUSSIONS

4.1 The Response Rate

The study had 358 respondents, who included the student council members, Form three students, and Form three class teachers and deputy principals of public boys'

and girls' boarding secondary schools. Results of the response rate are shown in Table 2

Table 2: Response Rate

Respondent	Sample Size	Response	Response Rate
Form 3 Students	144	126	87.5
Student Council	192	186	96.9
Class Teachers	24	22	91.7
D/Principals	24	24	100.0
Total	384	358	93.2

The results shown in Table 2 indicate that data was successfully collected from 358 respondents from the 6 sub-counties in Nyeri County which contributed to 93.2% response rate. The results indicated that deputy principals had the highest response rate of 100% which may have been contributed by the fact that the deputy principals are school administrators responsible of protecting the school image by responding to public expectations. They were followed by the student council members 96.7 %, then the class teachers 91.7% and last were Form three students with 87.5%.

School Management

There was an item in the questionnaire on the participation of student council in the management of public boys' and girls' boarding secondary school. Different sets of questions anchored on a five point Likert-type scale ranging from 1=strongly disagree to 5= Strongly Agree were used to measure the participation of student councils. The findings are displayed in Table 3.

Table 3: Descriptive Statistics on School Management

	BOYS			GIRLS		
Student council Participation in management	N	Mean	SD	N	Mean	SD
S C has participated in the management of students activities	176	2.05	1.255	180	2.00	1.088
Student councils have enhanced fairness in allocation of duties	178	2.04	1.266	180	2.63	1.694
Student councils participate in decision making	178	2.33	1.300	180	2.77	1.554
Student councils have helped the school management to make good decisions	178	2.13	1.241	180	2.27	1.222
Student councils has helped to resolve student conflicts	178	2.01	1.110	180	2.28	1.320
The student councils have helped to reduce classes, ethnic and houses conflict	178	2.02	1.125	180	2.29	1.339
Creation of student councils has helped to reduce student unrests	178	2.13	1.223	180	2.10	1.242
Student councils communicate to the school administration about students	178	1.85	1.189	180	1.89	1.162
The student council communicate to the students about school administration	178	2.20	1.404	178	2.39	1.455
Overall Mean score		2.09	1.235		2.29	1.342

The results in Table 3 indicate that the respondents, on average had a low rating on aspects of participation of student councils in school management with an overall mean score of 2.09 and 2.29 (2=disagree) for boys' and girls' school respectively. This implies that student councils do not participate adequately in management in public boarding secondary schools. The student councils had 1.455 rating in communication with the school administration where students had 1.89 mean score for boys' and 1.85 girls' schools respectively. Similarly, student councils participation in conflict resolution had moderate mean score for girls' school with a mean of 2.77.

4.3 Participation of Student Councils in Conflict Resolution

There was an item in the questionnaire which sought to establish the influence of student council participation in conflict resolution to enhance school management in public boys' and girls' boarding secondary school. The study sought to establish the rate of participation of student councils in conflict resolutions to enhance management of boys' and girls' public boarding secondary schools. A Likert scale items were used measured the participation of student councils in conflict resolutions. The pertinent results are presented in Table 4.

Table 4: Participation of Student Councils in Conflict Resolution

	Boys			Girls		
Conflict Resolution	N	Mean	SD	N	Mean	SD
Participate in open forums (baraza)	178	3.28	1.55	180	3.33	1.68
They emphasize obedience of school rules	178	4.30	1.01	180	4.33	1.02
They allocate duties to students fairly	178	4.18	1.27	180	3.36	1.68
They perform peer mentoring to student	178	3.76	1.29	180	3.39	1.35
Conduct peer counselling of students	178	3.69	1.26	180	3.60	1.42
Aware of individual differences	176	3.58	1.41	180	3.51	1.40
Listening to student	178	3.67	1.36	180	3.38	1.44
Tolerance with one another	178	3.85	1.21	180	3.78	1.27
Express themselves in English or Kiswahili	178	4.13	1.23	180	4.23	1.21
Ensuring all students have items they need	178	3.11	1.47	180	3.03	1.39
Emphasize the school vision the students	178	3.67	1.30	180	3.29	1.50
Emphasize forgiveness to students	178	3.45	1.41	180	3.43	1.47
Cooperating the student council	178	3.96	1.21	180	4.23	1.01
Control their emotions and behavior	178	3.64	1.28	180	3.50	1.45
Orient all new students to the school	178	4.13	1.19	180	4.20	1.16
Present difficult issues to administration	178	4.38	0.92	180	4.20	1.10
Mean Score		3.80	1.27		3.67	1.35

The results in Table 4 suggest that the respondents, on average indicated high agreement with aspects of participation of student councils in conflict resolutions with an overall mean score of 3.80 and 3.67 for boys' and girls' school respectively. Most notably is that student councils express themselves in English or Kiswahili had

high mean score for girls, school than boys' school with a mean of 4.23 and 4.13 respectively. Similarly, they present difficult issues to school administration had highest score (mean score 4.38, SD=0.92 and mean score=4.20, SD=1.10) for boys' school than girls' school respectively. This result shows that participation of student councils in conflict resolutions was more evident in boys' than in girls' public boarding secondary schools.

4.4 Tests for Equality of Means on Conflict Resolution

The study sought to establish whether there is significant mean difference between participation of student councils in conflict resolution in public boys' and girls' boarding secondary schools. The results are displayed in Table 5.

Table 5: A t-Test Group Statistics in Conflict Resolution

Variable	School Type	N	Mean	SD	SE	Mean Diff.	t-value	P-value
Conflict Resolution	Boy	178	3.80	0.88	0.07	-0.13	-1.02	0.31
	Girl	180	3.67	0.87	0.06			

The results in Table 5 show a t-test on participation of student council in conflict resolution on management of public boys' and girls' boarding secondary schools was The results are t-value=-1.02; P-value=0.31>0.05 at 5% significance level. This implies that the participation of student councils in conflict resolution on management is the same in both boys' and girls' public boarding secondary schools. Thus, there is insignificant mean difference between the participation of student councils in conflict resolution in management of public boys' and girls' boarding secondary schools.

4.5 Regression Analyses on Conflict Resolution

To determine the influence of student councils participation in conflict resolution and management of public boys' and girls' boarding secondary schools, a simple regression analysis was conducted. The results are summarized in Table 6.

Table 6: Regression analysis for Conflict Resolution and School Management

(a) The Goodness - of -Fit

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
BOYS	.779[b]	.607	.605	.57854
GIRLS	.825[b]	.681	.679	.52849
COMBINED	0.802	0.643	0.642	0.55677

(b) The Overall Significance of the Model

Model		Sum of Squares	df	Mean Square	F	Sig.
BOYS	Regression	90.916	1	90.916	271.626	.000c
	Residual	58.909	176	.335		
	Total	149.825	177			
GIRLS	Regression	105.933	1	105.933	379.277	.000c
	Residual	49.716	178	.279		
	Total	155.648	179			
COMBINED	Regression	198.879	1	198.879	641.558	.000c
	Residual	110.358	356	0.31		
	Total	309.236	357			

(c) The Individual Significance

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	S.E	Beta	t	Sig.
BOYS	(Constant)	.262	.119		2.205	.029
	Conflict Resolution	.816	.050	.779	16.481	.000
GIRLS	(Constant)	.227	.113		2.007	.046
	Conflict Resolution	.887	.046	.825	19.475	.000
COMBINED	(Constant)	0.238	0.082		2.889	.004
	Conflict Resolution	0.855	0.034	0.802	25.329	.000

Dependent Variable: School Management

Predictors: (Constant), Conflict Resolution

The results in Table 6 reveal that participation of student councils in conflict resolution had a statistically significant influence on management of public boys' and girls' boarding secondary schools at 5% significance level. The results explained 60.7 % (R^2 = 0.607) and 68.1 % (R^2=0.681) of its variation in management in the boys' and girls' public boarding secondary schools respectively.

The F–test statistics was used to assess the overall robustness and significance of the simple regression model. It was established that the regression equation was statistically significant at 5% significance level (F = 271. 626, P- value = 0.000 < 0.05) for the public boys' boarding secondary schools and (F = 379. 277, P-value = 0.000< 0.05) for public girls' boarding secondary schools.

The t- test statistics were also used to determine individual significance of the influence. The study revealed that the participation of student councils in boys boarding secondary schools in conflict resolution was statistically significant (Regression coefficient= 0.816; t-value 16.481; P value = 0.000< 0.05) for the public

boys boarding secondary schools and (Regression coefficient = 0.887; t- value 19.475; P- value = 0.000 < 0.05 for public girls boarding secondary schools. The findings indicate that the participation of student councils in conflict resolution enhances management of public boys' and girls' secondary schools. Therefore, the hypothesis that there is no statistical significant influence in the participation of student councils in conflict resolution to enhance management of public boys and girls boarding secondary school is not supported by this study.

The following regression equations was used to estimate influence of the student council in the management in public boys' and girls' boarding secondary schools in Nyeri County for a given measure of change in participation in conflict resolution. The regression equation for the public boys' boarding secondary schools was as follows:

$Y = 0.238+0.816X_{1.}$

Where Y = school management, X_1=conflict resolution and 0.238 is a constant.

The 0.816 is an estimate of the expected increase in management of public boys' boarding secondary schools in response to a unit increase in participation of student councils in conflict resolution in boys' boarding secondary schools. The regression coefficient of 0.238 which is a constant indicates the value of school management when participation of student council in conflict resolution in public boys' boarding secondary schools is at zero while a unit increase in participation of student councils in conflict resolution in boys' schools leads to a 0.816 increase in the management of public boys' boarding secondary schools. On the basis of these findings it is concluded that participation of student councils in conflict resolution influence significantly the prediction of the management in public boys' boarding secondary schools. For a given measure of changes in the participation of girls in public boarding secondary schools in conflict resolution:

$Y= 0.227 +0.887X_1$

Where Y = school management; X_1=conflict Resolution; 0.227= Constant.

The 0.887 is an estimate of the expected increase in management of public boys boarding secondary schools in response to a unit increase in participation of student councils in conflict resolution. The regression coefficient of 0.227 which is a constant indicate the value of management of public boys and girls' secondary schools when participation of student councils in conflict resolution is at zero, a unit increase in participation of student conflict resolution would lead to 0.887 increase in management of public girls' boarding secondary schools. On the basis of these findings it is concluded that participation of student councils in conflict resolution influence significantly to the prediction of management of public girls' boarding secondary schools.

The results also indicate that the participation of student councils in conflict resolution had a statistically significant influence on management of public boarding secondary schools as they accounted for 64.3% of the variation in management

(R^2=0.643). F- Test statistic was used to assess overall significance of the simple regression model. It was found that the regression equation was statistically significant at 5% significance level (F=641.56, P-value=0.000<0.05).

A t-test statistic was used to determine individual significance of the influence. The study revealed that the participation of student councils in conflict resolution is statistically significant (regression coefficient=0.855; t-value=25.329; P-value=0.000<0.05). This implies that the participation of student councils in conflict resolution enhances management of public boys' and girls' boarding secondary schools. The hypothesis that there is no statistical significant influence of participation of student councils in conflict resolution on management of public boys' and girls' boarding secondary schools is not supported by the current study. The following regression equation was used to estimate the significance of management of public boys and girls boarding secondary schools in Nyeri County for a given measure of changes in the participation of student councils in conflict resolution:

$Y=0.238+0.855X_1$

Where Y = School Management; X_1 = Conflict Resolution; 0.238 = constant

0.855 is an estimate of the expected increase in management of public boys' and girls' boarding secondary schools in response to a unit increase in participation of student councils in conflict resolution. The regression coefficient of 0.238 under constant indicates the value of management when participation of student councils in conflict resolution is at zero while a unit increase in participation of student councils in conflict resolution would lead to a 0.855 increase in management of public boys' and girls' boarding secondary schools. On the basis of these findings, the researcher concluded that participation of student councils in conflict resolution contribute significantly to the prediction of management of public boys' and girls' boarding secondary schools. This finding is in harmony with a study by Woods and Cribs (2001) who found that student councils' participation in conflict resolution gives students opportunities to dialogue on specific issues of conflict with students, teachers and school management and where a consensus was reached peace prevailed in the school. That is in agreement with study conducted by Gebretensay (2002) in Ethiopia that established that the major conflict handling styles when dealing with students were competing, avoiding, collaborating, compromising, accommodating and mediation. The study recommended that all issues of conflict should be attended before they escalate to out of control.

Similar studies by Duma (2011), reveals that the student councils are important agents of the school conflict management with teachers and administrators as responsive active partners who have influence on school governance. However studies by Mabena (2002) established that where student councils fail to make significant contribution in conflict resolution in schools, there lies an attitude educators' display towards students. That also concurs with studies conducted in Britain that established that student conflict resolution councils had helped eliminate that student conflict associated with bullying in England (Botti, 2010). Contributing to conflict resolution in secondary schools a study by Otegbulu (2014) established that conflict portends negative outcomes for the teachers and students. Therefore imperative and appropriate conflict resolution mechanisms have been created in secondary schools so that conflicts are resolved before they escalate into dangerous and destructive levels among the students and teachers. Similar studies by Giulia (2010), established that mediation based on the idea of peer counseling and active listening make students talk about conflicts and their solutions in secondary school.

The study also found out that peer mediation is a preventive method that solves smaller conflicts issues before they escalate into serious ones.

4.6 Correlation Analysis for Participation in Schools Management

In order to assess the relationships among the independent variable and dependent variable a Pearson's Product Moment Correlation (r) analysis was conducted. Results of the analysis are presented in Table 7.

Table 7: Correlation Analysis for Variables of Study

Variable of study		School Management	Conflict Resolution
School Management	Pearson Correlation	1	
	Sig. (2-tailed)		
	N	358	
Conflict Resolution	Pearson Correlation	.802**	1
	Sig. (2-tailed)	0.000	
	N	358	358

** Correlation is significant at the 0.01 level (2-tailed).

Table 7 show the results of statistically significantly correlation of participation of student council in conflict resolution and management of public boys' and girls' boarding secondary schools which were r=0.802; P=0.000<0.05. The result suggests that conflict resolution is also a major determinant of the management of public boys' and girls' boarding secondary schools.

5.0 CONCLUSION AND RECOMMENDATION

5.1 Conclusion

Participation of student council in conflicts resolution had statistically significant influence on management of public boys' and girls' boarding secondary schools. The study concluded that a unit increase in participation of student councils in conflict resolution improved in school management by a factor of 0.887. Therefore, participation of student council in conflict resolution enhances the management of public boys' and girls' boarding secondary schools.

5.4 Recommendation

Since participation of student council in conflict resolution enhancing school management in public boys' and girls' secondary schools, the study recommended that there is need to enhance guidance and counselling among students, organize forums to train student councils on conflict resolution strategies and promote moral behaviour and characters in order to be trusted in resolving conflicts among students

References

Abuya B. A & Muhia N. (2016). Fighting Fire with Fire is Unlikely to Stem Kenya Student Unrest. United Kingdom: African Population and Health Research Center.

Black, R., & Walsh, L. (2009). Corporate Australia and schools: Forming business class alliances and networks. Seminar Series Paper 182, February. Melbourne: Centre for Strategic Education.

Botti, J. (2010). London School Prefects. London: Bethesada Publications.

Duma, M.A.H. (2011). Silent Leadership: Educators' Perceptions of the Role of Student Leadership in the Governance of Rural Secondary School. Centre for Promoting Ideas, USA: International Journal of Business and Social Science Vol. 2 No. 4

Dubrin, A. J. (2007). Leadership: Research, findings, practice and skills. 5th edition. Boston Houghton Mifflin Company.

Fletcher, A. (2005). Meaningful Student Involvement. Nairobi: Sound Out.

Gatabu F. (2011). Influence of Administrators' Schools, Nairobi County – Kenya. University of Nairobi, Med Thesis, Department of Education Administration and planning. Treatment of Prefects on Discipline.

Gebretensay T. (2002). A Study of factors that generate conflict between government secondary school teachers and educational managers in Addis Ababa Administrative Region. A Thesis presented to The School of Graduate Studies Addis Ababa University, p.3

Giulia, M. (2010). Conflict management among secondary school students. Milano: Procedia Social and Behavioral Sciences.

Hoy, W. K. & Miskel, C. G. (2013). Education, Administration, Theory, Research and Practice, New York: McGraw Hill In.

Huddleston, T. (2007). From Student Voice to Shared Responsibility: Effective Practice in Democratic School Governance in European Schools. London: Citizenship Foundation

Institute of Economic Affairs (2012). Nyeri County. Nairobi: Government Press.

Indimuli, K. (2012). Effective students' council a tool kit for student council leadership, Nairobi: Track academic solutions.

Jeruto, B. T. & Kiprop, J.C., (2011). Extent of Student Participation in Decision Making in Secondary Schools in Kenya. International journal of Humanities and Social Science. Vol. 1 No. 21

Kathuri, J. N. & Pals A. D., (1993). Introduction to Educational Research, Njoro: Egerton University.

Kamuri, P. K, (2014). The student Council, A Handbook for Every Student Leader. Nairobi: Benchmark Educational Publishers and Service.

Kinyua, A. C., (2015). Factors Influencing Effectiveness of Student Councils in Public Secondary Schools in Kirinyaga East Sub-County, Kenya. Published Master's Thesis, University of Nairobi.

Keogh F.A., Whyte J. (2005). Second level Student Councils in Ireland. A Study of Enablers, Barriers and Supporters. Dublin: New Oceans.

Kerzner, H. (1998). Project Management: A System Approach to Planning, Scheduling, and Controlling. New York: John Willey and Sons, Inc.

KESSHA, (2010). The Implementation of Student Councils in Secondary Schools. Nairobi: Quanta Innovates Ltd.

Leithwood, K. Louis, K. S., Anderson, S., & Wahlstrom, K., (2004). How leadership influences student learning. New York: Wallace Foundation.

Lynn D. and Yamashita H., (2007). Involving Children and Young People in Decisions which affect their Lives. Hertfordshire: Children Trust Partnership

Mabena, L. T., (2002). Learner involvement in school governance as an aspect of school management: Implications for the whole school development. (Master's Thesis. Rand Afrikaans University.)

Magadla, M. (2007).The Role of the Learner in the School Governing Body: Perceptions and Experiences of Principals, Educators, Parents and Learners. Unpublished Med Thesis: University of Kwazulu- Natal.

Masese, R., (2015). Status of Recent Student Unrest in Secondary Schools. Paper presented at Education Stakeholders Forum. Nairobi: Kenya Institute of Curriculum Development.

Modaff, D. P., Butler, J.A., DeWine, S. (2008). Organizational Communication: Foundations, Challenges, and Misunderstandings (Third Edition). Glenview: Pearson Education, 59–62.

MOE, (2008). Report on School Unrest in Central Province. Nyeri: Ministry of Education.

MOE. (2010). Kenya Guidelines for Formation and Implementation of Secondary Schools Student Councils. Nairobi: Elimu Publisher.

MOE, (2015). Report on Stakeholders on Student Unrest in Secondary Schools by July, 2015. Nairobi: Ministry of Education.

MOE (2016). Ministry of Education Records. County Educational Office, Nyeri.

MOE (2016). Preliminary Audit Report on the Causes of Riots in Secondary Schools. Nairobi: Ministry of Education.

Muchui, D. (2016). Why student unrests are on the rise in the country as 60 schools go strike in Meru. Dairy Nation, June 13, 2016 pg. 27

Mugenda, M. O. & Mugenda, G. A. (2013). Research Methods, Quantitative and Qualitative Approaches. Nairobi: Acts Press.

Murage, L. M. (2014). Influence of Student councils on management of Discipline in Secondary Schools in Kirinyaga East District: Published Master's Thesis, Karatina University.

Ndiritu, T. (2011). Effective student leadership. Nairobi: Center for Research, Education and Counseling.

Ndungu, E. W. & Kwasira, J. (2015). Contemporary Roles of Elected Student Council on Management of Public Secondary Schools in Kenya: A Survey of Selected Secondary Schools in Nakuru East Sub-County. International Journal of Innovative Research and Development, Vol. 4 Page 227.www.ijird.com.

Oku, O. O., Emenalo, F.C. & Okeke, F.N. (2008). Fundamental Issues in Educational Administration and Supervision. Eket: Corporate Impressions

Oluand O. & Abosede O. (2003). Conflict Management in Secondary Schools in Osun State, Nigeria. Obafemi: Awolowo University, Nigeria

Otegbulu (2014). Conflict and Conflict Resolution in Secondary Schools in Nigeria. Knowledge Review Volume 31No. 2.

Otieno, J. (2006). Effective Prefects System. Nairobi: Rinny Education & Technical Publishing Services.

Otieno, J. (2010). Establishing Effective Student Councils in your School. Nairobi: Rinny Education & Technical Publishing Services.

Otieno, J. (2010). Establishing Effective Student Councils in your School. Nairobi: Rinny Education & Technical Publishing Services.

Ouma W. & Muide J. (2016). List of 126 Secondary schools hit by student unrest as of July 2016. www.nation.co.ke

Republic of Kenya, (1999). Total Integrated Education and Training, Report on the Commission of Inquiry into the Education System of Kenya. Nairobi: Government Printer.

Republic of Kenya, (2013). Nyeri County Development Profile. Nairobi: Government Printer.

Republic of Kenya, (2015). Basic Education Regulations, 2015. Kenya Gazette supplement No. 37. Nairobi: Government Press.

Ruto-Korir, R. (2003). "Violence in Kenyan Secondary Schools: an Insight into the Adolescent's Socio-Emotional Development". Njoro: Egerton Journal Vol. IV, No.2&3, pp. 53-68.

Sithole, S. (1998).The Participation of students in Democratic school Governance; Unpublished Med Thesis: University of KwaZulu-Natal.

Stokes, H., & Turnbull, M. (2008). Real Engagement with Real Issues: An evaluation of the RUMAD program. A Report for Education Foundation. Melbourne: Youth Reference Centre.

Tikoko B.J. & Kiprop C. J. (2011). Extent of Student Participation in Decision Making in Secondary Schools in Kenya. International Journal of Humanities and Social Science, 1(21) 34

Tirop, C. (2012). Student Involvement in School Governance - A Kenyan Experience. The 7th Africa Conference of Principals (16-37). Nairobi: Kessha Secretariat.

UNICEF (2010). Progress Report for UNICEF Education in Emergencies and Post-Crisis Transitional Program Nairobi: UNICEF, Kenya.

UNICEF (2011). Student Leadership Program: How Far are we? Reflections from student leaders on the implementation of student councils in secondary schools in Kenya.

Virkus, S. (2009). Strengths of Contingency Approach. Tallinn University.

Wango, G. M., (2009). School Administration and Management: Quality Assurance and Standards in Schools. Nairobi: Jomo Kenyatta Foundation.

Welsh, L. & Black, R. (2011). Students in the Lead: Increasing Participation by Young People. In V. Zbar & T. Mackay (eds.), leading the Educational Debate - Volume 3: Selected papers.

Woods, D. & Cribb, M. (2001). Effective LEAs and School Improvement, Making a Difference. London: Routledge Falmer.

Comprehensive sex education in Kenya: Islamic perspective

Presented by Dr. Hassan Kinyua Omari and Dr Edith Kayeli Chamwama

University of Nairobi

Abstract

This paper is an attempt to address the Comprehensive sex education debate in Kenya curriculum from a religious perspective. This is tackled from the Islamic perspective. The discussion is premised on the current debate in the country on sex education and the rejection of faith based organizations especially in its implementation in schools based on religious persuasions and reasons. The fundamental questions addressed in this paper are:

(1) What are the sexual values addressed by Islamic sharia

(2) What are the sexual lessons permitted by Islam?

(3) What are sexual behavior currently observed among Muslim students?

(4) To which extent does Islam allow teaching of sex education?

(5) What are causes and solutions to teen pregnancies in Kenya?

Sex education in Islam is paradoxical: on the one hand, Islam allows for it and actually calls for students to exercise their sexuality but, on the other hand, there seems to be discrimination between male and female sexuality due to a misinterpretation of the scriptures. It seems like boys are given more rights with regard to the expression of their sexuality. The combination of these contradictory views with the current trends on teenage pregnancy leads to an inquiry of the Islamic perspective on sexual education.

Keywords: Comprehensive sex education, reproductive health, jurisprudence, Islamic sharia

Introduction

The debate on sex education in Kenya has been ongoing for the past five years. This debate was thrust into the limelight by Senator Judith Achieng Sijeny through her presentation of a reproductive health care bill in the senate. This bill sought to have adolescents given comprehensive sexual education and confidential services in matters of reproductive health. The bill did not sail through the senate as many of the legislators termed it an attempt to "spoil" children. The then Education Cabinet Secretary Prof. Jacob Kaimenyi said that his ministry would not allow for "introduction of immorality" in schools. Religious bodies as well chimed in and were in the front line rejecting the introduction of sex education in schools. Many of the religious leaders argued that introduction of sex education would open up children to promiscuity, moral decadence and flouting religious guidelines which in turn affects their religiosity. Some people even claimed that this should be rejected as it is un-african.

Nonetheless, the reality on the ground is that even though the young ones are denied sexual education in schools they are already engaging in it. This is evidenced by the high number of pregnancy cases witnessed towards the end of 2018 as the students sat for their national examinations. Many were either pregnant or had recently given birth, while in some cases across the country, young girls had to sit for their

examinations in maternity wards. This occurrence therefore calls for a sober re-examination on the whole issue of sex education. It should be noted that issues of sex education and teenage or adolescent engagement in sexual matters is not unique to Kenya. This has happened and even continues to happen in other countries within and without the continent. What is key however, is the manner in which this is approached and handled. Religions here play a key role. This is because religions are the major mobilizing and rallying institutions for many Kenyans. Religions through the religious leaders play a key role in the country and have an unmatched ability to rally masses in any social or cultural issue. Religious leadrs are the voice and conscience of many people in Kenya and therefore it is mperative that their doctrines and teachings on sex be examined and discussed. Thus, this paper addresses this emotive subject from the Islamic point of view.

Sexual values addressed by Islamic sharia

Islam teaches that sex is a form of worship as the Prophet (PBUH) said, "When one of you have sex with your wife, it is a rewarded act of charity." The Companions were surprised and said, "But we do it purely out of our desire. How can it be counted as charity?" The Prophet replied, "If you had done it with a forbidden woman, it would have been counted as a sin, but if you do it in legitimacy, it is counted as charity."(Hadith). It should be noted here that, Islam though esteemed is only permitted within wedlock or the institution of marriage. Sex within marriage is seen as a pleasurable form of worship that is highly rewarded by Allah.

To appreciate sex as a form of worship, believers are supposed to learn Sexual Health. Islam jurisprudence teaches that sexual health comprises of physical, emotional, mental and social well-being in relation to sexuality. A Muslim is supposed to maintain good sexual health to avoid divorce because failure in physical health is among the reasons that may lead to divorce in Islam. Male dysfunction, according to Islamic jurists leads to divorce. Therefore, Sexual health requires a positive approach to sexuality. Islamic teachings guide that couples must practice safe sex for both to enjoy the act. This should be free from coercion and violence as Allah SWT and His Prophet taught.

The man in the Islamic account is perceived as a brother to the woman and the woman is the other half of the pair. The Messenger (blessings and peace be upon him) says, "Women are the sisters of men." [Narrated on the authority of Mother of Believers Aisha by Imam Ahmad (6/256); Abu Dawud (236); Al-Tirmithy (113) and others. The Qur'an, on its part, treats this issue of fraternal equality from more than one perspective. On a purely religious level for instance, the Qur'an says: "Verily, the Muslims (those who submit to Allah in Islam) men and women, the believers men and women (who believe in Islamic Monotheism), the men and the women who are obedient (to Allah), the men and women who are truthful (in their speech and deeds), the men and the women who are patient (in performing all the duties which Allah has ordered and in abstaining from all that Allah has forbidden), the men and the women who are humble (before their Lord -Allah), the men and the women who give Sadaqat, (i.e. Zakat, and alms, etc.), the men and the women who fast (the obligatory fasting during the month of Ramadan and the optional Nawafil fasting), the men and women who guard their chastity (from illegal sexual acts) and the men and women who remember Allah much with their hearts and tongues (while sitting, standing, lying, etc. for more than 300 times extra over the remembrance of Allah during the five compulsory congregational prayers or praying extra additional Nawafil prayers of night in the last part of night etc.) Allah has prepared for them forgiveness and a great reward (i.e. Paradise) (Qur'an 33:35). This infers that men should treat tier

wives as they would a sister who is very close and dear to them. This calls for handling them in a way that the men would want to be handled or how they would want those near and dear to them to be handled.

The holy Qur'an establishes socio-economic and spiritual equality by maintaining: "The believers, men and women, are "Awliy," (helpers, supporters, friends, protectors) of one another, they enjoin (on the people) Al-Ma`ruf (i.e. Islamic Monotheism and all that Islam orders one to do);and forbid (people) from Al-Munkar (i.e. polytheism and disbelief of all kinds, and all that Islam has forbidden); they offer their prayers perfectly (lqamat-as-Salat), and give the Zakat and obey Allah and His Messenger. Allah will have mercy on them. (Qur'an 9:71). Thus, here we find that in Islam equality of the genders is emphasized as a co-dependency. The husband and wife here thus regard each other as a companion, a helper and a key support of the other. The man, naturally has the duty of protecting the woman physically. In return the woman offers the man spiritual protection through prayers and service that complements the man.

In Islamic jurisprudence men are taught how to approach their spouses based on the Hadith of Prophet Muhammad (PBUH) "Let not one of you fall upon his wife like a beast falls. It is more appropriate to send a message before the act." This hadith espouses that spouses should prepare each other in good time before approaching them for sex. Some Muslim scholars advice that spouses should have certain signs signaling for the desire to engage or commence the sexual act. Among the Swahili of the East African coast,if a wife puts rose flowers or jasmine on the bed, it is a signal to the man that she is need of her conjugal rights. The same message can also be passed through putting a *Leso* with a love message on the bed. The man then needs to act upon this and please his wife.[98]

Nonetheless, sexual issues between spouses should be treated in confidentiality as the Prophet PBUH) taught, "Do not divulge the secrets of your sex life with your wife to another person nor describe her physical feature to anyone."

(2) What are the sexual lessons permitted by Islam

The basis of sexual lessons are enshrined in the Holy Qur'an where Allah SWT says "O mankind! Be dutiful to your Lord, Who created you from a single person (Adam) and from him (Adam) He created his wife (Eve), and from them both He created many men and women and fear Allah through Whom you demand your mutual (rights), and (do not cut the relations of) the wombs (kinship). Surely, Allah is Ever an All-Watcher over you. " [Surah 4:1]

This verse teaches that human beings (men and women) were created by Allah from a single soul or self. This self is a nucleus from which Allah created its companion i.e., wife to complete the creation of human being. Thus no human being is complete without the other. The verse refers to Adam and his wife Eve. Allah states that He created Eve for Adam in order that he enjoy the pleasure of living with her." [Surah 7:189] from this point in history Allah, blessed the two and scattered the multitudes of men and women of different races and color across the globe. All of them worshipped one God. They were all children of the same parents. This indicates that

[98] interview with sheikh Abdul Aziz Merabaksh at Pumwani Majengo,Nairobi County on Saturday 23rd March 2019.

they are all united in a fraternity, embracing each other as brother and sister. It is Because of this that the Qur'an commands human beings to fear Allah as their Lord, appreciate Him as their Creator and be heedful to His teachings. The Quran also teaches respect of the duties towards parents and observing respect for the womb respect as a symbolic of human bond. This verse when observed keenly is the foundation of sex education. However, it is to be explained and expounded depending on age and mental capacity of the recipient.

Islam is a way of life which calls for education throughout one's life. However, education must be based on age Appropriateness. When we talk of Comprehensive Sexuality Education (CSE), whoever teaches should be cognizant of age of the students at different levels. Sexual education, like any other education provides opportunities to learners to explore their own value and attitude. It also helps in building learners' decision-making capacity as well as enhance respective appropriate communication skills. When this is achieved, risk as a result of sexual activity is reduced in a big way in all aspects of sexuality

Islam respects culture and appreciate is as a way of life for particular people. As long as culture does not contradict sharia principles then it is embraced. Otherwise some amendments have to be made to omit the contradiction. Therefore Islam permits sex education as long as it is culturally relevant. Nonetheless, the approach to teach children of different cultures should be customized in order to have the interests of the cultures brought on board.

(3) What are sexual behavior currently observed among Muslim students?Among the prevalent sexual behavior observed among Muslim students is legitimate mixing between boys and girls. In Islam socializing freely between boys and girls is prohibited unless there is a guide like a teacher or parent who observes that the fraternization is in accordance with the shariah. Currently the youth socialize freely terming it as "mingling." During the era of the Prophet (blessings and peace he upon him), the era of the companions who succeeded the prophet (PBUH), and the era of their followers, Muslim men and women met at different occasions, religious or otherwise, to discuss various issues affecting them. This was recommended by Prophet Muhammad(PBUH). The socialization of human beings which is natural is not prohibited in Islam, the only guidance given is the manner in which those gathering should conduct themselves.

In the contemporary society mingling has become very common. It is however important to mention that socialization is among the recommended activities in Islam. The religion only prohibits the kind of mingling that might lead to sin.

In meeting between boys and girls, as discussed in the second volume of *Contemporary Legal Opinions* (Fataawa Mu'aserah), the author states that greeting women, handshaking women, and the treatment of women by male doctors as matters that need a lot of sensitization. This is especially in those areas where Islam is a prevalent religion and it is advisable for one to adhere to the best guidance as given by Prophet Mohammed (PBUH), his righteous caliphs and educated companions as advocated for by the prophet (PBUH). Doing this assists in avoiding being trapped between the two extreme paths of western leniency and severe eastern asceticism.

Observance of the guidance of the Prophet (PBUH), reveals that women are not incarcerated or isolated. Similarly, this does not occur during the era of the caliphs after the death of the prophet (PBUH). Women attended major Islamic events and

congregational prayers on Fridays at the Prophet's masjid. They also they prayed the night salat (Al-Esha)as well as dawn (Al-Fajr) prayers. The only guidance the Prophet (PBUH) gave was that the women were to form salat rows behind the men. This was to avoid physical mingling after prayers. This was also as a precautionary measure so that both men and women would not see the sensitive (sexualized) parts of the other. It should be noted that, when the prophet gave this directions, underwear and trousers were not common form of attire. In addition, the mosque did not have a partition between the men and women prayer halls. Moreover, during that era men and women used on entrance to the mosque, hence crowding would occur. In one instance upon seeing the crowding of men and women at the entrance, the Prophet (PBUH) said, "If only we left this entrance to the women". [Transmitted by Abu Dawud on the authority of Ibn Umar (462) (463). After this a separate entrance for women to the mosque was allocated and aptly named the "woman's Entrance." During the Friday congregation, women attended prayers behind the Prophet and listened to the sermon to an extent that some of them memorized entire sermons which they later shared with their children at home. Um`Ateyya, a prominent woman companion during the Prophet's era, said, "We were frequently instructed to go out for the Bairams."

In another account, Um`Ateyya stated, "The Messenger of Allah (PBUH) instructed us, the house helps, and the ones menstruating to go out and gather with others. The menstruating women would stay away from prayer and witness the joy (of the day) and Muslim's prayer (to Allah). So I said, `O the Prophet of Allah, there may be one of us who does not have a *Jilbaab* (dress)." He replied, `Let her sister (in Islam) give her one. [Sahih Muslim "The Prayers of the Two Eids" (890).] Analyzing the above hadith, we realize that some Muslim communities ignore women in their countries by misinterpreting the Quran and thereby misrepresenting Islam.

Other behaviors observed among some Muslim girls is nude dressing. This is proscribed in Islam as it is seen as demeaning the woman. We learn that women always attended the learning sessions of the Prophet (PBUH). During these sessions they would dress modestly. They would address Aisha with the questions they found uncomfortable or too bold to ask themselves directly to the Prophet. The Prophet's wife, Aisha (R.A), praised the women of the supporters whose shyness did not prevent them from seeking knowledge of Islam and asking questions about major issues such as impurity, complete sex or ejaculation which prevented one from performing some forms of worship, bathing from impurity, menstruation and other such matters. When women realized that they need ample time with the prophet, they demanded a special day of teaching especially for them. They said openly, "Oh Prophet of Allah, the men have taken complete possession of your company, so devote one of your days to us." The Prophet (PBUH) promised to give them a day during which he preached and gave them instruction. [Transmitted by Bukhaari in The World (Al-Alam) 1/34 on the authority of Abu Said.]. Um `Ateyya says, "I went on seven military expeditions with the Prophet (PBUH); I would guard the fighters, provisions, make their food, treat the injured and nurse the ill ones". [Transmitted by Muslim (1812).]

Another sexual behavior witnessed today is open seduction among the youth without care or fear. When one examines the Qur'an's discourse on women affairs, especially during the era of the prophets we find that women were highly respected and men strived to avoid sin. A good example is Moses. When he met Aaron's daughters who were suffering, he asked them some questions. He got their answers without any particular feeling of guilt or embarrassment. In the end he assisted them. One of them even suggests to her father to hire Moses, describing him as a strong and honest man. This is how the Qur'an puts it: "And when he arrived at the water of Midian (Madyan)

he found there a group of men watering (their flocks), and beside them he found two women who were keeping back (their flocks). He said, "What is the matter with you?" They said, "We cannot water (our flocks) until the shepherds take (their flocks). And our father is a very old man." So he watered (their flocks) for them, then he returned back to shade, and said: "My Lord? Truly, lam in need of whatever good you bestow upon me!" Then there came to him one of the two women, walking shyly. She said: "Verily, my father calls you that he may reward you for having watered (our flocks) for us." So when he came to him and narrated the story, he said: "Fear you not. You have escaped from the people who are Zalimun (polytheists, disbelievers, and wrongdoers)." And said one of them (the two women): "O my father! Hire him! Verily, the best of men for you to hire is the strong, the trustworthy. [Surah 28:23- 26] This is the kind of behavior that Islam espouses the young ones to embrace. They should always be ready to assist the other gender without intention of receiving payment or a form of reward in return for their service.

(4) To what extent does Islam allow teaching of sex education

Islam permits teachings on Reproductive Health. These lessons are found both in the Qur'an and hadith. In reproductive health learners are supposed to be taught their body parts and their functions. Students are also taught in madrassas in jurisprudence books their state of complete physical body. They are also instructed on how to preserve their mental health through *dhikr* (remembrance of Allah at all times) as well as how to take care of their social well-being. In Islam social wellbeing is not only being physically healthy, it also includes one being fine in all aspects of life which include social, economic and spiritual well-being. The prophet Muhammad (PBUH) used to emphasize on Muslim youth marrying in his famous hadith in *sahiih Bukhaari* where he always mentioned" Oh Youth…. whoever of you who is capable…" the word capable here means all matters relating to the reproductive health as well as system, its functions and processes.

Children are a trust of Allah on parents. It is therefore the responsibility of parents to make sure that their children live the best life as was narrated from 'Abdullah ibn 'Umar who said: I heard the Messenger of Allah (PBUH) said:

"Each of you is a shepherd and each of you is responsible for his flock. The ruler is a shepherd and is responsible for his flock. A man is the shepherd of his household and is responsible for his flock. A woman is the shepherd of her husband's house and is responsible for her flock." Narrated by al-Bukhaari (853) and Muslim (1829)

Part of the responsibility that parents have towards their children is protecting them from everything that may lead to corruption or have a negative impact on their morality. Teaching children morality from covering the '*awrah*, controlling the gaze and seeking permission before entering designated private spaces, begins from an early age. When they attain puberty or reach the age of discernment, the boys and girls have and sleep in separate bedrooms. This is as per Allah (SWT) revelation "O you who believe! Let your legal slaves and slave-girls, and those among you who have not come to the age of puberty ask your permission (before they come to your presence) on three occasions; before *Fajr* (morning) prayer, and while you put off your clothes for the noonday (rest), and after the *Isha* (late-night) prayer. These three times are of privacy for you, other than these times there is no sin on you or on them to move about, attending (helping) you each other. Thus Allah makes clear the *Ayat* (the verses of Quran, showing proofs for the legal aspects of permission for visits, etc.) to you. And Allah is All-Knowing, All-Wise" [an-Noor 24:58].

Imam Ibn Katheer (R.A) explained that in this verse Allah (SWT) instructs the believers that their servants and slaves, and their children who have not yet reached the age of puberty, should ask permission before entering rooms in three situations, the first of which is before *Fajr* prayer, because at that time people are usually sleeping in their beds. "And while you put off your clothes for the noonday (rest)" that is, at the time of siesta or midday nap, because a person may take off his clothes at that time with his wife. "And after the *Isha* (late-night) prayer" because this is the time of sleep. The reason why children should not be allowed to enter rooms at these times is for fear that the parents may be in an intimate situation or may be sleeping naked due to heat. Taser Ibn Katheer (6/82)

When children reach the age of puberty, they are obliged to seek permission before entering their parents bedrooms at all times, as Allah instructed, "And when the children among you come to puberty, then let them (also) ask for permission, as those senior to them (in age). Thus Allah makes clear His *Ayat* (Commandments and legal obligations) for you. And Allah is All-Knowing, All-Wise" [an-Noor 24:52]

In Islam children undergo basic training from birth to seven years, after which serious teaching and instruction begins as was narrated from 'Amr ibn Shu'ayb, from his father, that his grandfather said: The Messenger of Allah (PBUH) said: "Instruct your children to pray when they are seven years old, and smack them if they do not do it when they are ten years old, and separate them in their beds." Narrated by Abu Dawood (495). Separating the children in the beds when they reach the age of puberty is a precaution against provocation of desire, even among siblings.

Following these verses it is clear that when children reach puberty they should be taught the signs of puberty and be sensitized on the physical characteristics which distinguish men from women, as well as the types of discharge that may be secreted from their sexual organs. They should also be taught the rules of ablution' and *ghusl*, paying attention to the phrases used in teaching and ensuring that it is taught according to what the child needs to know. Both boys and girls are taught what their *awrah* is and that it is private, and that it should be covered from non *mahram*(non relatives who can marry them) . This is aimed at instilling in them chastity and modesty which will safeguard them from transgressing against Allah's commands.

Majority of the Muslim scholars argue that comprehensive sex education touching on intercourse, should be taught at an appropriate age when marriage is approaching. Many state from age nine or when children are mature enough to comprehend issues of *fiqh*, such as the rulings on *zina* (fornication or adultery) and the like, which have to do with intercourse and '*awrahs*.

The jurisprudence scholars also argue that basic knowledge on natural and instinctive nature is what children should be taught gradually, in accordance with the stages of their development, as taught by *fiqh*. The scholars advice that the words and phrases we use,should be modest and attention must be paid to the appropriate ages and stages of human development.Allah teaches that "And of everything We have created pairs, that you may remember". [Surah 51:49] It is therefore upon teachers to teach students about the pairs and what the pairs entail.

Islam as per this verse teaches that there is no healthy gender existence without the other. This is why when Allah created our father Adam as the first human soul, He also created for him, our mother Eve to be his counterpart, so as to accompany each other in the journey of life and find peace in each other . After creating Eve Allah

advised both, “Dwell you and your wife in the paradise and both of you freely with pleasure and delight of things therein as wherever you will, but come not near this tree or you both will be of the *Zalimun* (wrongdoers)". [Surah 2:35]

These lessons are taught to students in madrassa on daily basis all over the world. We therefore find sex education in madrassa. This approach is what might be triggering the debate on comprehensive sex education. Men and women complete each other. Indicating that none of them is complete without the other as the Qur'an emphasizes that difference: " And the male is not like the female." [Surah 3:36] They are as unlike as earth and heaven which highly complement each other without which the world would not be in existence. No gender is higher in rank than the other in creation as Allah says, : "you are from one another" [Surah 4:25] , "And Allah has given you wives of your own kind". [Surah 4:25]

In Allah's wisdom both male and female have physical and psychological construction which some are alike, while others are different. Both have elements that attract each other like a magnet. Though females have more of those elements which attract men, the ultimate reason for women attraction is Allah's wisdom to equip her with a natural desire and a strong passion that leads to their attraction which leads to communion for life to continue and generations to be brought forth.

Islam allows women to be taught sex education by female teachers not male. This is because Islam from onset set religious codes for both men and women on how they should relate and interact with each other as well other relevant codes, instructions and rules pertaining human life. The woman is to safeguard her femininity and acknowledge her respect. Allah (SWT) as per His wisdom created a barrier between men and women to protect women from predators who are out there to ‘enjoy’ their bodies then dump them. Some of the teachings of Islam on how men and women should relate are as follows:

Islam protects femininity to maintain the stream of tenderness and beauty running to remain in women. For this reason, there are things forbidden for men and permissible to women. For example women are allowed to wear gold and pure silk while it is prohibited for men as we find in this hadith , "These two (substances) are prohibited for the men of my nation and allowed for its women". [Transmitted by Ibn Majah on the authority of Ali (3595), Hadith Sahih.]

Women on their part are prohibited from putting on things that go against their femininity, such as men's wear, adopting movement and behavior which is masculine in nature. No gender is to wear the garment of the other The Prophet (PBUH) says: "Allah condemns the man who dresses like a woman and the woman who dresses like a man". [Transmitted by Abu Huraira, Abu Dawud (4098); and Ahmad 2/325; and Ibn Hibban (1904); and others.] For men to behave like women and women to behave like men is equally condemned by Allah. Again the Prophet (PBUH) taught, "Three (kinds of people) will not enter Paradise and will not enjoy Allah's gaze upon them on the Day of Judgment : a son who is disobedient to his parents, a mannish woman and an adulterer. [Transmitted by Ahmad lbn Umar and approved by Sheikh Shaker as Sahih (1680); and Al-Nisa'i 5/80; and Al-Hakim 1/72 and others.]

Islam supports the female in view of her relative weakness in some issues. It places some of her interest in men to support her. An example is in securing the costs of living and the provision for their needs especially in communities where women are restricted by nature and environment to work, as well as circumstances like after

giving birth where she needs time to rest and recuperate. In this situation, her guardian, father, husband, son or brother are all obliged to look after her needs as an obligation under the Sharia. No basic need should constrain her from appreciating life.

Islam protects the female's morals and decency. It guards her reputation and dignity. It defends her chastity against evil beings who misuse their thoughts and tongues trying to misuse her to harm her. In order to achieve these, the Qur'an teaches women to lower their eyes and preserve chastity and purity. As Allah states, "And tell the believing women to lower their gaze (from looking at forbidden things), and protect their private parts (from illegal sexual acts etc.)". [Surah 24:31]

Islam teaches women to maintain a decent, unrevealing manner of dress and ornamentation. This is not intended to oppress her but protect her. Allah says, "and not to show off their adornment except that which is apparent and to draw their veils all over *Juyubihinna* (i.e,. their bodies, faces, necks, and bosoms, etc.) " [Surah 24:31] The visible or apparent ornament that the verse refers to has been interpreted to be inclusive of *kohl*, the finger ring, the face, the two hands and, some exegetes and jurisprudents establish, the two feet. [During the time of the Prophet (PBUH), it was customary for some women to cover their face. The flexibility of Islam allows the woman the option of covering her face or not. The woman is to cover the other attractions that do not show, such as the hair, neck and throat, arms and legs, from all people except her husband, and her consanguineous, non-marriageable relations or *mahrim* [Those persons whom the woman is forbidden to marry because of the proximity of the relation such as brothers, uncles etc, whom she finds it hard to hide these from. "and not to reveal their adornment except to their husbands, fathers, their husband`s fathers, their sons, their husband's sons, their brothers or their brother's sons, or their sister's sons or their (Muslim) women (i.e. their sisters in Islam), or the (female) slaves whom their right hands possess, or old male servants who lack vigor, or small children who have no sense of the shame of sex". [Surah 24:31]

(5) What are causes and solutions to teen pregnancies in Kenya?

In response to this question, we conducted a research commissioned by Muslim education council (MEC) on Causes of Teenage Pregnancy at pumwani area of majengo Nairobi county Kenya.

The responses we got include:

poverty

broken home

separation of couples

single parent

death

peer pressure

Influence

Lust

religious beliefs

rape and

sexual abuse

alcoholism and drug abuse

lack of knowledge

environmental influence and

Pornography.

absence of chaplaincy services in schools

Poverty – This refers to the state of being poor. This often leaves many young girls vulnerable and at the mercy of those who provide for them. In an interview at Pumwani hospital, a pregnant teenager said her parents could not provide her basic needs like food, clothes and learning materials. She therefore used to visit a male classmate to study with him and also take some of his books home. They liked each other more and by the time she realized they were in a serious relationship that later led to her pregnancy. Others interviewed stated that their parents pushed them into commercial sex work so as to bring home an income, while others were lured by rich men using money, and the end result was pregnancy.

Broken Home - refers to a family that either lacks parental guidance due to their absence or lack of control due to influence of drugs like *khat* and alcohol. It may also refer to a home where the parents are not staying together either by divorce or separation or death of one of them. Teenagers in such a homes suffer a lot, there is no or little parental love and affection. There is also no parental control and the girl may therefore be preyed upon by school mates or some irresponsible men leading to pregnancy.

Separation of couples - is when couples are separated due to marital problems or one works in a different town. In Pumwani there are many of such cases. Some parents disappeared as it is documented and therefore their whereabouts is unknown. Some get jobs in Middle East and only come back after two years. Separation is very dangerous because naïve girls may be lured to engage in premature sex. Some of the girls also take advantage of this and get entangled in premarital sex. Some play the parents against each other by claiming she is visiting the other parent when in real sense she is not. Some take advantage of the fact that the parents are not in communication due to marital differences. In the end she goes to her boyfriend and the end result if teenage pregnancy.

Single parent – is when one of the parents is only taking care of the children due to death, or separation, or divorce. There are many single parents in Pumwani. Some of the girls therefore take advantage of the parents being away for most of the time and spent time with boyfriend(s) and at the end may get pregnant. The parents, mainly women, are out eking a living to make ends meet.

Death – some teenagers are orphaned at a very early age and therefore lack adults as a role models and guides. Thus due to lack of parental control and guidance end up in illicit relationships that lead to pre-marital pregnancies.

Peer pressure or influence – those teenagers who get pregnant in their teens in Pumwani its due to peer influence. Most young teenagers who are in boy – girl relationship laugh at their peers who are not making them view themselves as 'back ward'.

Lust – some teenagers get into sexual relationships because of lust. In adolescent stages both males and females go through some psychological and physical sexual feelings and may put into reality or act on it. This often results in teenage pregnancy.

Religious beliefs and practices – it is a practice among some Muslims to allow teenage marriage. They claim that Islamic jurisprudence allows a girl from as young as 9 yrs to marry. They believe in early marriage and some parents do not even allow their girl children to have formal education.

Rape and sexual abuse – some teenagers get pregnant as a result of rape or may be sexually abused by some of the people within the society including teachers, or an elderly person.

Alcoholism and drug abuse – many students are fond of taking alcohol and hard drugs. There is a saying that the devil finds work for an idle hand, these alcoholics and drug addicts end up indulging in casual sex which then leads to teenage pregnancy.

Lack of knowledge or ignorance – many young girls lack knowledge in matters of sex. Thus many end up in relationships with little or no knowledge on how to manage their sexuality. These end up pregnant and are clueless of what happened. This is especially the case with those who are uneducated.

Environmental influence – this refers to the social norms and values in the community. In some communities, the moment the girl child gets her first menstruation, she can get married. Sometimes too it is normal for a teenager to get pregnant in the community because the parents and grandparents were once the same. In Pumwani due to Gikomba market there are many visitors on a daily basis who prey on Pumwani girls. Those from poor families and broken families reported having sex before 18.

Pornography – pornographic videos and photos easily available to the young ones on the internet, magazines, newspapers, books, and other media lure teenagers into indiscriminate sex and may lead to teenage pregnancy. In Pumwani there are many video places where youth go to watch movies, football and other shows. This is where many boys especially learn bad behaviours which lead them to lure the girls into sex

absence of chaplaincy services in schools- Absence of chaplaincy services in schools is seen to have dealt a major blow to our children's morals. Majority of the teenage pregnancies occur in schools which do not have chaplains. Many of the causes of teenage pregnancies and teenage immorality can be solved by having chaplains in schools. For example, fatherless children can take chaplains as their father figures. Children from leaderless families can also be constantly assisted by a chaplains.

Effects or Consequences:

The research by MEC team found out that teenage pregnancy has an adverse effects and consequences on the individual or victim, family, and the society as a whole. The following are some of the effects or consequences: school dropout, fatherless children, street children, armed robbery, dependency burden, death, increase of economic hardship, spread of diseases, abortion, and family conflicts.

School dropout – many teenagers who get pregnant are not able to complete their education. Furthermore, in most cases when they get pregnant they are forced out of their homes. They either go to those men who are responsible for the pregnancies, but in many instances they become prostitutes or 'waziba' the term used in Pumwani to refer to prostitutes.

Fatherless children - many children born by teenage mothers do not know their biological fathers because the men responsible deny responsibility. These children are marginalized by the community leading to stigma which they live with for their entire life.

Street children – some children born by teenage mothers end up being street children. This happens because; the teenage parent(s) may not take proper care or cannot afford to provide for the children.

Armed robbery – the study found out that many armed robbers were born by teenage parent(s) and single parents. This is due to lack of father figure. Some of the street children grew up to become armed robbers.

Death – some teenagers do not survive. Some decide to deliver at home. In some instances, they succumb to excessive bleeding and die.

Spread of diseases – teenage mothers or parents usually spread sexual transmitted diseases (STD). When the relationship starts, the guy may have indiscriminate sex likewise the girl hence increase in spread of STDs may occur.

Abortion – teenage girls usually makes the attempt to abort their babies. Abortion is not accepted in many nations and also immoral according to the Qur'an. The effects of abortion are childlessness in future, death, deformities of the teenager or the baby etc.

Family conflicts – usually teenage pregnancy results in conflicts between the girl's parents and the guy or boy's parents. This may due to tribal issues, finances, religious beliefs, etc.

Solutions to the causes is Prevention and Control of teenage pregnancy

The community should engage its members in in preventing teenage pregnancy by all means and offer counseling where necessary. There should be holiday workshops for teenagers during school holidays where they offer them sex education

Providing community outreach program, and other social interventions like visiting schools to talk to teens on how to protect themselves will be a big solution.

Education partners should offer Spiritual *counselling* to teens and their parents.

Our curriculum should produce studying materials geared towards guiding the young ones on how to protect themselves and being productive citizens.

MoE should enhance Adult *education* to parents and guardians of school going children. Through its County education boards representatives they should seek to play a role in offering advice and lectures to parents on the importance of their children education and future.

MoE should conduct *Community outreach programs* where known influential leaders should visit mosques, media with an aim of addressing teenage pregnancy

MoE should begin a program where all *School dropout* will be encouraged to go back to school and acquire necessary qualifications to make them employable hence solve poverty challenge among the youth. It should also target teenagers who get pregnant and not able to complete their education and assist them complete education.

The entire community should stop discrimination of *Fatherless children* for they were not part of the sin. Nonetheless the government should seek to establish the biological fathers of these children and order them to take responsibility of their deeds.

On *Street children, the county government should collaborate with partners and solving the menace of* **stre**et children.

On robbery, the GoK should partner with all stakeholders in rehabilitating some identified robbers who in turn can be utilized as detectives and investigators as well as counselors in their respective fields.

On Family conflicts, GoK should to set up conflict resolution centers in the counties where children suffering from the same, will report and get necessary assistance which involve counseling the parents

Recommendations

The government has opened the first children rights investigation center at CID training school [99]this is commendable. Establishing 47 more branches in all the 47 counties will be a great achievement in curbing teenage pregnancies

Government administrators throughout the nation should work hand in hand with schools and other partners in bringing all sex offenders to book

[99] *Citizen News* Monday 25th March 2019 9:00p.m

The government through MoE should conduct annual symposium for schools, colleges and universities where they address teenage pregnancy and collect data on cases available

The government should deploy chaplains in all schools across the nation. The chaplains should be mandated to address all issues related to youth in collaboration with teachers, parents and all education stakeholders.

Parents should resume their duties of parenting and stop delegating that responsibility to anyone because they are the best education foundation for their children.

Conclusion

Sex education is a subject that can no longer be pushed under the carpet. Its implementation is long overdue given the rise in teenage pregnancies as reported in the media. The parents, who traditionally were mandated to undertake this task no longer do so as they are very busy trying to make ends meet. Religions on the other hand are not taking the task upon themselves. When it is done, it is shrouded in mystery and lots of "sanitization" so as to fit the religious outfit yet the repercussions are visible to all. As a country we are losing many young people through illicit abortions procured in backstreet alleys and bogus clinics. These deaths can be prevented if the young people are given comprehensive sexual education. The children need not get conflicting messages and wrong advice from social media platforms. As a country we are capable of coming up with age-appropriate sexual education that takes cognizance of the various religious ethics.

It is time for us to get our heads out of the sand and catch the bull by the horns. It should be noted that restrictive sexual education has gained a lot of mileage and become idealized as a result of the rejection of the Comprehensive sex education by faith based organizations. Currently, religion is no longer the only point of reference which provides guidance concerning sexual practices. There exists policies on sexual laws which in their own merit influence this field. This calls for a reform of societal norms through the reinterpretation of holy texts, which in this case is the Islamic text.

References

"Circumcision of boys". Religion & ethics—Islam. BBC. 2006-03-24. Archived from the original on 2008-03-05. Retrieved 2008-07-29.

"Etiquette of intimate relations". Sheikh Muhammad Salih Al-Munajjid. islamqa.info. Archived from the original on 24 July 2015. Retrieved 24 July 2015.

"Hadith - Book of Dress - Sahih al-Bukhari - Sayings and Teachings of Prophet Muhammad (PBUH)". www.sunnah.com. Archivedfrom the original on 2013-09-16.

"Hadith - The Book of Purification - Sahih Muslim - Sayings and Teachings of Prophet Muhammad (□□□ □□□□ □□□□ □ □□□)". www.sunnah.com. Archived from the original on 2013-10-18.

"Sex education: An Islamic Perspective". www.islamicity.org. Archived from the original on 2018-06-19. Retrieved 2018-06-19.

"What is the appropriate age to teach children sex education?". islamqa.info. Archived from the original on 8 December 2015. Retrieved 27 November 2015.

"MALIK'S MUWATTA, BOOK 36: Judgments". sunnahfollowers.net. Archived from the original on 2016-05-29. Retrieved 2017-01-28.

"Oral Sex in Islam". The Majlis. Vol. 6 No. 8: JamiatKZN, Central-Mosque.com. 14 June 2003. Archived from the original on 14 June 2012. Retrieved 7 July 2012.

Ahmad, Anis. "Oxford Islamic Studies Online". Oxford University Press. Archived from the original on 2016-03-04.

'Alî Abdurrahman al-Hudhaifî (4 May 2001). "Remembrance of Allah". Islamic Network. Islamic Network. Archived from the original on 15 April 2012. Retrieved 7 July 2012.

Ali, Kecia (2006). Sexual Ethics and Islam: feminist reflections on Qur'an, hadith, and jurisprudence. Oxford: One world.

Bloom, Jonathan; Blair, Sheila (2002). Islam: A Thousand Years of Faith and Power. Yale University Press. ISBN 978-0-300-09422-0. p.48

Brunschvig. 'Abd; Encyclopedia of Islam, Brill, page 13.

Clarence-Smith, William (2006). Islam and the Abolition of Slavery. Oxford University Press. pp. 198–200. ISBN 978-0195221510. Archived from the original on 2017-06-11.

Hajj Gibril. "Questions On Sexuality, Oral sex". Living Islam. GF Haddad. Archived from the original on 20 June 2012. Retrieved 7 July2012.

Jami` at-Tirmidhi, tirmidhi/17 17:37 Archived 2015-10-20 at the Wayback Machine Archived 2015-10-20 at the Wayback Machine, Sunan Abu Dawood, 38:4366

"Are partners allowed to lick each other's private parts?". Mawlana Saeed Ahmed Golaub. Moulana Ismail Desai. Archived from the original on 4 October 2012. Retrieved 9 October 2012.

"Ruling on marrying a man who is intersex or impotent, and the difference between them". www.islamqa.info. Archived from the original on 2017-08-29.

"Sex change operation - Islam Today - English". en.islamtoday.net. Archived from the original on 2015-01-07.

"View on Transgender - Islam". 9 May 2015. Archived from the original on 7 May 2017.

Kassam, Zayn. "The Oxford Encyclopedia of Islam and Law". Oxford Islamic Studies Online. Archived from the original on 2016-03-04. Retrieved 3 May 2013.

Omar, Sara. "The Oxford Encyclopedia of Islam and Law". Oxford Islamic Studies Online. Archived from the original on 8 September 2015. Retrieved 3 May 2013.

Esposito, John. "Oxford Islamic Studies Online". Oxford University Press. Archived from the original on 14 November 2016. Retrieved 3 May 2013.

Kassam, Zay "Encyclopedia of Islam and the Muslim World". Macmillan Reference USA. Retrieved 3 May 2013.

Sikainga, Ahmad A. (1996). Slaves Into Workers: Emancipation and Labor in Colonial Sudan. University of Texas Press. ISBN 978-0-292-77694-4. p.22

*Noor, Azman Mohd (1 January 2010). "Rape: A Problem of Crime Classification in Islamic Law". Arab Law Quarterly. **24** (4): 417–438. doi:10.1163/157302510X526724.*

Wheeler, Brannon. "Encyclopedia of Islam and the Muslim World". Macmillan Reference USA. Retrieved 3 May 2013.

al-Fataawa al-Islamiyyah, 3/145, 146, Kashf al-Qinaa', 5/189, Al-Muhalla, 10/40, Kashf al-Qinaa', 5/189

Al-Halabi, Ali Ibn-Burhan-al-Din. Alsirah al-halabiyyah. Vol.1 Beirut: Al-maktabah al-islamiyyah. (n.d.): 54-5

Ali, Kecia (2006). Sexual ethics and Islam: feminist reflections on Qur'an, hadith, and jurisprudence. Oxford: One world.

Asar, Adam. Peace of Mind and Healing of Broken Lives. ISBN 9780557334681.

Atighetchi, Dariusch (2007). Islamic bioethics problems and perspectives. New York: Springer Science & Business Media. p. 149. ISBN 9781402049620. Archived from the original on 31 March 2018. Retrieved 13 July 2017.

Ayubi, Nazih (2004). *Political Islam: Religion and Politics in the Arab World*. New York: Routledge.

Bosworth, C.E. (1989). The History of al-Tabari Vol. 30: The 'Abbasid Caliphate in Equilibrium: The Caliphates of Musa al-Hadi and Harun al-Rashid A.D. 785-809/A.H. 169-193. SUNY Press. ISBN 9780887065644. Archived from the original on 2015-09-24.

Bowen, Donna Lee (2003). "Contemporary Muslim Ethics of Abortion". In Brockopp, Jonathan E. Islamic ethics of life: abortion, war, and euthanasia. University of South Carolina Press. ISBN 9781570034718. Archived from the original on 2015-10-01.

Camilla Adang (2003), Ibn Hazam on Homosexuality, Al Qantara, Vol. 25, No. 1, pp. 5-31

Dr. Shahid Athar. "Sex education, teenage pregnancy, sex in Islam and marriage". /www.islam-usa.com. Archived from the original on 2015-06-15. Retrieved 13 June 2015.

Esposito, John. "Oxford Islamic Studies Online". Oxford University Press. Archived from the original on 2014-02-01.

Ibn Qudaamah, Malik, Al-Mughni, 7/30, Al-Jassaas, Ahkaam al-Qur'an, 1/374, Sheikh al-Islam, Al-Ikhtiyaaraat al-Fiqhiyyah, p. 246

İlkkaracan, Pınar (2008). Deconstructing sexuality in the Middle East: challenges and discourses. Ashgate Publishing, Ltd. p. 36. ISBN 978-0-7546-7235-7. Archived from the original on 2015-10-30.

Islam, Gender, and Social Change - Page 28, Yvonne Yazbeck Haddad, John L. Esposito - 1998

Jackson, Sherman A. (2005). "Black America, Immigrant Islam, and the Dominant Culture". Islam and the Black American: Looking Toward the Third Resurrection. Oxford, UK: Oxford University Press. p. 151. ISBN 9780195343571. Archived from the original on 2016-04-26.

Masud, *Islamic Legal Interpretation, Muftis and Their Fatwas*, Harvard University Press, 1996

Mohamed S. El-Awa (1993), Punishment In Islamic Law, American Trust Publications, ISBN 978-0892591428

Moosa, Ibrahim. "Encyclopedia of Islam and the Muslim World". Macmillan Reference USA.

Muhammad ibn Adam al-Kawthari. "Kissing and Foreplay in Islam". Sex in Islam. Zawaj.com. Archived from the original on 24 June 2012. Retrieved 8 July 2012.

Omar, Sara. "Oxford Islamic Studies Online". Oxford University Press. Archived from the original on 2016-11-14.

Rizvi, Muhammad (1994). "3. The Islamic Sexual Morality (2) Its Structure". Marriage and Morals in Islam. Scarborough, ON, Canada: Islamic Education and Information Center. Archived from the original on 2016-01-04.

Rowson, Everett. "Encyclopedia of Islam and the Muslim World". Macmillan Reference USA. Retrieved 1 May 2013.

S.H. Rizvi, Syed Athar Husain. "Islamic Marriage". World Islamic Network. Archived from the original on May 4, 2013. Retrieved April 28, 2013.

*Sachedina, Zulie (1990). "Islam, Procreation and the Law". International Family Planning Perspectives. **16** (3): 111.*

Sidi Faraz Rabbani. "Basic bedroom fiqh". Hanafi fiqh. themodernreligion.com. Archived from the original on 19 August 2012. Retrieved 8 July 2012.

Stephen O. Murray and Will Roscoe (1997), Islamic Homosexualities: Culture, History, and Literature, ISBN 978-0814774687, New York University Press, pp. 88-94

Suad Joseph, Afsaneh Najmabadi, ed. (2003). Encyclopedia of Women & Islamic Cultures: Family, Law, and Politics. BRILL.

Suad, Joseph (2006). Encyclopedia of Women and Islamic Cultures. Leiden, Boston: Brill.

Suad, Joseph (2007). Encyclopedia of Women and Islamic Cultures. Boston: Brill, Leiden. p. 531.

Syed Mumtaz Ali & Rabia Mills. "Sex in Islam: Its Role and Purpose". Archived from the original on 2017-10-02. Retrieved 8 October 2018.

The Lawful And The Prohibited In Islam, Yusuf Al-Qardawi - 1997

Yusuf Laher (IQS). "Are Muslim women allowed to have sterilization?". Archived from the original on 2018-10-09. Retrieved 9 October 2018.

Good Governance Practices And Promotion Of Child Friendly Schools Model

Author: Dr Mugai Jane J. Wanjiru

Email : wanjijanedr@gmail.com Tell: +254 722 473062

Abstract

The aim of this paper was to explore how good governance practices by school boards of management can promote the achievement of the components of child friendly (CFS) model in primary schools in lower zones of Embu County. Child Friendly (CFS) model adopts its own governance or leadership procedures and practices to ensure that their jurisdiction operates in an open and transparent way as well as ensuring that the school board is accountable and responsible to the whole school community

and in particular the learners. This is achieved through the practice of good governance in their schools. Good governance in schools is a set of responsibilities, practices, policies, and procedures exercised by an institution to provide strategic direction to ensure objectives are achieved and resources are used responsibly and with accountability by the school management boards. The concept of child-friendly school which was initiated by UNICEF's studies, has a nature of actualizing the following components, full child participation, inclusivity, gender sensitivity, equity and quality education, safe and friendly environment, high hygiene levels, availability and equal distribution of resources, safe school structures, teaching and learning process among others. Despite the know benefits of implementing the CFS model issues of school drop rates, children learning under trees, lack of essential commodities, like safe water, poor infrastructures low quality education and cultural factors are still being noted and happening in CFS model in some schools in Kenya. The objectives of the study were to examine how integrity practices, inclusiveness practices, and resources and commitment to excellence practices can promote child friendly schools model in primary schools. The study was guided by transformational leadership theory and servant leadership theory. The study adopted mixed methodology and concurrent triangulation design. Qualitative data was analyzed thematically, while quantitative data was analyzed descriptively with the help of Statistical Package for Social Sciences (SPSS) and results presented using tables and frequencies. The study established that integrity, inclusiveness, responsiveness and resources and commitment to excellence had positive effect on promotion of child friendly schools model but at different degrees. It was however noted that practices of diversity were poorly rated and did not help in promotion of child friendly schools model. The study recommended that the Ministry of Education should formulate and organizes relevant governance and management training courses and capacity building programmes for education managers on good governance. Introduce programmes that enhance system awareness towards embracing diversity and utmost inclusiveness in schools. Ensure sustainable human development, actions must be taken to work towards this ideal with the aim of making it a reality. Putting the regulations about the democratic involvement of the stakeholders in practice of good governance in CFS.

Keywords: Good governance Child friendly schools, Integrity, Inclusiveness, Resources and Commitment to Excellence, School management

Introduction

The history of good governance in education may be associated with the World Bank and United Nations (UN) studies,(UNICEF 2009 ; UNESCAP ,2010). According to World Bank (2018) good governance in education means a set of responsibilities, practices, policies, and procedures exercised by an institution to provide strategic direction to ensure objectives are achieved and resources are used responsibly and with accountability. Good governance practices support schools by helping them manage their resources so they can deliver quality education. The above sighted activities are part of what school leaders or boards of management should do in order to promote and enhance child friendly schools. According to the United Nations(2002), good governance as a daily practice is measured by eight characteristics which include; participation, rule of law, consensus oriented, transparency, responsiveness, and, equity, inclusiveness, effectiveness, efficiency, accountability and implementation of policies. Good governance practices support schools by helping them manage their resources so they can deliver quality education. These assessing

indicators may be applied in measuring the promotion of Child Friendly Schools (CFS) model.

UNICEF grounded the CFS framework in the 1990 Convention on the Rights of the Child's principles of children's rights, as well as other international human rights instruments and international declarations such as the Declaration of Education for All (1990). These principles emphasize the right of all children to receive free and compulsory education in settings that encourage enrolment and attendance; institute discipline humanely and fairly; develop the personality, talents and abilities of students to their fullest potential; respect children's human rights and fundamental freedoms; respect and encourage the child's own cultural identity, language and values, as well as the national culture and values of the country where the child is living; and prepare the child to live as a free, responsible individual who is respectful of other persons and the natural environment (Chabbot, 2004). CFS models is as a pathways towards quality' in education that reflect three key, and interrelated, principles derived from the Convention on the Rights of the Child as noted by UNICEF, 2009).

In order to ensure promotion of CFS and development, the schools management boards have to establish the school's strategic direction and aims, in conjunction with the other stakeholders. Ensure accountability to the public for the school's performance and to assure that the school is managed with probity, integrity and with fairness, (World Bank 2018). These primary functions of school leaders or governors are based on the five elements of a CFS model as sight earlier on. The purpose of a CFS model is to move schools and education systems progressively towards quality standards, addressing all elements that influence the wellbeing and rights of the child as a learner and the main beneficiary of teaching, while improving other school functions in the process. Provision of Quality standards by good governance practices should make it possible for all children to access school, survive from grade to grade and complete the school cycle on time. School governors as managers should also provide an enriched educational experience through which students can thrive, develop and achieve their full potential,(UNICEF, 2002). When school managers practice good governance in CFS a participatory and comprehensive approach to planning for quality education is promised. Also stronger links between schools and their communities will facilitate the consultative process, a prerequisite for developing credible education sector plans that can attract external support in line with the good governance requirements.

According to the Imaginative mind (2008) good governance, is described as the leadership, direction and control of an organisation like a school and the primary functions of a governing body are said to be to: establish the school's strategic direction and aims, in conjunction with the executive. Ensure accountability to the public for the school's performance and to assure that the school is managed with probity and integrity. These primary functions of school leaders are bases for which institutions for education are formally organized and managed, Altbach (2005). The good governance indicators are applicable in different sectors and can be adapted to assess the governance of public services in education systems including Child Friendly Schools (CFS). Therefore, for the purposes of this study, the following indicators have been used as a framework for assessing good governance in promotion of child friendly schools. Indicators are, integrity, inclusiveness and resources and commitment to excellence. Education is one of the main priorities of the Government of Kenya. The Center for educational Policy analysis (2018) opines that governance

of educational institutions has a large impact on student and teacher success by defining and regulating institutions has a large impact on student and teacher success by defining and regulating relationships both within schools as well as between schools and outside agencies.

Institutional rules and policies determine how educators train and operate, and ultimately determine how students learn. Researchers in educational governance examine how the various aspects of educational governance impact the organization, operations, and outcomes of different educational systems. This is only achievable with the practice of good governance.

Some studies in Asian countries like in Nepal by World Bank and UNESCAP (2010) indicate that good governance follows a set of responsibilities, practices, policies, and procedures exercised by an institution to provide strategic direction to ensure objectives and are achieved and resources are used responsibly and with accountability. This is applicable in CFS. In such a case good governance practices should support CFS by helping them manage their resources so they can deliver quality education. This argument has similar sentiments as the ones presented by (UNICEF 1999, 2002,) as regards adoption, and implementation of Child Friendly Schools (CFS) model whereby practicing good governance the CFS goals and objectives would be realized. Child friendly schools model is expected to be implemented in all schools.

UN and World Bank expect the running of the FCS schools to be guided by the model of good governance to the best interest of the child. Schooling is not always a positive experience for children and especially in a poorly governed school where basic necessities of learning are lacking. Studies by UNICEF (1999) indicate that some children leave home without basics of life like food, clean water, insecurity, under-nutrition, parasitic infestations, unhygienic surroundings, chronic poverty, household chores, harmful traditional beliefs and practices, domestic overcrowding, gender discrimination, HIV and AIDS, domestic violence, child rapes defilements and other traumatic conditions, childcare deficiencies and the increasing prevalence and severity of natural disasters related to climate change are factors that can wreak havoc with a child's right to attend and complete school. School governors must therefore focus on the whole child, which means taking into account conditions in the family or community that might be hindering his or her educational progress, (UNICEF 2005, 2006). UNICEF realized that a number of children were educationally, emotionally, physically socially and educationally disadvantaged looking at the poor conditions that are in some schools even to date. So there came the introduction of CFS model which gave guidelines, policies, regulations components. CFS was then introduced and expected to be implemented in all schools worldwide. Studies from Thailand indicate that CFS has been implemented since 1998. Governing and managing of the schools was left in the hands of the schools boards of management and teachers.

In Latin America and the Caribbean, where inclusive quality education for all is a key goal, the CFS framework has been used in a number of countries such; Bolivia, Colombia, Guyana, Honduras and Nicaragua among others. The East Asia and the Pacific region has been developing and applying the CFS framework since it was first introduced in the 1990s. In India the CFS concept has been applied in emergencies as a framework for the reconstruction and restoration of primary education. In Eastern

and Southern Africa, national standards exist to promote child-friendly and gender-sensitive school environments in a number of countries.

In African regions, child-friendly and girl-friendly initiatives are clearly linked as UINCEF (2016) further observes that in West Africa, girl-friendly school models have been implemented in Burkina Faso, Cameroon, Gambia, Ghana, Guinea, Guinea-Bissau, Mauritania, Nigeria and Senegal, and a child-friendly/girl-friendly school manual has been developed. Uganda started implementing CFS just about the same time with Kenya. Reports from MOEST (2003) in Kenya indicate that existing schools were turned into child-friendly but without other modification.

In Embu real implementation of CFS was about 2003 just the same times with inclusive education, (MOEST 2004). World Bank, (2015) report asserts that the quality of education in Kenya has been suffering for some time. Many children were progressing through primary school without having achieved the numeracy or literacy skills expected at their level (MOEST, 2014). As a result, more than 50% of pupils fail the national Kenya Certificate of Primary Education examination (KCPE) which they need to advance to secondary school (UNESCO, 2012). The object of the initiative is to provide quality education to every child, irrespective of his/her circumstances. The question here is what do the school mangers do in order to correct the problems. Through Uwezo Kenya programme it is hoped that learners will receive better and quality education which is part of the goals of CFS model, (MoEST, 2014b) but with practice of good governance. The lower side of Embu County is semi-dry areas where climatically challenges such as infrastructures, long spells of dry seasons, and others can be hindrances to achieving CFS goals. However, the government NGOs and the community have corroboratively worked together in order to promote the CFS model. From the above discussion it should be clear that good governance practices is a model which is difficult to realize in its entirety. Very few countries have come close to achieving good governance in its totality.





A teachers teaching under a tree and learners sitting in the floor. A common feature in some areas in Kenya





Learners playing in muddy sandy area and others learning under a tree.

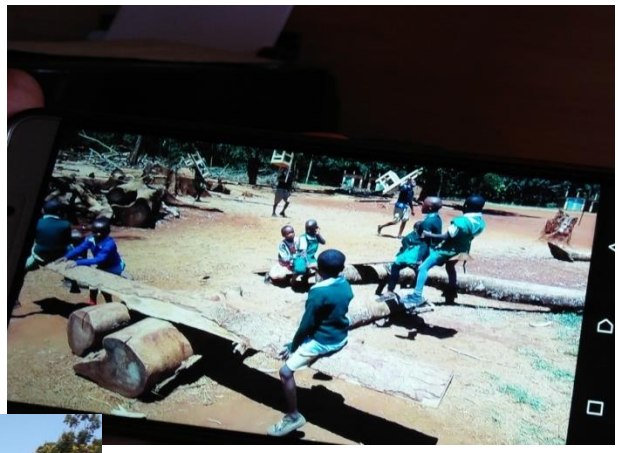




Learners writing on their knees.

Children with playing in unsecure field.

The images below here are examples of poorly governed CFS where the characteristics of CFS are not met. It is noted here that children are sited on the floor and learning







Improvised play materials by the children

School play ground. Very unfriendly and insecure

All this is happening even after the recommendation of implementation of child friendly school in Kenya. In view of that this study was set out to find out whethergood governance has influence on promotion child friendly schools.

Statement of the Problem

In spite of the obvious known importance of supporting and implementing the model of CFS issues of school drop rates, children learning under trees, lack of essential commodities like water and food, poor infrastructures and cultural factors such as FGM are still a hindrance to the full implementation of CFS model. Poor leadership and governance practices are not promoting the CFS model. National plans and priorities in Kenya for CFS have only been partially successful.

Purpose of the Study

The purpose of the study was to explore how the good governance practices can promote the FCS model in primary schools in the lower side of Embu County.

Objectives of the Study

i. To examine how integrity practices can promote child friendly schools model in primary schools in the lower side County of Embu

ii. To establish the influence of inclusiveness practices on promotion of CFS model in primary schools in the lower side of Embu County.

iii. To determine the extent to which resources and commitment to excellence can promote child friendly schools model in primary schools in the lower side of County of Embu.

Research Questions

i). How does the virtue of integrity practices promote child friendly schools model in primary schools in the lower County of Embu.

ii) What is the influence of inclusiveness practices on promotion of CFS model in primary schools in the lower side of County of Embu?

iii). To what extent do resources and commitment to excellence practices promote child friendly schools model in primary schools in the lower side of County of Embu?

Significance of the Study

The findings of study may help educational stakeholders realize the important good governance practices in promoting the model of CFS. It may also help teachers to recognize the significance and appropriateness of practicing good governance in promoting CFS model practices. This study may also be useful to stakeholders such as the government and community to channel more infrastructural resources for the successful implementation of the CFS in different in different schools so as to promote CFS framework. Finally, the study may also benefit other researchers and academicians who may be interested in carrying out research in the same area for it may lay a firm foundation.

Scope of the Study

This study was carried out in the lower side of Embu County primary schools only. School chair persons were used in the study. The study was looking at integrity practices, inclusiveness practices, and ethical leadership behaviours practices on promotion of CFS in primary schools.

Limitations of the Study

i. The study relied on self-report by respondents through filling of a questionnaire which resulted in participants self-underrating or over ratting or become suspicious as to the purpose of the study. Some may have concealed some information and especially that which was touching on performance of effective counselling and the results.

ii. The study findings may not be applicable to areas that experience different cultures and climatic conditions.

Assumptions of the Study

The following was the assumptions of the study:

i. All the respondents would be cooperative and provide reliable and or honest responses.

ii. That the teachers and school boards of management would provide the information on the challenges they faced while implementing CFS and in using good governance practices

iii. That all public CFS primary schools adhered to the Ministry of Education policy of having to adhere to proper implementation of CFS model polices by use of good governance practices.

LITERATURE REVIEW

This chapter discusses the literature of the previous studies related to this study.

Concept of Good Governance Practices

The concept of good governance is as old as human civilization. Expressly, governance refers to decision-making processes and practices applied in implementation of the decisions made. The concept is derived from the Latin term *gubernare or* Greek *kubernaein, which stand for steering or directing,* governance is described as the *use of power or authority by leaders, administrators or managers for the good and best interest of those being led or represented* (Kjae, 2004). Governance can also be defined as the process by which some sectors of the society wield power, and enact and promulgate policies which directly influence human and institutional interactions, and economic as well as social development. This type of power or authority must always be exercised for the common good of the learners in schools. Governance can be applied in varied contexts, in schools good governance relates to leaders and managers holding fast to ethics, good morals, and virtues in decision making, implementation of policies and in engagement with learners and the school communities for the best interest of learners.

Promotion of Child-Friendly Schools

Education is a right of every child and it is the obligation of education leadership to offer quality education to all its children. As a necessity to proper learning and human development, quality education should be as a result of factors from both within and outside of the classroom and access to appropriate supplies that are akin to the child's home environment. To achieve this conducive environment for learning, UNICEF, (1998,2002) came up with a framework guiding the process of realizing child friendly schools, a model that promotes qualities, such as inclusivity, health and protection for children all geared towards the best interest of the child. In this regard, Claire (2011) in a study carried out in Macedonia affirms that a CFS puts into consideration various dimensions, such as inclusiveness and gender friendly, quality teaching and learning, safe and protective environment, supportive of equity and equality and enhancing linkage to community as well as promoting partnership. Promotion of CFS can be achieved through complete implementation CFS model and by school board members being ethical in their ways of managing the schools, by putting emphasizes on quality teaching and learning processes, by practice of democratic participation, providing equal right of education to all children regardless of their gender, age or race, by providing safe, healthy and protective environment and preventing violence, like injury, abuse and neglect in the school. School leaders to guarantee that the school discipline practices are for the sake of the child.

How Good Governance can Benefit Child Friendly Primary Schools

World Bank (2018) contends that the following way can be practiced by school manger in order to promote CFS primary schools, these include; practice a more democratic and responsive system of school management, including more efficient utilization of resources. Have greater participation of all stakeholders (teachers, students, parents and school management) in the development of school policies, rules, plans, and code of conduct. Greater transparency in all school activities, including increased flow of information among all stakeholders about school plans, finances, rules and regulations, and programs. Practice strengthened accountability among stakeholders so as to improve school management. Practice coordination among various levels of formal governance like Education Office, Resource Centre, or other educational institution. Through school policy and guide lines the school leaders can develop detailed rules and code of conduct through discussion in the meetings of stakeholders and apply the these rules and code of conduct accordingly. Make available and maintain a complaint box. Frame policies on professional development of teachers and preparation of training materials. Provide methods of management of penalizing teachers disobeying those rules and code of conduct as well as ways of rewarding the good teachers without discrimination. More open communication among stakeholders about how to manage schools. Practice workable evaluation and assessment of the achievement of the elements of CFS, as sighted by (Nyatuka, 2015).

Benefits of Implementing Child Friendly Schools Models

Karite (2013) outlines a number of benefits of CFS mostly to children. These include; provides students with a positive environment to exploit their talents and capabilities to their maximum. This shapes them into their respective careers and professions at an early age. CFS is gender sensitive in their enrollment and provision of services. They also offer students an opportunity to broaden their thinking and do away with certain stereotypes. It sensitizes both the boys and the girls on the need to respect each others` rights and dignity for peaceful coexistence and development. CFS also trains its learners to be law abiding and patriotic. Students in such schools are used to

following simple rules and regulations. They get to understand that the outside world has rules and regulations just like the school. The extensive coverage of different cultures without bias enables learners to appreciate and love others. This in turn promotes peaceful coexistence. CFS also reduce drop out cases. The students feel comfortable and relaxed both emotionally and physically since all their needs are adhered to and this may reduce school dropout rate. CFS increases motivation both intrinsically and extrinsically to move on with their studies. This will also reduce drop out cases. Owing to the numerous benefits of child friendly schools, heads of schools should and school leaders embrace the qualities of these schools so as to improve on the performance of their learners.

School Leaders Responsibilities and Promotion of Child Friendly SchoolsThe success of every school including child friendly schools depends on the way it is managed or governed by the school leaders. School governance should take into consideration the school ecosystem and the policy makers as well in order to ensure sustainability. Teachers and leaders have the responsibility of setting high expectations and delivering top quality instruction for promotion of CFS. In Kenya the responsibility for overseeing the management of CFS is entrusted to a governing body. The terms used for such governing bodies vary, and include local school boards, boards of governors and school management committees or management. Research suggests that safe and good CFS is characterized by strong management and effective school leaders (Dunne et al, 2005; Pinheiro, 2006). School governing bodies and management in CFS structures have a duty of care in the school so as to promote CFS. School leaders should not lead CFS in unacceptable manners and should need to create a supportive and enabling environment to prevent and respond to cases of insecurity in schools. School safety is not only a matter of keeping potential threats off school compound but it also includes attending to the mental and emotional health of youth.

Leaders need to encourage school community to adopt and implement codes of conduct applicable to all staff and students that confront all forms of violence, taking into account gender-based stereotypes and behaviour and other forms of discrimination for promotion of CFS.

Leaders also have to prevent and reduce violence in schools through specific programmes which address the whole school environment including encouraging the building of skills such as non-violent approaches to conflict resolution, implementing, anti-bullying policies and promoting respect for all members of the school community. Ensure that curricula, teaching processes and other practices are in full conformity with the provisions and principles of the Convention on the Rights of the Child, free from references actively or passively promoting violence and discrimination in any of its manifestations, (United Nations, UN Study on Violence against Children,2006). Teachers' roles and responsibilities in child-friendly schools, is to strive for relevant and child centred teaching and learning. School authorities in CFS should take precautionary measures to avert risks to children's health and safety.

School leaders in CFS need to foresee imminent risk or possible dangers that could affect children within the school, its vicinity or the wider community. Good school governors ensure that there is a good range of skills, knowledge and experience amongst team members. School leaders need to develop and implement positive forms of discipline in schools. Ensure teachers and school staffs have training, and have the capacity to promote gender-sensitive and inclusive classrooms. Consult with and include children in governance and formulation of school rules. Work with families and communities to promote the use of positive

discipline and the principles of gender equality and non-violence and link with community-based child protection mechanisms. Establish clear, safe and accessible procedures and mechanisms to report cases of violence and assist victims (including knowing who to and when to refer cases). Provide referral to counselling and support services,(Dunne et al, 2005; Pinheiro, 2006).

Integrity and Promotion of Child-Friendly Schools

The word Integrity is used to describe an individual's level of uprightness, honesty, moral commitments and the willingness to stand with what is just at all times. According to Bretag (2018) integrity is the cornerstone of ethical practice that is premised on a set of values. In the same way, the International Center for Academic Integrity (ICAI) (2013) identified the said values as fairness, trust, honesty, respect and responsibility. *Integrity* is one of the guiding principles behind good governance, management and professional conduct in any institution. This is a quality that guides individuals to act with honesty and strong ethical principles, as well as moral uprightness. In good governance, integrity can be termed as the ability of leaders, managers and administrators to conduct themselves in acts of truthfulness and uprightness (Bretag, 2018).

According to, UNICEF (2012) a child-friendly school should ensure a physically secure and psychological enabling environment for every child, where teachers are the most important factor when it comes to providing an effective and inclusive learning environment. The report further stipulates that, a school is as a significant, personal and social environment for all learners. Kouzes et al (2007) observed that educational leaders are faced with so many demands and influencing factors. They emphasized that school leaders must therefore have clear guiding values if they are to positively maneuver through the numerous conflicts and contradictions and deliver unwavering leadership that can improve educational systems and learning experiences of all learners. In South Africa Vyver, Myer and Westhuizen (2014) established that integrity in governance influences learner output and performance. The study established that considerate, truthful and responsive governance improves teaching outcomes thus emphasizing that indifferent leadership results to declining levels of effectiveness, negative organizational relationships, a factor that further leads to distressing school climate.

In Kenya, studies also indicate that good governance as reflected through values such as integrity is connected to learner's performance. According to Wamahiu (2015), in a synthesis report carried out in Kenya, it was established that integrity of school managers and teachers resulted to improved skill acquisition in learners. The studies however have not indicated the relationship between specific values of integrity, such as accountability, uprightness, availability and responsibility on improving equity, equality, fairness or equality.

Inclusiveness on Promotion of Child-Friendly Schools

Inclusiveness in education is described as a teaching approach that focuses on the needs of learners from diverse backgrounds. This also includes learners with various special needs, learning abilities and styles. Inclusiveness implies that learners from groups that may have ordinarily been disadvantaged or at risk, such as those living with disabilities or speakers of minority languages can equally have access to quality learning opportunities in regular education systems (UNICEF, 2016). According to WHO and WORLD BANK (2011) surveys, it was estimated that from 93 million to

150 million children aged 14 years and below live with some form of disabilities. The report also estimated that after being enrolled, such children usually have lower attendance and completion rates, making disability one of the world's biggest factors of educational marginalization. On gender, the same report analyzing 51 countries showed that there were more girls were dropping out of schools than boys. The study further established that only 41.7 girls with disabilities had completed primary school as opposed to 52.9 percent of those without disabilities.

In Kenya, Kanamba (2014), observed that majority of teachers felt that aspects such as inappropriate or inadequate educational materials were affecting inclusion and effective teaching. Conversely some of the aspects that have hampered inclusivity and gender responsiveness in sub-Saharan Africa are practices such as FGM child marriages, lack of value on girl's education and onset of menstruation. However the studies have not expressly stated how some aspects of inclusiveness such as multiplicity and involvement enhance equity, equality fairness and skill acquisition towards achieving child-friendly schools model.

Resources and Commitment to Excellence on Promotion of Child-Friendly Schools

A Child-friendly school must be managed in the best interests of children, within a healthy, safe and protective environment, supplied with adequate facilities and resources (UNICEF, 2006). School resources therefore refer to learning and teaching materials and other physical and material resources meant to facilitate learning. UNICEF (2006) CFS manual states that resources, together with existing capacities and opportunities have enormous influence in the implementation of CFS model. The report emphasized that school managers needed to be accountable and answerable in order to demonstrate good stewardship in management of educational resources. According to a United Nations Girl Education Initiative (UNGEI) (2017), report, the existing gaps in resources were attributed to persistent marginalization of children with intellectual and profound disabilities.

To promote child friendly schools model, especially in rural areas such as the lower Embu County, school leadership must obligate to advocate for and allocate appropriate and adequate resources for all learners and administer such resources in an accountable and transparent manner for the best interest of children. However, existing studies indicate that this is not always the case, making it complex to realize CFS model. As UNGEI (2017) report showed, inadequate resources, opaqueness in management and lack of specialized support as well as lack of accountability in management posed a significant danger to implementation of CFS framework. The report included suggestion that government and those in charge of policy development need to create educational policies that focus on promoting children's rights and protecting them both within the school environment and elsewhere. In Kenya, Kanamba (2014) indicated that up to 90 percent of teachers reported that teaching materials were too little to meet their instructional needs. Concurring with this, Musila (2015) divulged that more than 70 percent of teachers who took part in the study felt that classroom materials were inadequate due to poor allocation. However the reviewed literature fell short of divulging how aspects such as reliability and transparency in commitment to resource allocation and management specifically affect promotion of child-friendly schools, thus the study.

In similar assertions, World Bank (2018), observes that in keeping up with good governance practices, of resources management, the school board of can practice the following activities; generate essential resources for the school from local and other sources through the active participation of stakeholders then manage the said resources with accountability and with responsiveness. Disclose information on the resources generated and how much of those resources are used for each areas on need in the CFS. Manage and maintain the school building, toilets, drinking water, and furniture equitably. Keep a record of resources generated from donors and local agencies. Keep a record of the property of the school both mobile and immobile. Conduct income-generating activities to support the CFS framework.

Theoretical Framework

The study was guided by Transformational Leadership Theory of James McGregor Burns (1978) and Servant Leadership Theory by Robert Greenleaf (1970). The rationale of using these theories for this study was informed by the fact that they both recognize the fact that good governance focuses on doing what is right and that being a leader calls for serving others, meeting their needs and promoting their personal development. Good governance is about who leaders are, and what they do, and school and classroom managers have to commit to the needs of all children irrespective of their gender, race or social status. Greenleaf (1970/1991) states that the effectiveness of servant-leadership is measured by how it affects the least privileged members in the society, that is whether such leadership will make them benefit or at least feel not further deprived. The rationale of using this theory is the fact that it recognizes the aspects of good governance, in the sense that school leaders have to first focus on serving the interests of children, caring for their health, growth and well-being as well as instilling values and inspiring them to become leaders themselves.

Transformational Leadership Theory

Transformational leadership theory was first developed by James McGregor Burns, in 1978.

In school management point of view, this standard implies that school managers, such as principals, teachers in their classrooms, departmental heads as well as other stakeholders in their different capacities ensure that there is teaching of high quality and improved learning. The theory is also applicable as it recognizes the role of school leader as that driven by principles and commitment to improving organizational performance and learners' and learners' academic performance.

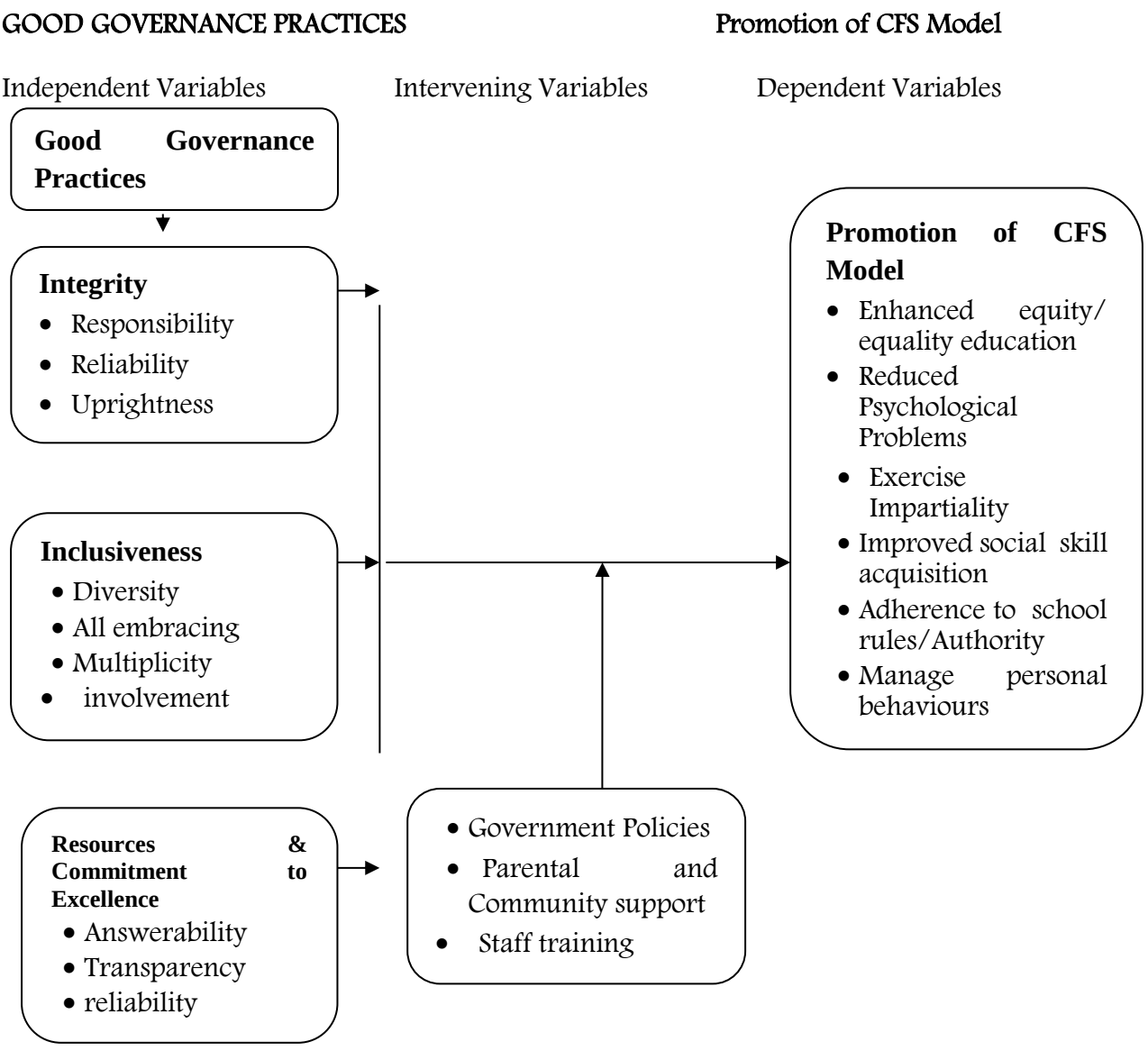
Servant Leadership Theory

Servant leadership is defined as a philosophy, and set of practices that enrich the lives of individuals, builds better organizations and ultimately create a more just and caring world (Greenleaf Center for Leadership, 2016). The phrase "servant leadership" was first coined by essayist, Robert Greenleaf, in an essay "The Servant Leader published in 1970. Greenleaf (1977) suggests that a servant leader is a leader first, and that it all begins with a natural feeling that one wants to serve and to serve first. He argues that it is that conscious choice that makes an individual to aspire to lead, suggesting that it is all a different case from a person who becomes a leader first than a servant later

Conceptual Framework

In this study, the Conceptual Framework shows the interrelationship of the independent variable as the good governance and the dependent variable which is promotion of child friendly schools. The independent variables were measured by use of the following variable indicators; integrity, inclusiveness, resources commitment to excellence. The intervening variables were parental and community support; government policies and staff training.

Conceptual Framework



Methodology:

Mixed model approach comprising quantitative and qualitative research methods was employed. Concurrent triangulation design was employed. Both qualitative and quantitative data were gathered simultaneously as suggested by Creswell and (Plato 2013). Thematic and inferential statistics were used for data interpretation and analysis with the help of computer application SPSS version 23. Findings were

presented using tables, frequencies, charts and in narrative form. Purposive sampling was used to distribute all the chairpersons in accordance with the sub county's administrative zones. Findings and recommendations were equally presented.

Findings:

This chapter also presents discussion of the results of the study.

Data Analysis Procedures

Qualitative data was analyzed thematically while quantitative data was analyzed descriptively through frequencies and percentages, means and standard deviation, on Statistical Package for Social Sciences (SPSS) and results presented using tables.

Data Analysis and Presentation

The quantitative data from questionnaires was entered into SPSS version 21 and analyzed descriptively through frequencies means and percentages.

Table 6: Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	30	83.3	83.3	83.3
	Female	6	16.7	16.7	100.0
	Total	36	100.0	100.0	

As shown on table 1above, more than 83 percent of respondents were male, that is 83.3%, while only 16% were female. This is a clear indication that school management in the area of study is dominated by men. However, the study shows that both genders are somewhat represented in school leadership

Table 7: Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-34	4	11.1	11.1	11.1
	35-44	10	27.8	27.8	38.9
	45-54	14	38.9	38.9	77.8
	Above 55	8	22.2	22.2	100.0
	Total	36	100.0	100.0	

The researcher sought information on the age of the respondents. The data on the table 2 above indicates that the highest percentage of chairs of boards of management was within the age bracket of 45 – 54 years, representing 38.9% of the respondents. This was followed by those aged between 35 – 44 years at 27.8% and those above 55 years representing 22.2%. The age bracket with the lease representation was those aged 18 and 34, who stood at 11.1%

Table 8: Educational Level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Diploma	9	25.0	25.0	25.0
	Undergraduate	20	55.6	55.6	80.6
	Post Graduate	7	19.4	19.4	100.0
	Total	36	100.0	100.0	

The research sought to establish the level of education of the respondents and found that more than half of the chairs of the boards of management had undergraduate degrees. That is, 55.6% had undergraduate degrees, followed by 25% who had a diploma and lastly 19.4% who had post graduate degrees. The educational level of a school manager is essential as it plays a major role in upholding good governance practices. This further determines the level of competency in of policy adoption and coordination of governance activities towards promotion of child-friendly schools.

Findings and Discussions

Table 9: Results

Statements	SA %	A %	U %	D %	SD %	Mean	Std. Dev.
A. Integrity on Promotion of CFS							
1. Managers level of Responsibility	55.6	13.9	2.8	13.9	13.9	3.83	1.55
2. Effect of Responsibility on CFS	52.8	5.6	11.1	22.2	8.3	3.72	1.50
3 Managers' level of truthfulness	38.9	13.9	11.1	27.8	8.3	3.47	1.46
4. Effect of Truthfulness on CFS	44.4	16.7	8.3	25.0	5.6	3.69	1.41
B. Inclusiveness on CFS Model							
	22.2	13.9	13.9	36.1	13.9	2.94.	1.41
1.Embracing diversity							
2.Effect of embracing diversity on CFS	27.8	16.7	13.9	306	11.1	3.19	1.43
3.Leadership, community Involvement	69.4	16.7	2.8	5.6	5.6	4.38	1.15
4. Effect of involvement on CFS.	72.2	8.3	5.6	8.3	5.6	4.33	1.24
C. Resources, Commitment to Excellence							
1. Managers' level of Answerability	52.8	16.7	11.1	13.9	5.6	3.97	1.31
2. Effect of Managers' Answerability	50.0	25.0	5.6	11.1	8.3	3.97	1.34
3. Managers Level of Transparency	58.3	13.9	5.6	13.9	8.3	4.0	1.41
4. Effect of Managements' Transparency	61.1	19.4	8.3	5.6	5.6	4.25	1.18

Integrity on Promotion of CFS Model

The first objective was to examine how integrity practices can promote child friendly schools model in primary schools in lower Embu County. As shown on table 4 above, the results revealed that majority of the respondents felt that school managers did not exercised reasonably good levels of responsibility. That is 55.6%, followed by 13.9% who agreed with the same position. The findings also revealed that more than half of the respondents, that is 52.8% and 5.6% were of the opinion that the level of managers' responsibility had positive effects towards the attainment of child-friendly schools model. This implies that most of the school managers are mildly dependable and in control in their governance roles, thus demonstrating qualities of good governance that are crucial in supporting safe, secure and healthy learning environment.

The findings indicated that truthfulness was not strongly exercised among the school leadership. Out of those sampled, only 38.9% strongly agreed that managers' demonstrated a high level of truthfulness. At the same time, only 13.9% agreed with the same view. These findings indicate that lack of satisfactory levels of truthfulness among school managers had negative effect on attainment of child friendly school model, since truthfulness is a key attribute for good governance.

Inclusiveness on Promotion of CFS Model

The research also sought to establish the influence of inclusiveness practices on promotion of CFS model in primary schools in lower Embu County. The findings revealed that inclusiveness practices were not well observed in schools. Less than half of the respondents reported that learners from diverse cultures background and abilities as well as gender were treated equally at school. That is, only 22.2% of the respondents strongly agreed that learners from diverse cultures, backgrounds, abilities and gender received equal treatment, same as only 13.9% who agreed with the same view.

This implies that schools managers in lower Embu County are yet to surmount retrogressive cultural practices that discriminate on gender, such as early marriages for girls, Female Genital Mutilation (FGM), favoring boys over girls and marginalization of learners with disabilities. Similarly, less than half of those sampled, that is paltry 27.8% strongly agreed, and 16.7% agreed that embracing inclusive culture in schools had enhanced equity, equality and fairness in schools under study.

The findings however revealed that involvement of various stakeholders was well practiced in the schools. Majority (69.4%) of those sampled strongly agreed that various actors and stakeholders such as family, community and school leadership worked together towards realization of CFS framework, while 16.7% agreed with the same view. Similarly, in response to whether involvement of family, community and school leadership helped promote CFS model, a strong majority (72.2%) strongly agreed, while 8.3% agreed with the same view. This implies that school leadership encouraged good relationships between the stakeholders for the best interest of children as such practices build positive interactions and enhance interpersonal communication, thus creating a better learning environment. The effectiveness and inclusiveness of the schools are high according to the students' perceptions. It was also indicated that they made efforts to increase the effectiveness and inclusiveness throughout the processes. The effectiveness and inclusiveness of the schools are high according to the students' perceptions

Resources and Commitment to Excellence on Promotion of CFS Model

The research also sought to determine the extent to which resources and commitment to excellence can promote child friendly schools model in primary schools in Mbeere North sub-County. The findings indicate that answerability, transparency and reliability in handling resources as well as committing to excellence were not satisfactorily exercised. Out of those sampled, 42.8% strongly agreed that school managers maintained high levels of answerability, while 16.7% agreed with the same view. At the same time, half (50%) of the respondents strongly agreed and 25% agreed that the practice of answerability by school managers played a positive role in enhancement of equity and equality for all learners.

This implies that the management maintained a reasonable level of answerability in planning and administering the available resources towards attainment of CFS model. The results were consistent with UNESCAP (2009) findings that answerability in management of resources and subsequently commitment to the laid down objectives are necessities in good governance. However the situation on the showed that

The results showed that majority (58.3%) of the chairs of the boards of management sampled strongly agreed and (13.9%) of them agreed that school managers conducted themselves with high levels of transparency. At the same time, majority (61.1%) of the respondents strongly agreed and 19.4% agreed that school managers always exercised high level of transparency in their work. This implied that leaders were committed to acceptable levels of good governance regarding resource management. The results lend credence to the findings by UNGEI (2017), which established that lack of transparency and specialized support in education leadership were a threat to attainment of CFS model. Nyatuka (2015)notes that some situations like not being able to find time from work and home, the negative school experiences of parents, economic problems, low levels of education, teachers' negative attitudes, and the cultural differences between the school and the home prevent the parental involvement and the cooperation.

CONCLUSION AND RECOMMENDATIONS

Summary

The objectives of the study were to examine how integrity practices, inclusiveness practices and resources and commitment to excellence can promote child friendly schools model in lower parts of Embu County. The study found that most of the chairpersons of boards of management consider governance practices being applied in schools as practical in promoting child friendly schools model.

Conclusion

It was thus concluded that integrity practices as characterized by responsibility and truthfulness enhanced equity and fairness as well as acquisition of skills in learners. However, although relatively low, the number of those disagreeing about truthfulness and its effectiveness on promotion of CFS model was notably significant.

In regard to inclusiveness, the study concluded that diversity of learners' needs was not properly addressed. The findings showed that children from diverse cultures, gender, backgrounds and abilities were not treated equally and fairly in their learning environment. Based on UNICEF (2017) that inclusiveness entails giving learners from

disadvantaged groups, those living with disabilities and speakers of minority groups equal opportunity in regular schools, it is clear that the diversities of these groups are not being addressed thus constraining the attainment of CFS model. The study however found that involvement as an aspect of inclusiveness was significant and that it enhanced learners' acquisition of skills. The study concluded that involvement of family and community promoted good relationships between the stakeholders and enhanced positive interactions, thus creating a better learning environment for the best interest of learners

From the findings, it was noted that management of resources and commitment to excellence by school managers promoted CFS model. It was found that school managers exercised reasonably good levels of answerability and reliability in resource management. It was noted that these practices enhanced equity and fairness, thus promoting CFS model. From the findings, it was concluded that leaders' practice of transparency enhanced fairness and acquisition of skills in learners.

Recommendations

It is therefore recommended that the Ministry of Education formulates and organizes relevant governance and management training courses and capacity building programmes for education managers mainly sensitizing on aspects of integrity such as truthfulness.

The study recommended that policy makers in the Ministry of Education should come up with programmes that enhance system awareness towards embracing diversity and utmost inclusiveness

Governance and management training institutes need to conduct continuous training programmes for school managers on various governance practices.

REFERENCES

Altbach, G.P. (2005). "Patterns in Higher Education Development". In Altbach, P.G.;

Atangba, J. (2014). *The Jinx of African Leaders*, Author House, pp 119-122, Bloomington IN USA

Bevir, M. (2012). Governance: A very short introduction. Oxford, UK: Oxford University Press.

Bretag, T (2018). Business Policy and Strategy, Ethics Online Publication:

Apr 2018 DOI: 10.1093/acrefore/9780190224851.013.14

Chabbott, C. (2004). UNICEF's Child-friendly schools framework: A desk review. New York:

Claire, N. (2011). *Elements of Child-Friendly Schools In Macedonia (*unpublished notes from the

regional meeting of UNICEF Bshp/EQL Skopje: Macedonia

Coaldrake, P.; Stedman, L.; Little, P. (2003). *Issues in Australian University Governance.*

Brisbane: QUT.

Clair, N., Miske, S. & Patel, D. (2012). Child rights and quality education: child-friendly schools

in Central and Eastern Europe (CEE). European Education, 44(2), 5-22. [4]

Creswell, J. W. (2003). Research design. London: Sage Publication.

Çobanoğlu F. Ayvaz Z. Ordu T.A. (2018). Child-friendly Schools: An Assessment of Secondary

Schools.*Universal Journal of Educational Research* 6(3): 466-477, 2018 http:// www .hrpub.org doI:10.13189/ujer.2018.060313; Faculty of Education, Pamukkale

University, Turkey.

The Convention of Children Rights (1989), UNICEF Turkey, 2004. [6]

Das, S. N. (2014). Do "child-friendly" practices affect learning? Evidence from Rural India.

Working Paper No. 14-03, Department of Quantitative Social Science, Institute of

Education, University of London. [7] Değirmencioğlu S. M. (2012). Katılım hakkına

tersten yaklaşım: Tersten katılım. Uluslararası Katılımlı Çocuk İhtiyaçları Sempozyumu,

Ankara, 18-19 Mayıs 2012.

Dodson, C. K. (2005). The relationship between school effectiveness and teachers' job

satisfaction in north Mississippi schools (Unpublished Doctoral Dissertation),

Mississippi University, Oxford.

Denmark, V., (2012). *Transforming Leadership: A Matter of Perspective, the source.* Retrieved from: http://www.advanc-ed.org/source/transformational-leadership-matter-perspective

Gooden, S. (2015) Race and Social Equity: A nervous Area of Government. Routledge, pp. 13-

18 *ISBN 978-*

Greenfield R., (1977) Servant leadership – A journey into the Nature of Legitimate Power, *Paulist Press* 1977 New Jersey.

International Center for Academic Integrity (ICAI). (2013). *Fundamental Values of Academic*

Integrity (2nd ed.). Retrieved from http:// www. academicintegrity. org/icai/assets/

Revised_FV_2014.pdf.

Johnstone, C. (2011) Inclusive Education and Child-Friendly Schools. http:// www. miskewitt.

com/ assets/8.- inclusive-education_final_9.14.11.pdf [Accessed: 18 February 2017].

Kanamba, G. M. (2014). School factors influencing provision of child friendly

environment in public primary schools in Igembe North District, Meru County,

Kenya. Unpublished M.Ed Project, University of Nairobi

Kjaer, A.Governance, (Cambridge: Polity Press, 2004), p. 3.

Kouzes, J. M., & Posner, B. Z. (2007). *The leadership challenge*, 4th ed. San Francisco, CA: Jossey-Bass.

Leithwood, K, Begley, P. T, & Cousins, J.B. (1994). *Developing expert leadership for future schools*. London: Falmer.

Mark B. (2012). Governance: A very short introduction. Oxford, UK: Oxford University Press.

Ministry of Education, Rwanda (2009) Child Friendly Schools Infrastructure: Standards and

Guidelines, Primary and Tronc Commun Schools, accessed online:

https://www.preventionweb.net/files/15377_rwandachildfriendlyschoolsinfrastru.pdf

Nyatuka, B. O. (2015). Assessment of the effectiveness of family-school-community partnership

in Kenya's child-friendly schools. (Unpublished Doctoral Dissertation), University of

South Africa.

OECD (2009). Leading to Learn:School Leadership and Management Styles, *OECD, Education and Skills* Volume 2009, Number 15, July 2009, pp. 177-206(30)

Osher, D., Kelly, D., Tolani-Brown, N., Shors, L., and C. Chen. (2009). *UNICEF Child-Friendly Schools Programming: Global evaluation final report.* Washington, D.C.: American Institutes for Research.

Rhodes, D. (2018) What is Social Equity Park City Community Foundation. Accessed online: https: // parkcitycf. org/what-is-social-equity/

Shapiro, J. P., & Stefkovich, J. A. (2005). *Ethical leadership and decision making in education: Applying theoretical perspectives to complex dilemmas* (2nd ed). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Tiihonen, S. (2004). *From Governing to Governance: a process of change.* Tampere: Tampere

University Press.

Touchstone, M, (2010) Professional Development: Part 8 – Commitment to Excellence,

EMS World, accessed online: https://www. emsworld.com/article/10319383/

professional-development-part-8-commitment-excellence

UNESCAP (2009). What is Good Governance? United Nations Economic and Social

Commission for Asia and the Pacific.

UNICEF (2009). Child-friendly schools manual. New York: UNICEF. [23] UNICEF (2012).

Child - Friendly Schooling Approach. Retrieved from https: //www. unicef.org/education/

bege_61717.html.

UNICEF (2006). *Child Friendly Schools Manual*, New York: United Nations Children's Fund.

UNICEF/UNESCO. (2007). A human rights-based approach to education for all. New York:

UNICEF (2012) Focusing Resources on Effective School Health, Life Skills UNICEF, accessed online: https:// www. unicef.org/lifeskills/ index_7262.html

UNICEF (2016). UNICEF stands for Inclusive Education and Social Inclusion, International.

Online: https: //inclusion-international.org/unicef-stands-inclusive-education-social-

inclusion/

UNICEF (2006). *Child Friendly Schools Manual*, New York: United Nations Children's Fund.

United Nations Girls' Education Initiative (2017), Still Left Behind: Pathways to Inclusive Education for Girls with Disabilities. Retrieved from http://www.ungei.org/Still_Left_Behind_Full_Report.PDF

UNESCAP (2010). *What is Good Governance?* [Electronic publication.] Available 10.6.2010:

http://www.unescap.org/pdd/prs/ProjectActivities/Ongoing/gg/ governance.pdf.

Vyver C.P. Westhuizen P C and Meyer L.W. (2014) The Caring School Leadership in the South,

South African Journal of Education, Volume 34, Number 3, August 2014

Wamahiu S., (2015) Value Base Education in Kenya: An Exploration of Meanings and Practices. Retrieved online: http:/ /_____ www. werk. co.ke/img/VbE_Syntheis_Report.pdf

World Bank, (2017). *Good School Governance. Frequently Asked Questions.* World Bank.

Social development.

Zubay, B., & Soltis, J. F. (2005). *Creating the ethical school: A book of case studies.* New York, NY: Teachers College Press.

Influence of Non-Governmental Organizations Education Support Activities On Academic Performance Of Students In Public Primary Schools In Kenya: A Case Of Machakos County

Dr Jennifer Kilonzo, PhD[1]

Scott Christian University

Nathan Mutua[2]

Scott Christian University

Abstract

Non-governmental organizations have initiated education support activities which have improved school performance of students in public primary schools. The researcher looked at the influence of the nongovernment organizations education programs on academic performance of public primary schools. The study concentrated on influence of non-governmental organizations education support activities on academic performance of students in public primary schools in Machakos only. The study delimited itself to the target population of 176 participants in Machakos. The study adopted descriptive method because it provided a quantitative or numeric description of trends, attitudes and opinions of a population by studying a sample population. The researcher has put in mind that participation in research is voluntary, thus quality time was taken to explain to the respondents the importance of the study thus requested them to participate in the study by giving relevant and honest information. Questionnaires were used to collect information from the selected respondents. The researcher then analysed the data using descriptive statistics, the findings will help various key stakeholders including the government and Non-governmental organizations. The results of the data analysis are presented in chapter of this report thus data has been organized and presented as per the objectives of the study and demographic information captured at the beginning of the analysis. The researcher thus concluded that multiple factors influence academic performance of students negatively for instance lack of scholarly materials, lack of well-structured school feeding programs and lack of well installed physical facilities. The study revealed that academic performance was not negatively influenced by lack of clean water.

Keywords: Non-governmental organizations, education, school performance and public primary schools.

Background of the study

Various reasons have influenced the academic performance of students in public primary schools especially for the children whose parents or care givers cannot afford education in private schools. Some of these factors include; being orphaned, poverty and ignorance by parents. School going Children OVC perform poorly in academics for several reasons including poverty, need for domestic labour, need for income-generating activities, stigmatization, and parental sickness or death. School enrolment

inequities among school going children have been documented throughout sub-Saharan Africa (Bicego, Rutstein, & Johnson, 2003). One estimate suggests that orphans are approximately 13% less likely to attend school than non-orphans (Monasch & Boerma, 2004). Studies have also shown that disparities in grade progression were found in several countries including Botswana, Niger, Ghana, Kenya, Tanzania, and Zimbabwe (Bicego et al., 2003). Appropriate grade progression is important because losing ground in school places children at higher risk of failing and dropping out. The completion rate of education in Africa is among the lowest in the world (UNESCO, 2006). This poor academic performance and low transition rate of primary school pupils into secondary schools is partially attributed by the inability of caregivers to pay school fees. Even in countries where secondary school education is provided for by the government, there are additional maintenance costs to be settled.

Statement of the problem

Various factors have influenced academic performance of students in public primary schools like poverty, which leads to parents' inability to meet basic needs, therefore; various Nongovernmental organizations have initiated activities geared towards improving the academic performance of such marginalized students. These activities provide scholarly materials like school uniforms and books, school feeding programs, physical facilities and provision of health and sanitation which support the education of these children. However much these strategies have been used in various developing countries, their relative impact on education especially academic performance has not been greatly felt. Therefore, this study sought to investigate the impact of NGO education activities on the performance of Primary school children in Machakos County.

Literature review

Theoretical framework

Tinto's model

The most commonly referred to model in the student academic performance in relation to school retention. It was first offered in a literature review (Tinto, 1975), and so began with the support of being broadly consistent with a considerable range of other people's research, as well as having a theoretical derivation by analogy to Durkheim's model of suicide. It probably gains most support though because it immediately appeals to people's common sense with its central notion of "integration". It is less clear whether there is much direct empirical support for it, and certainly it is hard to find direct empirical tests of and challenges to it. The literature claiming to support it seems to be about reporting weekly consistent evidence: not controlled experiments, nor comparing alternative theories against Tinto's with respect to data.

This is adapted by the researchers from Tinto, V. (1975) "Dropout from Higher Education: A Theoretical Synthesis of Recent Research" Review of Educational Research vol.45, pp.89-125". Its central idea is that of "integration": it claims that whether a student persists or drops out is quite strongly predicted by their degree of academic integration, and social integration. These evolve overtime, as integration and commitment, interaction, with dropouts depending on commitment at the time of the decision.

Empirical Review

Scholarly materials provision and academic performance of students

rovision of Scholarly materials is a critical construct for academic performance because it has some correlation with the quality of service delivery. Regular attendance for learning is associated with provision of scholarly materials. When they reach school age, research demonstrates that to achieve academically, children must attend school consistently equipped with scholarly materials like textbooks, stationeries and uniform. A child's exposure to curriculum gives him/her an opportunity to learn significantly, influence achievement and exposure from being in school (Fuller et al., 1999). A study of village-based schools in Kenya found that students with access to scholarly materials had greater learning gains and lower rates of repetition, a finding consistent with many other studies (Miske, Dowd et al., 1998).

School feeding programs and academic performance of students

Kenya is still a developing country and food as a basic need is still scarce in the country especially for orphans and vulnerable children. Kenya is classified as an upper middle-income country (World Food Programme (WFP), 2010) with frequent food deficits because of recurring droughts which have resulted in high rates of malnutrition. The country is food secure at national level; however, it is at household level that access to sufficient food for marginalised and vulnerable groups in the society remains a constant challenge, contributing to the current, unacceptable levels of malnutrition. School feeding programs are targeted as social safety nets that provide both educational and health benefits to the most vulnerable children, thereby increasing enrolment rates, reducing absenteeism, and improving food security at the household level. This has linked both food and education for poor and vulnerable children living in highly food-insecure areas.

The government has also initiated the food for work program which targets the families. All these initiatives are hoped to build capacity to the individual child and family and remarkable Improvement in enrolment has been noted in the primary schools with the enrolment figure moving from 5 million in year 2000 to 8 million in year 2010. According to United Nations Children's Fund (UNICEF) 2010, assessments in 2009, the estimated overall crop production was 139,000 tonnes, leaving a deficit of 150,000 tonnes, which the country had to import to meet the consumption demand of its population. The world is still recovering from the financial and food crises of 2008. A key response, especially in developing countries, was to scale up school feeding programs.

School feeding programmes are essential in any country whether it is developed or is still developing. The benefits of these programmes are immense not only at the individual level but also to the community and society at large. The primary assumption of school feeding programmes is that education and learning depend on good nutrition (Briggs, 2008). School health and nutrition also addresses the critical health and nutrition factors that keep children out of school and reducing their ability to learn effectively, such as malnutrition and hunger (Save the Children USA, 2007). Bundy, Burbans, Grosh, Geli, Jukes, and Drake (2009) defined school feeding as the provision of food to school children. There are two main groups of school feeding approaches, namely 'in-school feeding' and 'take-home rations".

School supplementary feeding programmes can therefore be implemented as in-school feeding, where the children eat the food in school or as take home rations, where the learners take dry portions of food to consume at home. In-school feeding programmes are better preferred for the learners as their eating can be monitored and they consume the full amount of their daily ration. In take home rations however, the possibility of sharing the food with family is high resulting in the learner not consuming adequate amounts of their daily ration. School feeding programmes are mainly implemented with the intention to achieve the following results: Increase enrolment and attendance, Alleviate short-term hunger, Improve nutritional status, Improve micronutrient status (WFP, 2004)

Food can act as a strong incentive for children to attend school on a regular basis. Girls especially benefit from this, as parents feel there are sufficient income-transfer benefits (Del Rosso, 1999). In many communities, girls are culturally disadvantaged such that in hardship situations, male children are given opportunity to go to school over girls. School supplementary feeding programmes can provide a way in which parents can save money by spending less on food and thereby allow the girls to attend school. It is however important to establish that school meals do not replace food that has been part of the children's diet in the household, but rather add to what the family provides. In Jamaica providing breakfast to primary school students significantly Increased rate of school attendance. The learners who benefit the most are those wasted, stunted, or previously malnourished (Del Rosso, 1999). Alleviation of Short-Term Hunger in learners is also another objective of feeding programs in schools. Much research has also been conducted on the effects of short-term hunger related to learning capacity and in-school meals provided to learners reduce short-term hunger (World Food Programme (WFP), 2004).

Learning ability is affected greatly by hunger due to skipped meals. Many factors contribute to hunger among school children, these include long distances children have to travel to school, cultural meal practices that include no or small breakfasts due to a lack of family time and resources to provide adequate meals to children before and/or during the school day (Berliner, D. C., 2009). Poverty and potential: Out-of-school factors and school success.

Many cultures do not provide breakfast. This means the child's last meal is in the evening. The possibilities of long travelling time mean the child starts the school day hungry and is unable to concentrate. The provision of even a small snack at the start of the day or mid-morning alleviates the short-term hunger and has been linked to increased awareness, activity and learning capacity (Briggs, 2008).Improving Nutritional Status in learners is also another major objective. The physical growth of a child is a result of a number of interconnected variables, especially in areas where poverty is endemic. Environmental factors, genetics, food consumption patterns, health and illness, hygiene practices, lack of sanitation and the onset of puberty are but a few. Even though data collection on these variables has been inconsistent, some research indicated that undernourished children do benefit from school feeding programs (Bundy, Burbans, Grosh, and Geli, Jukes & Drake, 2009). The school supplementary feeding programmes help to improve the nutritional status and health status of schoolchildren, as they learn better if they are not hungry (King & Burgess, 1995).

Poorly fed schoolchildren who are provided with good meal improve their growth and school performance, and prevent anaemia, and other nutritional deficiencies. Other objective of school supplementary feeding programmes include: Increasing attention and concentration of students producing a gain in cognitive function and

learning. Nutrition affects the development of factors that encourage cognitive development before and after a child is enrolled in school. Conditions such as protein-energy malnutrition and other micronutrient deficiencies can have adverse effects on attention and concentration in school (Pollitt, 1984) School feeding effectively reduces absenteeism and increases the duration of schooling, educational outcomes which includes; performance, drop out, and repetition. It increases community involvement in schools, particularly where programmes depend on the community for preparing and serving meals for the children. In addition, schools have the potential to reach out not only to orphans and vulnerable children, but also staff, teachers, parents and community members, including young people not attending school.

Rautiainen K., Nissinen M. &Lassenius C. (2000) argue that schools can teach students how to resist unhealthy social pressures since eating is a socially learned behaviour. Skilled personnel are available to provide follow-up and guidance after appropriate training of students, teachers and other service personnel. Teaching school children about nutrition can help other people in the community to learn about nutrition (King & Burgess, 1995). Evaluations show that school-based nutrition education has the ability to improve eating behaviours of young people (Del Rosso, 1999).

Framework for an Effective School Supplementary Feeding Programme needs to be institutionalized, which include; Starting point for developing an effective school nutrition component in broader efforts to improve health status. Schools can effectively deliver some health and nutritional services, provided that the services are simple, safe and familiar, and address problems that are prevalent and recognized as important within the community (Del Rosso, 1999).

2.4 Physical facilities and academic performance of students.

The relationship between school resource level and pupils' achievement can be related largely in various literatures. According to Global Education Monitoring Report (2016) outlines, that the sustainable Development Goal on Education requires availability of learning material as a key strategy for achieving inclusive and equitable quality education that promotes common lifelong opportunities. Mukami (2009) affirmed that Facilities and infrastructure greatly affect the levels of students' achievement as well as the safety of both teachers and learners. Standard classrooms, textbooks and furniture are basis for a good learning environment. Standard classrooms are an important precondition for pupils' learning and participation in school activities, this is what NGOs strive to provide. Availability of classrooms, libraries and other physical facilities enhance the learning environment which is reflected in examination performances (Gakuru 1982).

Fielmua & Bandie, (2012) carried out a study in Ghana, on the contribution of local Non-Government Organizations (NGO) in promoting basic education in the Nadowli District. He identified The Sustainable Integrated Development Services Centre (SIDSEC) which was a local operating NGO in Nadowli District in Ghana that provided physical facilities including teaching and learning material with the aim of bettering the quality of education in the district. Teachers at basic education level indicated that the reading and counting skills of pupils had improved as a result of the provision of physical facilities by NGOs. In addition it led to increased enrolment and retention in the primary schools. A poor physical facility in primary schools is one of the main barriers to excellent academic performance.

A study by Buhere (2007) in Webuye subcounty in Kenya revealed gaps in the quality of education in Kenya relative to physical facilities. The study proved that nearly all physical facilities required for teaching and learning were lacking, from textbooks, learning material and inadequacy of library services .As a result, performance in these schools is affected negatively, since learners lack practical approach in learning of the subject taught. Empirical data show that physical facilities are an important factor in both school attendance and achievement. For this reason, improving primary school infrastructure is a high priority among SMCs. Over time, communities and parents have been responsible for and have made substantial investments in school infrastructure.

World Bank (2002) did a study that involved over 89 education projects across Africa. The study found the cost effectiveness and importance of localized and customized reading materials in increasing literacy skills in school settings. In 2007-2009, a research study was implemented to analyze the impact of text and library books upon reading comprehension and fluency upon students in Tanzania (Plonski, 2009). This study used a comparative case study that incorporated a mixed methods design. The results of the investigation indicated there were some significant differences in student fluency and reading comprehension achievement scores.

In addition a study by Fuller (1985) discovered that pupils who had more than two textbooks were almost 3 times likely to pass with 67% while completing school compared to pupils who had no textbooks in school had 24% on completion. Therefore textbooks are very significant for academic achievement .In Kenya, due to the increased enrollment as a result of the free primary education, the Government funds schools to cover non-salary expenditure, including textbooks. According to the Global monitoring report 2016, these grants are vulnerable to budget reductions. The current unsustainable financing of textbooks has often left parents covering the cost of learning materials for their children, disadvantaging families who cannot afford these out-of-pocket expenses. Since a growing body of evidence has confirmed the critical role of textbooks in improving student achievement has influenced education policies, there is need for NGO involvement.

Health and sanitation and academic performance of students

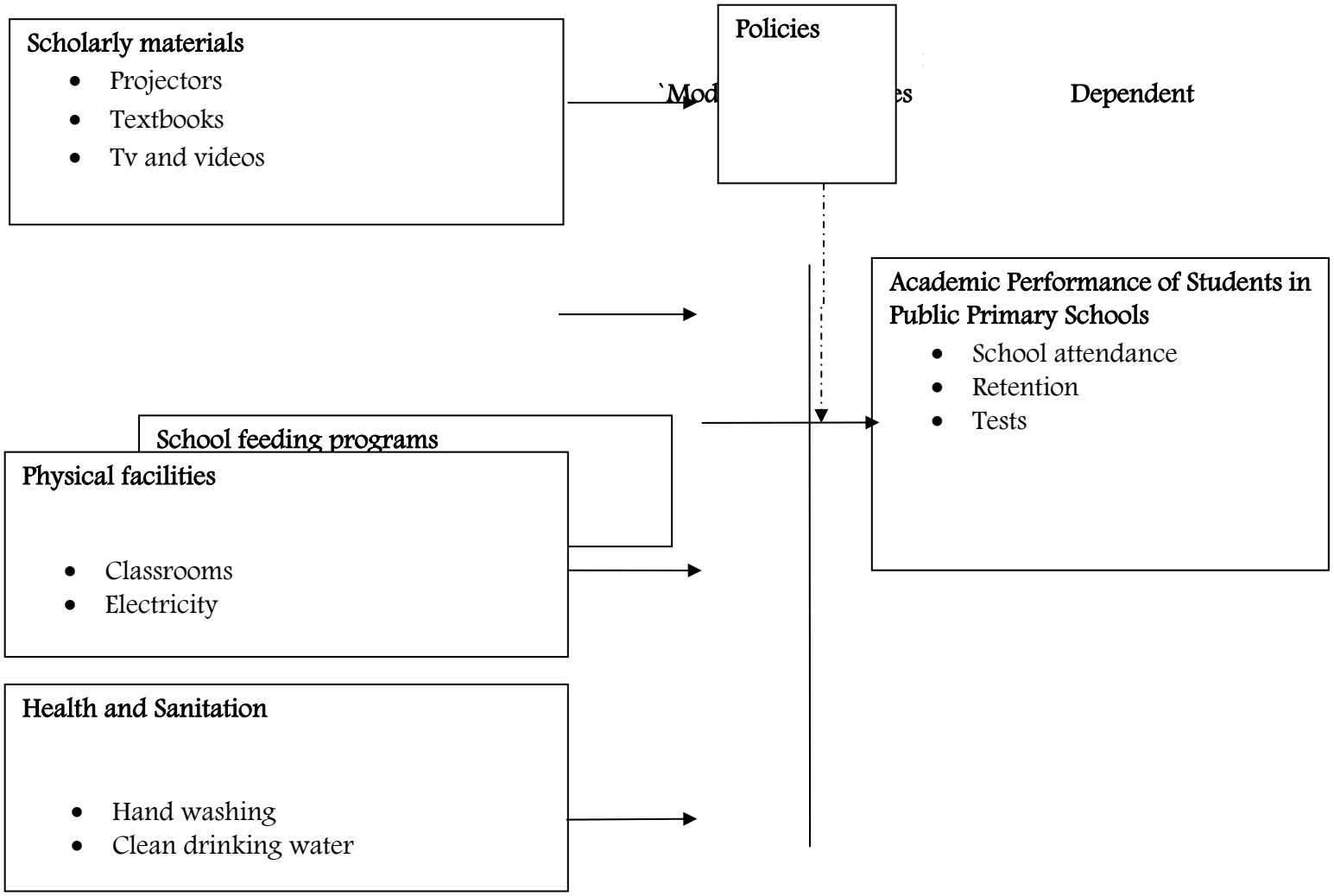
To recognise and treat existing and new illnesses, the necessity to provide clinical services to treat illness and injury in schools has long been recognised, and this primary health care service forms the backbone of school health provision services. Palmiere (2000) argue that opportunities for health improvement for the majority of students in schools provide a unique opportunity for health assessment and care and for high risk behaviours and chronic, perhaps silent, diseases to be identified and treated. In their study, Pridmore, & Yates (2006) posit that health and sanitation not only fulfils the duty of care of the health providers to the students, but may enhance student's ability to perform better academically, with a subsequent reduction in the risks to themselves and the community. According to WHO (2006), clinical services can be categorised as acute care services, communicable disease control, chronic disease control and mental health. Core services in these programs are generally delivered by health centre staff, with additional services provided by visiting community-based organisations and specialist in reach.

According to Holzmann & Jørgensen, (2001) the prevalence of chronic disease in schools has led to the establishment of a systematic program run throughout the State. The chronic disease program focuses on the chronic diseases of asthma, cardiovascular disease and diabetes. The framework for the program is based on: the

identification of students with a chronic disease he improvement of health care for these people through individualised services like introduction of hand washing activities which ensure there is continuous process of students washing their hands, this water containers are placed strategically especially outside the latrines, at the entry of the dining places and also provision of clean and treated drinking water.

Conceptual framework

The study was guided by a conceptual framework in a diagrammatic representation containing all variables and indicators



Research methodology

Research design

The study employed a descriptive survey research design. Descriptive survey research design was considered appropriate for the study because the purpose was to obtain information which would describe the existing phenomena by asking individuals about their perception, attitudes, behaviours or values (Mugenda &Mugenda, 2007).

Target population and sample size

According to Mugenda (2003), target population is the total number of elements that researcher specifies in his or her research. The target population for this research was 176 participants which is inclusive of principles/deputy, heads of department in schools, board of managers, subject teachers, educational officials and NGO project manager. According to the TSC records in Machakos County, there are a total of 777 public primary schools in the region. A sample of size of 88 schools was selected, the researcher used the concept of Gall and Borg, (2003) who recommended that at least 10% of the participants in the population are representative; in this case, 88 schools will be the least number to be selected. The unit of analysis was therefore represented by 1 Principal and 1Deputy Principal per school.

Data Collection Instrument

Questionnaires were used to collect information from the selected partakers. The questionnaires were self-administered by use of two trained research assistants and the researcher. The questionnaire was administered to a convenient sample in Machakos.

Data analysis and procedure

Descriptive and inferential statistics was used to analyse the data with the aid of the Statistical Package for Social Sciences (SPSS) version 21 which was used in the analysis. After data collection, the data was organised and edited to remove any inconsistencies, repetitions or errors that made its analysis difficult. The cleaned data collected was then analysed using both quantitative and qualitative methods. The data was analyzed in the most logical and meaningful way and relevant comments made appropriately. Quantitative data was analysed using descriptive statistics which included meaning, standard deviation and frequency distribution. Considering the quantitative nature of the data, descriptive statistics which describes the main features of the data collected (frequency, percent, mean and standard deviation) was used. Inferential statistics was tested using Pearson method of correlations (a measure of relations between variables) which involves determining the extent of the relationship between variables (arrange of 0 to 1).

Summary of the findings, conclusions and recommendations

Majority of the respondents 57% agreed that donor funded overhead projectors/transparencies improves learning outcomes in public primary schools, majority of the respondents 69%. Agreed that here was no sufficient donor funded overhead projectors/transparencies in school; this implies negative learning outcomes in public primary schools. Respondents strongly agreed that enough textbooks improve academic performance of students which implies that lack of

enough textbooks in school; this implies a negative academic performance for students.

The study concluded that sufficient donor provision of television and videos as learning materials improves the academic performance of students. Most of the respondents said that there was lack of donor provision of television and videos as learning materials in school; this implies negative learning outcomes in public primary schools. Majority of the respondents 43% said that sustainability of SFP improves the academic performance of students. Respondents agreed said that there was lack of sustainability of SFP, this implies a poor academic performance in public primary schools, that food/Balanced diet in SFP improves the academic performance of students and that there was lack of nutritious food in SFP, and this implies a poor academic performance in public primary schools.

The study concluded that the academic performance of students was negatively influenced by the lack of scholarly material, lack of well-structured school feeding program, and lack of well installed physical facilities. The study revealed that academic performance was not negatively influenced by lack of clean water.

REFERENCES

Amha, W., &Narayana, P. (2000). Review of Microfinance Industry in Ethiopia: Regulatory Framework and Performance (No. 2). AEMFI.

Beckmann, S., & Rai, P. (2004). Tanzania HIV/AIDS, Work and Development.

Bekele, A. (2013). Challenges And Prospects Of Service Provision Arrangements To Orphans And Vulnerable Children In Addis Ababa: The Case of Arada Sub-City (Doctoral Dissertation).

Berliner, D. C. (2009). Poverty and potential: Out-of-school factors and school success. Education Policy Research Unit.

Brown, R., Scragg, R., & Quigley, R. (2008). Does The Family Environment Contribute to Food Habits or Behaviours and Physical Activity in Children. Wellington: Agencies For Nutrition Action (ANA).

Cho, Y., Robalino, D., & Watson, S. (2016). Supporting Self-Employment and Small-Scale Entrepreneurship: Potential Programs to Improve Livelihoods for Vulnerable Workers. Journal of Labor Policy, 5(1), 7.

Goldman, J., Salus, M. K., Wolcott, D., & Kennedy, K. Y. (2003). A Coordinated Response to Child Abuse and Neglect: The Foundation for Practice. Child Abuse and Neglect User Manual Series. Gile, Developmental Implications of Hiv/Aids: The Case Of Aids Orphans & Caregivers.

Grantham-McGregor, S. M., Chang, S., & Walker, S. P. (20088). Evaluation of School Feeding Programs: Some Jamaican Examples. The American Journal of Clinical Nutrition, 67(4), 785S-789S.

Green, G. P., & Haines, A. (2015). Asset Building & Community Development. Sage publication

Himmelgreen, D. A., Romero-Daza, N., Turkon, D., Watson, S., Okello-Uma, I., &Sellen, D. (2009). Addressing the HIV/AIDS—Food Insecurity Syndemic in Sub-Saharan Africa. African Journal of AIDS Research, 8(4), 401-412.

Holzmann, R., &Jørgensen, S. (2001). Social risk management: A new conceptual framework for social protection, and beyond. International Tax and Public Finance, 8(4), 529-556

Irwin, A. C., Millen, J. V., & Fallows, D. (2003).Global AIDS: myths and facts: tools for fighting the AIDS pandemic. South End Press.

Kamau, M. N. (2012). AIDS Stigma and Discrimination in Public Schools: A Case Study of HIV-Positive Children in Kenya.

Kellner, G. H. J. H. D. (2007). The Impact of HIV/AIDS on the Electoral Process in Namibia.

Kürüm, C. (2009). Surviving Modernism: The Live-in Kitchen Including The Turkish Cypriot Case (Doctoral dissertation, Eastern Mediterranean University (EMU).

Louw, L. (2007). The Experiences of Adolescents Orphaned by HIV/AIDS Related Conditions (Doctoral dissertation, University of Pretoria).

McIntyre, L., Travers, K., &Dayle, J. B. (1999). Children's Feeding Programs in Atlantic Canada: Reducing or Reproducing Inequities? Canadian Journal of Public Health, 90(3), 196.

Mensah, S. (2004, March).A review of SME financing schemes in Ghana.In A Presentation at the UNIDO Regional Workshop of Financing SMEs (pp. 15-16). Ghana: Accra.

Mindell, J. A., & Owens, J. A. (2015).A Clinical Guide to Pediatric Sleep: Diagnosis and Management of Sleep Problems. Lippincott Williams & Wilkins.

Mutangadura, G., &Eshetu, T. (2011).Mainstreaming Social Protection into Poverty Reduction Strategies and National Development Plans: Lessons and Experiences from Eastern and Southern Africa.Economic Commision for Africa, 6.

Naudeau, S., Kataoka, N., Valerio, A., Neuman, M. J., & Elder, L. K. (2012). Investing in Young Children: An Early Childhood Development Guide for Policy Dialogue and Project Preparation. World Bank Publications.

Nyberg, B. J., Yates, D. D., Lovich, R., Coulibaly-Traore, D., Sherr, L., Thurman, T. R., ...& Howard, B. (2012). Saving lives for a lifetime: supporting orphans and vulnerable children impacted by HIV/AIDS. JAIDS Journal of Acquired Immune Deficiency Syndromes, 60, S127-S135.

Palmiere, A. D. (2000). The Social and Economic Impacts of HIV/AIDS on High-Density Households in Bulawayo, Zimbabwe.University of Calgary.

Pridmore, P., & Yates, C. (2006). The Role of Open, Distance and Flexible Learning (ODFL). In HIV/AIDS Prevention and Mitigation for Affected Youth in South Africa and Mozambique.DFID.

Richter, L. M., Sherr, L., Adato, M., Belsey, M., Chandan, U., Desmond, C. & Madhavan, S. (2009). Strengthening Families to Support Children Affected by HIV and AIDS.AIDS care, 21(S1), 3-12.

Schenk, K. D. (2009). Community Interventions Providing Care and Support to Orphans and Vulnerable Children: A Review of Evaluation Evidence. AIDS Care, 21(7), 918-942.

Shibuya, T., & Taylor, V. (2013). Alternative Care Options and Policy Choices to Support Orphans: The Case of Mozambique in the Context of the SADC. International Social Security Review, 66(1), 71-95.

Ulrich, D., Younger, J., & Brockbank, W. (2008). The Twenty-First-Century HR Organization. Human Resource Management, 47(4), 829-850.

Wakhweya, A., Dirks, R., &Yeboah, K. (2008). Children Thrive in Families: Family-Centred Models of Care and Support for Orphans and Other Vulnerable Children Affected by HIV And AIDS. AIDS JLICA.

Webb, D., & Elliott, L. (2000).Learning to Live: Monitoring and Evaluating HIV/AIDS Programmes for Young People. Save the Children.

Woodward, R., Biewener, M., &Aldinger, C. (2009). Desk Review for Developing a Monitoring and Evaluation Framework for a Comprehensive HIV and AIDS Response in the Caribbean Education Sector.

World Health Organization. (2006). The world Health Report: 2006: Working together for Health.

Zungu-Dirwayi, N. (2004). An Audit of HIV/AIDS Policies in Botswana, Lesotho, Mozambique, South Africa, Swaziland and Zimbabwe. HSRC Press

Influence of Afrocentric Evaluation Methods on Societal Norms among Secondary School Learners in Meru County, Kenya

Joseph Muriungi Kirugua

Chuka University

Prof. Njoki Wane

Department of Social Justice Education

University of Toronto, Canada

Prof. George M. Muthaa

Department of Education

Chuka University

Abstract

The school system is expected to inculcate desirable societal norms in the learners. However, cases of unacceptable norms such as immorality, destruction of property, riots, strikes, drug abuse and disrespect for authority have been on the increase despite numerous interventions put in place by the government and individual educational institutions such burning of external exams, abolition of visiting days and holiday tuition. This study sought to examine the application of Afrocentric teaching methodology to enhance societal norms among secondary school learners in Meru County, Kenya. The study adopted exploratory descriptive research approach. The study used questionnaires and interview schedules to collect data. Data was analyzed using descriptive statistics such as mean, standard deviation and coefficient of variation. Inferential statistics used for data analysis was Linear Regression Analysis. The study found out that integration of Afrocentric evaluation methods into current Kenyan school system has statistically significant influence on societal norms among secondary school learners. The findings of this study will provide useful knowledge in regard to Afrocentric evaluation methods and societal norms and provide a basis for further studies.

Key Words: Influence, Afrocentric, Evaluation methods, Societal norms

Introduction

An assessment exercise refers to the process of collecting information about a student to help in making an evaluation about the progress and development of the student According to Chilisa (2012) Afrocentric evaluation strategies emphasize on making evaluation culturally relevant. It advocates for culturally responsible and acceptable practices through incorporation of African voices in the practices. This implies that an evaluation exercise should be guided by certain values that acceptable in one's society. Tests and assessment tools should use a language that is neutral, meaning that it will neither give undue advantages to some learners nor will it hurt or unduly

disadvantage others. According to Guba and Lincoln (2005) the world is diverse, culture is divers and therefore evaluation methods should take care of those diversities and not see learners backgrounds in one color.

A research study by Jeng (2012) on rebirth, restoration and reclamation, the potential for Africa centered evaluation and development models revealed that evaluation strategies should not blindly rely on Eurocentric models. An evaluation that would benefit African children should take into consideration the learners cultural backgrounds because learners' cultural background and experiences form the learners' foundation of learning and understanding the world. According to a research study by Muwanga-Zake (2009) on building bridges across knowledge systems: Ubuntu and participative research paradigms in Bantu communities in Africa, an evaluation exercise should consider aspects of communal nature and collective responsibility of indigenous African communities. This would promote those African values that should live beyond the contemporary globalization which is characterized by capitalistic nature of modern societies. According to a research study by Moore and Zenda (2012) on contemporary development challenges for Africa and their implications for evaluation, an evaluation exercise should aim at building a relationship between the learner and the evaluator. An evaluation exercise therefore ought to take into consideration the learners views and interest for that relationship to be well established.

Useful classroom assessments will provide feedback through corrective instructions in the spirit of giving students a second chance to demonstrate success thus helping them to learn and acquire intended skills, values and attitudes (Stiggins, 2002). Gronlund (2004) in his book titled assessment of student achievement shows that evaluation has numerous benefits including being an important component in improving education but not just ranking students or schools. Evaluation thus helps teachers to improve the use of results and align their teaching with desired norms and values. According to studies by Rogers (2006) on effective student assessment and evaluation in the classroom, credible evaluation guides students to know what they have learnt in the classroom, the skills and attitudes they have acquired and therefore are able to know where they need to put more effort to succeed. Evaluation thus helps students to plan and revise their classroom instructions.

According to Alberta Assessment Consortium (2005) scoring guide of an evaluation should not be complicated for students to understand and should avoid any content or language that is sensitive, sexist or offensive. After an evaluation exercise results should be promptly communicated. According to a research study by Fernard (2002) the evaluator should think of a general motivation as a reward to the learners based on their performance and collaboration. This is because students can be reinforced to learn what is desired by a physical stimuli such as food. Such an intervention would counter the learners' negative feelings and lack of assertiveness when they consistently do poorly in an assessment exercise. According to Ndambuki, Rono and Frank (2006) affirming children and encouraging them will boost their social and emotional health.

Statement of the Problem

Kenyan society has entrusted the school system with the key role of socialization. The schooling process is expected to inculcate desirable societal norms among learners.

However, cases of undesirable behaviors that do not conform to acceptable societal norms such as immorality, destruction of property, riots, strikes, drug abuse and disrespect for authority have been on the increase despite interventions put in place by the government and the individual educational institutions to make the learning environment in schools learner friendly. This inconformity with societal norms raises concern on the role and effectiveness of school system in inculcating societal norms. This study sought to examine application of Afrocentric evaluation methods into the Kenyan school system to enhance inculcation of desirable societal norms among secondary school learners.

Objective

The objective of the study was to establish the influence of Afrocentric evaluation methods on societal norms among secondary school learners.

Hypothesis

The following Hypothesis was addressed:

H_0: There is no statistically significant influence of Afrocentric evaluation methods on societal norms among secondary school learners in Meru County, Kenya.

Methodology

This study used exploratory descriptive research design and correlation design. Descriptive design was applicable for the study because it embarks on investigating and finding the real nature of the problem. The target population was 86,700 subjects and sample size was 384. The validity of the instrument was ensured through assistance of the supervisors. Reliability of the instrument was ascertained through a pilot study and a correlation coefficient of 0.774 was established.

Results and Discussions

The current study sought to determine the influence of Afrocentric evaluation methods on societal norms among secondary school learners in Meru County, Kenya. The respective research findings are presented in Table 1.

Contemporary Evaluation Methods

Table 1 presents descriptive statistics for each of the contemporary evaluation methods variables measured. The researcher analyzed the information regarding contemporary evaluation methods and got means and standard deviations of the responses. The results are presented in Table 1.

Table 1

Contemporary Evaluation Methods

	N	Mean	Std. Deviation	CV
Classroom assessment tests don't come as surprises to learners.	376	3.35	1.232	36.819
Teachers give clear corrective instructions after an evaluation exercise.	377	3.59	1.015	28.279
Teachers guide learners on what is to be evaluated	377	3.34	1.131	33.821
Teachers don't use test to rank learners but rather to get feedback on what they have taught.	377	3.56	0.993	27.927
Evaluation helps learners to revise what they have learnt in classroom.	377	3.63	1.036	28.506
Assessment tests do not use language that is sensitive and offensive.	377	3.29	1.217	37.036
Tests and examinations cover both cognitive and behavior attitudes.	377	3.29	1.153	35.042
Teachers evaluate what they have taught.	377	3.47	1.185	34.103
Overall Mean Score	377	3.45	1.113	32.351

The research findings presented in Table 1 show that evaluation helps learners to revise what they learnt in classroom had the highest mean score of 3.63. This implies that on average the respondents tended to agree that evaluation that is done in their schools is useful in helping the learners to revise what their teachers have covered in class. The least mean score (3.29) was registered on two parameters (Assessment tests do not use language that is sensitive and offensive and tests and examinations cover both cognitive and behavior attitudes). This implies that on average most respondents indicated that they had no opinion on the two statements. The findings further imply that the responses were neutral, meaning that the respondents could neither agree nor disagree with the given statements. Similarly these results imply that it is not very clear to tell whether the tests and examinations in secondary schools evaluate both cognitive and behavior attitudes of the learners. Information presented in Table 1 indicate that the statement teachers don't just use tests to rank learners but rather to get feedback on what they have taught had a mean score of 3.56. This implies that on average the respondents tended to agree that teachers use the feedback they get through evaluation exercises to improve their teaching. The results further indicate that all the variables in study had close mean scores ranging from 3.29 to 3.63. The results therefore reveal that all the variables under study had moderate agreement with an overall mean score of 3.45 which implies that the responses were ranging between having no opinion and agreeing with the given statements. These results agree with research findings of a study by Hansan (2016) on teaching dispositional strategies which established that if teachers utilize feedback they get about their learners, they can reorganize their content delivery in a way that will assure them of achieving their set objectives.

Afrocentric Evaluation Methods

Information was sought on Afrocentric evaluation methods. The respondents indicated their agreement with given statements and mean and standard deviation were computed. The results are presented in Table 2.

Table 2

Afrocentric Evaluation Methods

	N	Mean	Std. Deviation	CV
Evaluation by observing how the learner works promotes sense of responsibility.	377	4.22	0.806	19.107
Evaluation through participation in what is taught encourages honesty among learners.	377	4.33	0.785	18.117
Evaluating the level of engagement during the learning process promotes integrity.	377	4.27	0.790	18.489
Active involvement in productive work during the learning promotes hard work.	377	4.42	0.740	16.737
Role playing enhances transparency and honesty.	377	4.37	0.743	17.014
Evaluating the character of the learner promotes acceptable social values.	377	4.30	0.768	17.841
Overall Mean Score	377	4.32	0.772	17.884

The research findings in Table 2 indicate that active involvement in productive work during learning promotes hard work had the highest mean score of 4.42 while evaluation by observing how the learner works promotes sense of responsibility had the least mean score of 4.22. This implies that on average, the participants' responses tended toward strongly agreeing. The results therefore imply that most of the respondents believed that involving learners in productive work during learning process can encourage students to work hard. The results in Table 38 also indicate that evaluating by observing how the learners work could promote sense of responsibility had the least mean score mean score of 4.22. This implies that the least responses to the statements were agreeing, implying further that no respondent disagreed with the given statements. The findings also show that for all the variables under study, mean scores were very close ranging from 4.22 to 4.42. Therefore for all the variables in the study, the agreements were high with an overall mean score of 4.32. This implies that on average the responses to all parameters of Afrocentric evaluation methods were above agreeing.

These results agree with Wilmot (2009) on African life and customs who indicated that application of Afrocentric perspectives in schools can improve education system and enhance desired behavior by blending Eurocentric and Afrocentric ideas for the good of African children. The findings also agree with Olaniyan (2006) who established that when emphasis is laid on African cultural traditions, values and symbols of communication, desirable behaviors can be instilled in the learners. Omolewa (2007) on traditional modes of education and their relevance in modern society supports the findings of the current study by asserting that Afrocentric principles in a school system facilitate for a holistic education in which children's home experiences are linked to school learning.

Correlation of Evaluation Methods and Societal Norms

The objective of the current study was to determine the influence of Afrocentric evaluation methods on societal norms among secondary school learners. A correlation analysis was conducted in order to assess the relationships among the research variables. The results are shown in Table 3.

Table 3

Evaluation Methods and Societal Norms

		Societal Norms	Contemporary Evaluation methods	Evaluation Methods
Societal Norms	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	377		
Contemporary Evaluation methods	Pearson Correlation	.436**	1	
	Sig. (2-tailed)	0.000		
	N	377	377	
Integrated Afrocentric Evaluation Methods	Pearson Correlation	.484**	.929**	1
	Sig. (2-tailed)	0.000	0.000	
	N	377	377	377

**. Correlation is significant at the 0.01 level (2-tailed).

The results presented in Table 3 show varied degree of relationship between societal norms, contemporary evaluation methods and integrated Afrocentric evaluation methods. The results indicate that contemporary evaluation methods had a fair positive correlation with societal norms ($r = 0.436$, p-value < 0.01; sig 2-tailed = $0.000 < 0.05$). The research findings further show that integrated Afrocentric evaluation methods had a fair positive correlation with societal norms ($r = 0.484$, p-value < 0.01; sig. 2-tailed = $0.000 < 0.05$). This fair positive correlation therefore implies that integration of Afrocentric evaluation methods into the contemporary school system in Kenya fairly influences societal norms among secondary school learners.

Regression Analysis and Hypothesis Testing

To assess the relationship between evaluation methods and societal norms, the following hypothesis was tested:

H_0: There is no statistically significant influence of Afrocentric evaluation methods on societal norms among secondary school learners in Meru County, Kenya.

In order to test this hypothesis, a linear regression analysis was done at 95% confidence level ($\alpha = 0.05$). The contemporary evaluation methods and the integrated Afrocentric evaluation methods were regressed against societal norms to establish the goodness oft, the overall significance and the individual significance of the Model. The results are presented in Table 4, Table 5 and Table 6.

To establish the percentage of variation in societal norms that is explained by independent variable in the Model, the researcher regressed contemporary evaluation methods and integrated Afrocentric evaluation methods against societal norms. The results are presented in Table 4.

Table 4

The Goodness of Fit of Models

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
Contemporary Evaluation Methods	.436[a]	0.190	0.188	0.53375
Integrated Afrocentric Evaluation Methods	.484[a]	0.234	0.232	0.51919

The information presented in Table 4 shows that contemporary evaluation methods had influence on societal norms among secondary school learners. The coefficient of determination is 0.190. This suggests that 19% of variation in societal norms is explained by current contemporary evaluation methods. The results in Table 4 also indicate that 23.4% of variation in societal norms is explained by integrated Afrocentric evaluation methods. The coefficient of determination is 0.234. Therefore based on these results, the study revealed that integrated evaluation methods contribute significantly towards societal norms.

The researcher conducted analysis of variance in order to assess the robustness and overall significance of the evaluation Model. The results are presented in Table 5.

Table 5

The Overall Significance of the Models

Model		Sum of Squares	df	Mean Square	F	Sig.
Contemporary Evaluation Methods	Regression	25.114	1	25.114	88.154	.000[b]
	Residual	106.832	375	0.285		
	Total	131.946	376			
Integrated Afrocentric Evaluation Methods	Regression	30.861	1	30.861	114.485	.000[b]
	Residual	101.086	375	0.270		
	Total	131.946	376			

The research findings in Table 5 indicate that contemporary evaluation methods significantly influence societal norms with F statistics = 88.154 and a p-value 0.000 < 0.05. This implies that the regression Model is statistically significant at 5% level of significance. The results further show that integrated Afrocentric evaluation methods significantly influence societal norms with F statistics = 114.485 and a p-value 0.000 < 0.05. This also implies that the regression Model is statistically significant at 5% level of significance.

The researcher sought to establish the significance of the individual variables in the evaluation Model. The results are shown in Table 6.

Table 6

Individual Significance of the Model

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
Contemporary Evaluation Methods	(Constant)	2.531	0.145		17.406	0.000
	Contemporary Evaluation methods	0.388	0.041	0.436	9.389	0.000
Integrated Afrocentric Evaluation Methods	(Constant)	1.788	0.197		9.095	0.000
	Integrated Afrocentric Evaluation Methods	0.548	0.051	0.484	10.700	0.000

The results in Table 6 show that contemporary evaluation methods were considered to be statistically significantly significant with t-value of 9.389 and p-value 0.000 < 0.05. This implies that for one unit change in contemporary evaluation methods, societal norms increase by a factor of 0.388. The study further revealed that there exists a statistically significant relationship between integrated Afrocentric evaluation methods and societal norms at 5% level of significance (p-value = 0.000 < 0.05) This implies that for one unit change in integrated Afrocentric evaluation methods, societal norms increase by a factor of 0.548.

The study conclusively revealed that contemporary evaluation methods and integrated Afrocentric evaluation methods influence societal norms at 5% level of significance. The null hypothesis that there is no statistically significant influence of Afrocentric evaluation methods on societal norms among secondary school learners, is not supported in the current study. The predictive Models for societal norms in respect to evaluation methods can be stated as follows:

$Y = 2.531 + 0.388\ X_{11}$ and $Y = 1.788 + 0.548\ X_1$

Where Y = Societal norms

X_{11} = Contemporary evaluation methods

X_1 = Integrated Afrocentric evaluation methods

2.531 and 1.788 are constants

0.388 and 0.548 are regression coefficients.

The current study established that Afrocentric evaluation methods enhance societal norms. This study is in line with a study by Gronlud (2004) on assessment of students' achievements in England which shows that evaluation has numerous benefits

including helping teachers to improve the use of the results in order to align their teaching with desired norms and values. Gronlud (2004) established that an evaluation should guide learners to discover their strengths as well as their areas of need. The findings of this study also agree with Guskey (2003) who found that an evaluation assessment should not be a matter of do-or-die experience to the learners. The study confirmed that evaluation should be an on-going effort to help or guide students to learn values and that an evaluation that enhances societal norms therefore does not condemn learners on the basis of their performance outcome but rather encourages learners to revisit what was intended for them to acquire in class. Guskey (2003) further supports the findings of the current study by arguing that teachers need to be given adequate formal training on how to develop evaluation in forms of quizzes, tests and assignments.

Similar studies by Rogers (2006) on effective student assessment and evaluation in the classroom echo the findings of this study by revealing that learners' behaviors are improved by credible evaluation that guides students to review what they have learnt in the classroom and the desired values and attitudes they are expected to acquire. Similarly the findings of this study are backed by Arrasian (2005) who reveals that an evaluation should not come as a secret to the students, especially at the middle grade levels. Informing students on evaluation time and areas to be covered assists the learner to master of what is to be evaluated and enables them to live according to the desired norms and values. The findings of the current study however disagree with the studies by Perkins and Craig (2006) on a successful social norms campaign to reduce college student drinking which reveal that evaluation methods have negative impact on societal norms because most evaluations strategies are only focused on cognitive skills. The results further agree with Ndambuki, Rono and Frank (2006) who revealed that affirming children after an evaluation exercise promotes good morals.

Conclusions

The findings of the study revealed that Afrocentric evaluation method contributes significantly to enhancement of societal norms at 5% level of significance. The study shows that Afrocentric evaluation methods have significant influence on societal norms. The study indicates that the highest percentage of variation in societal norms in the Model was as a result of integrating Afrocentric evaluation methods into the current Kenyan evaluation methods in school system. A unit change in integrated evaluation methods similarly resulted to the highest increase in societal norms compared to current Kenyan evaluation methods alone. From the results of this study, the researcher therefore concludes that integrating Afrocentric evaluation methods into the current Kenyan evaluation methods would significantly improve societal norms among secondary school learners.

Recommendations

The researcher made the following recommendations:

There is need to integrate Afrocentric evaluation methods into Kenyan school system for maximum enhancement of societal norms.

There is need to sensitize teachers and students on the importance of integration of Afrocentric evaluation methods into Kenyan school system.

References

Alberta Assessment Consortium (2005).*Framework for Students' Assessment* (2nded.). Edmonton AN: Alberta Educational Publishers.

Arrasian, P.W. (2005).*Classroom Assessment*: Concepts and Applications (5thed.). New York: McGraw-Hill.

Gronlud, N. E. (2004). *Assessment of Student Achievement (7thed.).* Boston: Pearson Custom Publishing.

Guskey, T. R. (2003). *How Classroom Assessments Improve Learning*. Alexandria: Educational Leadership Vol. 60 Nr 5 Pg 6-11

Machado, E. A. (2016). *Strategies of Promoting Values in Education*. Retrieved from http://www.coe.int/en/web/Pestalozzi.

Perkins, H. W. & Craig, D. W. (2006). A Successful Social Norms Campaign to Reduce College Student Drinking. *Journal of Studies on Alcohol*. 67. Pp. 868– 879.

Rogers, W. T. (2006). *Effective Student Assessment and Evaluation in the Classroom. Alberta:* Retrieved from http://www.teaching quality.ab.ca/resources.

Sena, E.K. (2006). *Core Curriculum Guide for Strengthening Morals and Values Education in Educational Institutions in Trinidad and Tobago.*Stiggins, R. (2002). Assessment Crisis. The Absence of Assessment for Learning. *Phi Delta Kappen*> 83(10).758-765.

Swanson, M. (2006).*Effective Student Assessment and Evaluation in the Classroom.Alberta:* Retrieved from http://www.teaching quality.ab.ca/ resources.

Influence Of Educational Support On Academic Performance Of Orphans And Vulnerable Children In

Public Primary Schools In Kalama Sub County, Machakos County, Kenya

Kirima Lucy Karimi,

Department of Business and Economics, University of Embu, Kenya

P.O Box 158-60401 Chogoria

Email: mukathakinyua60@gmail.com ,+254720627460

&

Stephen Mbai Maingi

Department of Education, Africa Nazarene University

stephenmaingi@rocketmail.com,+254 7250559943

Abstract

Education gives children hope for life and work, and a strong protector against HIV to which Orphans and Vulnerable Children may be particularly susceptible. Despite the Kenyan government effort in mobilising and supporting community based interventions and ensuring access for Orphans and Vulnerable Children to essential services including but not limited to education, health care, psychosocial support and legal protection, OVC in Machakos County and especially Kalama Sub County have been experiencing challenges in meeting their psychosocial, nutritional, academic and health care needs. The purpose of the study was to establish the influence of educational support on academic performance of OVC in public primary schools in Kalama Sub County in Machakos County, Kenya. The study objectives were to examine the influence of class teacher's individualized support of OVC learning, to assess the influence of the school provision of OVC feeding programme and to establish the influence of teacher's/caregiver cooperation on OVC academic performance in Kalama Sub County. The study was premised on Abraham Maslow hierarchy of needs motivational theory. The study adopted descriptive survey design. The study sampled 36 teachers and 11 head teachers. The study data was collected through class teachers' questionnaire and head teachers interview schedule. Content and construct types of validity were ascertained through scrutiny by a panel of university lecturers. Using test retest technique, teachers; questionnaire was found to have a reliability coefficient of 0.78. Both descriptive and inferential statistics were used to analyze the data. The study's three formulated null hypotheses were analyzed using multiple regression analysis. School provision of OVC feeding programme had the most significant relative contribution to the prediction of pupils' academic performance ($\beta = 0.578$) followed by level of teachers' individualized support ($\beta = 0.452$) while teacher/caregiver's cooperation had the least influence ($\beta = 0.329$). The study recommended that all the School Management Commitees in collaboration with head teachers should be proactive and start income generating programmes in order to support the home grown school food programme in situations when the government stipend is not forthcoming and when it is inadequate. Further, the SMC

should collaborate with local community welfare groups and the larger community in order to extend the food programme to the OVC families.

Key words: Academic Performance, Educational Support, Orphan, Vulnerable children, School Feeding Program, Home-Grown School Feeding

1.0 Introduction

The United Nations Children's Fund (UNICEF) maintains that every child requires basic needs to develop and grow to a healthy and responsible adult (UNICEF, 2016). Parental love, care and protection of a child is very crucial in the early stages of development. The immediate family and environment of a child is critical in determining how that child develops because it is in this environment that they get nurtured, thereby experiencing love and acceptance, a sense of belonging, safety and security as well as developing trust, respect and confidence (UNICEF, 2016). Gaventa and Blauert (2016) decries that vulnerable and disadvantaged group of people are often derided, devalued and unappreciated, albeit indirectly by the larger society. The Orphans and Vulnerable children (OVC) fall in the category of the disadvantaged group.

According to USAID (2008) and UNICEF (2016), an orphan is a child under the age of 18 whose mother (maternal orphan), father (paternal orphan), or both parents (double orphan) have died from any cause. Vulnerable children are defined as children whose safety, well-being or development is at significant risk. Similarly, Traflon (2009) considers a vulnerable child as one who is living in circumstances with high risks and whose prospects for continued growth and development are seriously threatened. This includes children that are emotionally deprived or traumatized. Most of these children lack access to basic needs due to high levels of poverty. Most of the orphans are vulnerable, however not all vulnerable children are orphans.

A study spearheaded by UNICEF (2013) estimated that worldwide, there were about 145 million children between the ages of 0 to 17 years without one or both parents. The situation came about due to sickness, conflict and mishaps. The report further disclosed that globally, 15 million children have become orphaned because of AIDS, with 11.6 million of this because of AIDS in sub-Saharan Africa alone (UNICEF, 2013). As such, national governments, NGOs, international and local stakeholders have recognized the plight of OVC as an issue with economic, social and human right dimensions. Thus, addressing the needs of OVC and mitigation of the living difficulties they encounter has become a priority worldwide.

Rawlings (2003) cited in Musyoka (2016) observes that in the USA, Up to 40% of ninth-grade OVC students in some states repeat ninth grade since their academic skills are found to be insufficient for high school-level work. In New Delhi, India, despite the implementation of the Right to Education (RTE) initiative with increased funding, Harvey and Bailey (2011) noted that nearly one third of the states and union territories have seen an increase in the dropout ratio from 1.2% to 4.3% of OVC in primary education level. In Ghana, the Ghana Demographic and Health Survey (2008) reported that 16.3% of children under the age of 15 have at least one parent dead, 6.6% of children under the age of 15 are not living with either parent and therefore, included in the vulnerable category (Garcia & Moore, 2010).

The OVC in countries with many cases of HIV/AIDS experience discrimination in accessing education and healthcare as orphan hood is associated with HIV/AIDS (Fleming, 2015). Fleming further observes that double and maternal orphans are more prone to failure to access education than paternal orphans. Such orphans lack education related materials and conducive home setting and above all experience financial constraints. Children who head the double orphaned families are often associated with low school participation and chronic absenteeism since they are overburdened with domestic and economic responsibilities (Fleming, 2015).

Afwai (2013) reiterates that the situation of the OVC in Kenya is an issue of concern. In 2013, it was estimated that there are over 3 million Orphans in the country, of which 47 percent were orphaned as a result of HIV and AIDS and many more remain vulnerable due to several other factors. Afwai further notes that the statistics surrounding the rising population and the corresponding increase in children in vulnerable situations depicts a grim future and which requires sustained intervention. For instance, over 25% of the population live on less than $1 per day and 12-15% of households in Kenya are headed by an orphan sibling. These orphans sometimes become antisocial as they undergo trauma due to parents death in a society seemingly impervious to their plight (Afwai, 2013).

HIV and AIDS scourge compounded with high poverty levels has aggravated the situation of OVCs in Kenya. Children affected by HIV/AIDS are vulnerable long before their parents die (Langinger, 2011). Girls, in particular, assume caring responsibilities for their ailing parents besides parenting for their siblings. In some regions of the country, over 25% of orphans are acutely malnourished in a country whose economy is largely driven by agriculture (Munuhe, 2014).

Sloth-Nielsen, (2014) observes that with an economically weakened and overstretched traditional African extended family system that can no longer work effectively to address the high OVC burden, most children find themselves without proper social support with the incapacitation and death of their parents. The future of these children remains very unpredictable. This will deny the OVCs a chance to access their basic needs such as proper health care, education shelter and nutrition. Orphans suffer stigma, stress and trauma in addition to the loss of parental love, care and protection and more often they are disinherited by their next of kin (Kiambi & Mugambi, 2017). Further, OVC are exposed to different forms of abuse and exploitation; physical abuse, defilement, sexual exploitation, child labour, and early marriages while more flock to streets to fend for themselves. This situation diminishes their capacity to participate in matters affecting their lives. Indeed, cases of child abuse have become a common feature in this country with only a few of these being reported to the relevant authorities.

In response to OVC issues, the Kenya government has made strides in ensuring OVC are not only receiving basic education but also their upkeep through cash transfer to their care givers. The OVC response is based in the Kenya OVC Secretariat in the department of children's and gender services of the Ministry of Gender, Children, and Social Development (MOGCSD) (MOGCSD, 2009). Additionally, the multi sector National OVC Steering Committee was established to advise the government on OVC issues in policy, practice, and implementation; and to monitor OVC programming. Members include key ministries such as finance, education, and health; the National AIDS Control Council (NACC); the National AIDS and STI Control Program (NASCOP); and development partners. The steering committee meets regularly to review and advise the government on OVC issues chaired by the Permanent Secretary of the MOGCSD (MOGCSD, 2009).

Pfleiderer and Kantai (2010) observe that in an effort to quantify the OVC situation, the National OVC Steering Committee carried out a Rapid Assessment, Analysis, and Action Planning (RAAAP) Process for OVC in 2004. This eventually led to the development of the National Plan of Action (NPA) for OVC, 2007–2010. The National Plan of Action (NPA) for OVC, 2007–2010 outlines the policies and guidelines on OVC interventions in Kenya (Pfleiderer & Kantai. 2010). The policies and guidelines provide a strategic framework for the OVC response by program developers and implementers. The Kenyan Cash Transfer Programme (CTP) began in 2005 and was mainly funded by the government, the World Bank, the United Kingdom's Department for International Development (DFID), and the United Nations Children's Fund (UNICEF). CTP provides systematic support for OVC by strengthening households to take care of OVC (Pfleiderer & Kantai. 2010).

Musyoka (2016) notes that the U.S.A. President's Emergency Plan for AIDS Relief (PEPFAR) was another major source of funding for OVC and which provided nearly $50 million for OVC in 2010. The fund was used to provide free medical services for children below five years; free primary school, including scholarships for OVC; and legal support for inheritance.

Despite the great effort from both national and international bodies to cater for OVC in Kenya, the aid to OVC has not been sustainable. Furthermore, some aiding projects are susceptible to politics from donor countries and terminate their services when politics change. Such sudden changes in flow of aid has left many OVC more traumatized as they drop from schools, run out of food and lack medical attention (Kiambi & Mugambi, 2017).

2.0 Discussion

School Provision of OVC Feeding Programme and Academic Performance

Santa-Ana-Tellez, DeMaria and Galarraga, (2011) says that school feeding when properly programmed and targeted on the basis of poverty prevalence and food insecurity can not only encourage children to get into school but it can also attract new enrolments from marginalised communities. Further, when combined with food fortification and deworming, school feeding can relieve short-term hunger and tackle micronutrient deficiencies.

In Sub Saharan Africa, an introduction of a free lunch programme in most schools can cause a drastic increase in the number of pupils who attend school (UNICEF, 2016). Due to hard economic conditions and breakdown of traditional social fabric, many children and especially OVC report to school hungry with no hope of getting the next meal. This condition jeopardizes their chances of attaining meaningful education. Not only does education provide a solid foundation for continued learning throughout life, but it is also critically important to children's social integration and psychosocial well-being. Most of the OVC who have a constant school attendance, do regain a sense of normalcy and recover faster from trauma and impacts of their disrupted lives. School provision of feeding to OVC can provide a social safety net which to a great extent address issues of inequity and gender imbalance. Moreover, retaining these children in school, especially girls, can reduce their vulnerability to sexual abuse and exposure to HIV, provide access to vocational training, life skills education and entrepreneurship (UNICEF, 2013).

Teachers' and OVC Caregivers Cooperation and Academic Performance

Krishnan (2010), observes that the family, neighborhood and the school have the most and earliest influence on the child's development. Thus, cooperation between family members or care givers and the school community in providing educational needs for OVC is paramount. In doing so, the OVC educational performance can be enhanced. In addition, constant communication and coordination between the teachers and the OVC care givers can help in creation of optimal home environment for a child to develop physically, psychologically and academically. On the same vein Mwoma and Pillay (2016) proffer that in order for OVC to get adequate support from guardians/parents there is a need for workshops to sensitise them to the need to fully support OVC with school/homework and to supervise their personal hygiene at home.

PEPFAR (2006) notes that strengthening the families and school environment capacity to support OVC is one of the potent measures to enhance OVC academic performance and progress. Krishnan (2010) also pointed out that what happens in a microsystem such as home where a child lives, could influence what happens in the school and vice versa. It is imperative therefore, that capacity building for OVC caregivers on how best to offer educational support by providing an enabling environment such as allowing them time to study and providing the necessary guidance and hope is an option that cannot be overlooked. Class teachers should also make an effort to know and identify with each OVC family and especially the caregiver for close monitoring of OVC welfare. Santa-Ana-Tellez, DeMaria and Galarraga (2011) posit that a social worker attached to school can enhance the link between the teacher and the caregiver. Through various home visits, the social workers can to identify the various needs of OVC alongside the needs of caregivers with a view of identifying the appropriate ways of meeting those needs.

3.0 Methodology

This study adopted descriptive survey research design. According to Machakos County schools census report of 2016, there were 36 public primary schools in Kalama Sub County (MOEST, 2017). The study targeted 36 head teachers and all grade/class seven 46 class teachers. The study purposively sampled 36 class teachers for class seven from the 36 public primary schools. However, simple random sampling was used to select only one class teacher in schools with more than one stream in class seven.The study also aimed at gathering information about OVC by interviewing some head teachers. Kothari (2009) argues that a sample of 30% of the study population is sufficient to give reliable findings leading to valid and informed generalization and conclusion. In line with that view, the study sampled 30% of head teachers for the interview. The 11 head teachers were selected through simple random sampling. Thus the study sample consisted of 36 class teachers and 11 head teachers.

4.0 Results and Discussions

Teachers' individualized support of OVC learning and Academic Performance

The study examined the influence of class teacher's individualized support of OVC learning on their academic performance. To achieve the objective, a set of statements in form of a Likert scale were posed to the respondents to indicate the extent to which they agreed or disagreed with them. The questionnaire responses were coded such that strongly disagree (SD) was rated number 1 while strongly agree (SA) was rated number 5. The mean responses for class teachers were computed such that: a mean

response of above 3.0 was considered as agree while a mean of below 3.0 was considered as disagree. Further, for easier interpretation the responses were collapsed into three columns of Agree (A), Neutral (N) and Disagree (D) as shown in Table 4.1. Table 4.1shows the proportion of teacher respondents in various levels of agreement, the mean and standard deviation.

Table 4. 1: Teachers' Response on Individualized Support accorded to OVC

Statement	A	U	D		
	%	%	%	Mean	SD
I normally invite the OVC individually to review their academic performance	61.1	16.7	22.2	3.8	0.8
I guide the OVC in their class assignments and homework after school	13.9	8.3	77.8	2.4	0.5
I keenly monitor class attendance of the OVC	41.2	19.7	38.9	3.4	1.1
I normally keep some learning materials such as pencils, pens, exercise books and rulers for the OVC who might not be having these items.	25.7	3.6	70.7	2.1	0.6
I normally try to intervene when a child is depressed, sad or angry due to happenings at home or at a school	86.1	8.3	5.6	4.5	0.4
I constantly enquire from the OVC about the living conditions in their homes	77.8	11.1	11.1	3.8	1.2
As the class teacher, I make sure I brief teachers about each OVC with a view to empathize and intervene where possible	41.7	16.7	41.7	3.2	1.2
As a class teacher, I occasionally instruct my class on life skills	36.1	27.8	36.1	3.2	1.4
I have the skills to handle pupils undergoing trauma and shock	27.8	13.9	58.3	2.7	0.9
I have the skills to handle pupils affected by grief and loss	27.8	25	47.2	2.5	0.8
Aggregate Score				**3.2**	**1.0**

N = 36

In reference to Table 4.1, most of the teachers (61.1%) affirmed they normally invite the OVC individually to review their academic performance. This implies that teachers are concerned with the academic progress of OVC in their classes. However, the 22.2% of teachers who disagreed and 16.7% who were undecided, shows that, there was still a considerable number of teachers who were not keen in doing a follow up on the OVC academic work.

Teachers overwhelmingly (77.8%) indicated that they do not guide the OVC in their class assignments and homework after school. This implied that, OVC who lack a conducive environment at home for academic work, were not able to accomplish their

assignments leading to low academic performance. Nevertheless, 41.2% of the teachers affirmed that they keenly monitor class attendance of the OVC showing that were concerned of OVC academic performance and school participation. However, the 58.5% of teachers who disagreed and were undecided was a manifestation of nonchalance attitude assumed by teachers.

The statement that 'I normally keep some learning materials such as pencils, pens, exercise books and rulers for the OVC who might not be having these items' was refuted by 70.7% of teachers. Through the open ended section of questionnaires, some teachers indicated that they were overwhelmed by the number of pupils who required assistance in educational materials such as pens, pencils, rulers, rubbers, geometrical sets and books. It was therefore, safe not to entertain provision of any assistance.

Teachers overwhelmingly (86.1%) affirmed that they normally try to intervene when a child is depressed, sad or angry due to happenings at home or at a school (mean = 4.5, SD = 0.4). This implied that most of the teachers were empathetic towards the tribulations OVC undergo. Teachers' empathy and concern is a virtue which can help identify more pupils who may need to be classified as OVC in order to benefit from the government Cash Transfer Programme. Likewise, teachers overwhelmingly (77.8%), affirmed that they constantly enquire from the OVC about the living conditions in their homes. However, the relatively high standard deviation of 1.2, showed that there were some teachers who indicated that, they do not constantly enquire about the OVC welfare at their homes. Pupils' academic performance is also a function of the conditions at home. Pupils need psychosocial support, material support and spiritual support and constant guidance in order to function well in school.

The statement that 'as the class teacher, I make sure I brief teachers about each OVC with a view to empathize and intervene where possible' was affirmed by 41.7% of teachers and refuted by the same percentage of teachers. This implied that while some teachers embraced team work in handling the issues of OVC, others did not. Just like the multi sector approach adopted by the National government to handle OVC issues, teachers should embrace the team work in assisting OVC. The statement that 'as a class teacher, I occasionally instruct my class on life skills' elicited mixed reactions from the teacher respondents. About 36% of teachers affirmed, 27.8% were undecided while 36% teachers disagreed. This implied that while some teachers were certain that they did teach the life skills, were not sure. Life skills are essential in order for the OVC to overcome the challenges they encounter on daily basis. For instance, as OVC matures, they encounter pressure from peers to engage in sexual activities and use of substance and alcohol. Teachings of Life skills need not be planned and a class teacher advice or a word on how to avoid the common pitfalls in life as they take roll call daily basis, can be of immense help to OVC and other pupils in general.

Over 55% of teachers refuted that they have the skills to handle pupils undergoing trauma and shock. Similarly, 47.2% of teachers refuted that they have the skills to handle pupils affected by grief and loss while 25% were undecided. Therefore, most of the teachers indicated that they lacked the essential skills that are needed to assist OVC overcome the challenges encounter. This finding was affirmed by some head teachers who lamented of the manner in which some teachers handle the OVC. The following comments exemplifies the concern as expressed by the interviewed head teachers:

Some of my teachers are very crude in the manner they handle OVC…some of the pupils undergo very traumatizing experiences especially when they have very sick

people at home…when they perform below expectations or report late to school some teachers are quick to inflict physical pain or mental torture through ridicule in class… it becomes a double tragedy…. (Head teacher one-H1).

Surely, we need to be trained on how to handle pupils who have lost a parent or parents due to AIDS…on one hand the teachers would wish the affected pupils to be carefully handled in order to assist them in healing but on the other hand…much attention on these pupils would end up stigmatizing them…(Head teacher 8).

The number of pupils who need serious guidance and counseling as result of traumatizing experiences encountered at home are on increase in my school…most of the teachers are unable to handle these situations and I think that is why most of them are taking too long to recover….(Head teacher 4)

Such comments from head teachers denotes the lack of teachers' capacity to handle the specialized services required by the OVC. As shown in Table 4.1, overall the aggregate mean of responses was 3.2 with a standard deviation of 1.0. This implied that most of class teachers for grade five in Kalama Sub County accorded the OVC in their school individualized support in learning though to a small extent. The accorded support could have translated to better performance in termly examinations.

School Provision of OVC Lunch Programme and Academic Performance

The study also assessed the influence of the school provision of OVC feeding programme on their academic performance. To achieve the objective, a set of statements in form of a Likert scale were posed to the respondents to indicate the extent to which they agreed or disagreed with them. The questionnaire responses were coded such that strongly disagree (SD) was rated number 1 while strongly agree (SA) was rated number 5. The mean responses for class teachers were computed such that: a mean response of above 3.0 was considered as agree while a mean of below 3.0 was considered as disagree. The analyzed data was summarized in percentages, means and standard deviations (SD) as depicted in Table 4.2

Table 4. 2: Teachers' Response on the School Provision of OVC feeding Programme

Statement	A	U	D		
	%	%	%	Mean	SD
Our school has a sponsored food programme	36.1	5.6	58.3	2.6	0.9
The school has free lunch for all pupils	69.4	2.8	27.8	4.4	0.6
OVC are provided with take home package	13.8	25.0	61.1	2.6	0.8
There is a provision to cater for OVC who may lack supper and breakfast in their homes	22.2	22.2	55.6	2.7	1.0
The food provided in school is a balance diet	36.1	16.7	47.2	3.0	1.1
Our school provides lunch throughout the year	22.2	5.6	69.4	2.5	0.7
The school has food provision for OVC when the school is not in session	13.9	22.2	63.9	2.8	0.8
The school administration is keen on soliciting support for the feeding programme from different stakeholders	44.4	19.4	36.1	3.1	1.1
The school caters for OVC who require special diet	13.8	5.6	80.5	2.4	0.7
Aggregate Score				2.9	0.8

N = 36

In reference to Table 4.2, 58.3% of teacher respondents disagreed that their schools had a sponsored food programme. This implied that though some schools had a sponsor who supplied the food items, others managed without any assistance from sponsors. Incidentally, 69.4% of teachers indicated that their schools had free lunch for all pupils. The interviewed head teachers indicated that most schools in Kalama Sub County had benefitted from the food supply from drought rescue call by the Kenyan government. However, the supply was a seasonal event and could not be relied upon. The statement that 'OVC are provided with take home package' was refuted by 61.1% of the teacher respondents implying that, the free food catered for all pupils for lunch regardless of their social economic status but there was hardly any for OVC to take home. However, in some situations head teachers allowed some to have the same food for supper. One of the head teacher commented:

We sometimes put aside some food though discreetly to cater for OVC in extremely needy situation…especially during end term examinations. The food caters for their supper and sometimes breakfast. It is normally a tricky arrangement because when other pupils and some parents happen to know, the number of pupils who will plead for their desperate cases will be overwhelming big. (Head teacher 11)

Over 45% of teachers refuted that the food provided in their schools was a balanced diet, 16.7% were not sure while 36.1% affirmed. Some teachers argued that, the mixture of maize and beans which was mostly cooked did not qualify to be termed as balanced diet since there were no vitamins. Other teachers were reluctant to commit themselves for the reason that they were not dieticians. One of the head teacher commented:

There was a time we were supplied with a fortified rice…in which all the essentials required by growing children were said to have been in cooperated…however the current batch consists of only maize and beans…and I doubt whether it can adequately cater for a growing child. (Head teacher 5).

Most of the teachers (69.4%) refuted that lunch was provided throughout the year. This implied that the supply of food stuff was not constant in all schools. According to some head teachers, the World Food Program scaled down their supply and which gave way to the Kenyan Home Grown School Meals (HGSM) programme. The programme aimed at acting as a safety net strategy to increase food supply, improve incomes and reduce hunger and malnutrition. The government was expected to grant schools money to pay the local suppliers. However the flow of the expected funds has been erratic and schools are forced to either organize through the school committee or do without lunch programme. The gravity of the situation when the school runs out of supply was captured from one of the head teachers' comment, thus:

I dread the situation when our food store runs dry in the middle of the term…you

notice areal stress among the pupils…some stop coming to school, some become dirty, irritable and general restlessness…it is even worse with OVC, where some seek transfer to other school with running food programme and some leave school for street life…in such situations their academic performance drop drastically…teachers sometimes come together and contribute money to sustain the OVC in grade seven and eight… (Head teacher 6).

The statement that 'the school has food provision for OVC when the school is not in session' was refuted by 63.9% of teachers, 13.9% agreed while 22.2% of teachers were

not sure. This implied that most schools did not have an elaborate arrangement for OVC to continue getting food assistance when the school was not in session. One of the interviewed head teachers noted:

OVC suffer from hunger and lack of supportive environment during the school holidays…this has prompted me to organize for those in grade seven and eight to board in a place nearby the school. The arrangement enables teachers to assist them in both material, psychosocial and academic work. Most of those who board end up performing well in KCPE… (Head teacher 4).

The statement that 'the school administration is keen on soliciting support for the feeding programme from different stakeholders' elicited varied responses from the teacher respondents. While 44.4% of teachers agreed, 19.4% and 36.1% of teachers disagreed (mean = 3.1 and SD = 1.1). The relatively high standard deviation arose from the fact that being an administrative task, most teachers might not have been aware of the efforts made by the administration to solicit support for the food programme. However, the researcher gathered more information from the head teachers. Some head teachers expressed their frustrations in regard to finding a reliable school programme sponsor who would supplement the government funding or fund the programme fully. Further, though some schools management committees had mobilized parents to start food programmes, they often ran into problems due the fact that some parents claimed that education was totally free and hence were reluctant to continue their contributions.

In regard to school catering for OVC who require special diet, majority of teachers (80.5%) indicated to the contrary. Only 13.8% of teachers affirmed. On the same issue, one of the interviewed head teacher commented:

…the issue of a special diet has no place in our school…in the first place we struggle to get whatever is available and when it is not forth coming we stay without…when it is a must that an OVC needs a special diet…we try to connect the affected pupil to a private children's' home. (Head teacher 9).

Overall the teachers mean response on the school provision of food programme as a function of OVC academic performance, was 2.9 with a standard deviation of 0.8. Thus, on average, teachers indicated that the educational support for OVC in terms of food was unsatisfactory and they could not perform to their potential in the prevailing food situation in Kalama Sub County public primary schools.

5.0 Conclusion

Most of the class teachers in Kalama Sub County in Machakos County were not giving OVC the attention that their situation deserved. Apart from showing empathy, teachers should be able guide and counsel and above all instruct on life orientation skills especially after OVC traumatic experience. In addition, OVC need encouragement and guidance in academic work.

School food programmes in Kalama Sub County were found to be erratic in that most were not sustainable. In some schools the programmes collapsed the moment the free food from World Food Programme (WFP) got exhausted prompting massive OVC absenteeism and drop out. Most schools were yet to embrace fully the government initiated home grown school food programme. The School Management Commitees

are expected to take the stewardship of the school food programme where parents are to contribute some funds to make it successful.

REFERENCES

Action for the Rights of Children (ARC) (2009). *ARC resource pack: study material. foundation module 7: Psychosocial support.* Retrieved from http://www.unhcr.org/4c98a5169.pdf.

Abulof, U. (2017). Introduction: Why we need maslow in the twenty-first Century. *Society,* 54 (6): 508. Doi: 10.1007/s12115-017-0198-6

Afwai, F. (2013). *The plight of orphans in Kenya, a perspective of hope children's home.* Retrieved from https://lightuphope.org/the-plight-of-orphans-in-kenya/

Akuma, J. M. (2014). Social protection for Orphaned and Vulnerable Children in Kenya: initiatives, opportunities and challenges. *European Journal of Social Sciences Education and Research, 2(1),* 235-241.

Ayuku, D., Embleton, L. Koech, J. Atwoli, L. (2014). The government of Kenya cash transfer for orphaned and vulnerable children: cross-sectional comparison of household and individual characteristics of those with and without. *BMC International Health and Human Rights.* Retrieved from http://www.biomedcentral.com/1472-698X/14/25

Babbie, E. (2014). *The basics of social research* (6thed.). Belmont, CA: Wadsworth, Cengage Learning

Batra, S. (2013). The psychosocial development of children: Implications for education and society - Erik Erikson in context. *Contemporary Education Dialogue*, 10(2):249-278. doi:10.1177/0973184913485014

Bhattacherjee, P. (2012). *Social sciences research principles, methods and practices.* University of South Florida: Scholar Commons.

Bhargara, M. (2005). *Guidance and Counseling in ECDE.* Nairobi: Longhorn Publishers.

Boen, W. K. (2014). *Selected social factors influencing parental involvement in class seven pupils' homework in public day primary schools of Kaptumo Sub County, Nandi County, Kenya* (Unpublished M. Ed Thesis). Egerton University.

Bronfen, T. (2010). *Evaluation on school feeding programme in Kenya.* Nairobi: Masolapublishers.

Case, R. (2004). *UndestandingOpharns and Vulnarable Children.*Longhorn Publishers.

Chitiyo, M. (2008). *Policy on Opharns and Vulnarable Children and their impacts on social welfare development.* London: Oxford Press.

Chitiyo, M., Changara, D. M., & Chitiyo, G. (2008). Providing psychosocial support to special needs children: A case of orphans and vulnerable children in Zimbabwe. *International Journal of Educational Development*, 28(4):384-392. doi: 10.1016/j.ijedudev.2007.05.009

Ciaraka, M. (2003). *Parental involvement in facilitating the learning process: A case study of standard eight pupils in selected schools of Egoji-Meru, Kenya* (Unpublished M. Ed Project). Kenyatta University.

Cluver, L., & Gardner, F. (2007). Risk and protective factors for psychological wellbeing of children orphaned by AIDS in Cape Town: A qualitative study of children and caregivers' perspectives. *AIDS Care, 19*, 318-25.

Creswell, J. W. (2012). *Educational research: Planning, conducting and evaluating quantitative and qualitative research* (4th ed.), Upper Saddle River. NJ: Merrill

Creswell, J. W. (2014). R*esearch design qualitative, quantitative, and mixed methods approaches* (4th ed). Thousand Oaks, CA: SAGE Publications.

Datta, D. (2009). *Addressing the needs of orphans and vulnerable children: Strengthening ongoing community actions in Nyanza province, Kenya.* The paper presented in the Community Development Journal International Symposium, London.

Filmer, R. (2008). *Aids in Kenya Intervention and Impact (7th Edition).* Nairobi: Ministry

of Health.

Finan, T. (2010). *Impact evaluation of WFP school feeding programmes in Kenya (1999-*

2008). A mixed-methods approach. Rome: WFP

Fleming, K. E. (2015). *Improving access to education for orphans or vulnerable children*

affected by HIV/AIDS. Paper commissioned for the EFA Global Monitoring Report

2015, Education for All 2000-2015: achievements and challenges. UNESCO.

Retrieved from http://unesdoc.unesco.org/images/0023/002324/232423e.pdf

Garcia, M., & Moore, C. (2010). *Cash Transfer Programs: The emerging safety net in Sub-*

Saharan Africa. Africa Human Development, World Bank.

Gaventa, J., & Blauert, J. (2016). *Learning to change by learning from change.* Canada:

International Development Research Center.

Gay, L. R., Mills, G. E., & Airasian, P. (2010). *Educational research: competencies for*

analysis and applications (10th ed.). New Jersey: Pearson Education.

Gomba C, (2012). An Analysis of the effects of climatic change on conflict and peace

building in Sub-Saharan African

Guolang, E. (2010). *Effects of parental involvement in education: A case study of Namibia*

(Unpublished M. Ed Thesis). University of Iceland

Hallfors, D., Cho, H., Rusakaniko, S., Iritani, B., Mapfuno, J. & Helpern, C. (2011).

Supporting adolescent orphan girls to stay in school as HIV risk prevention:

Evidence from a randomized controlled trial in Zimbabwe. *American Journal of*

Public Health, 101(6), 1082-1088. http://dx.doi.org/10.2105/AJPH.2010.300042

Harvey, P., & Bailey, S. (2011*). Good practice review 11: Cash transfer programming in*

emergencies. Humanitarian Practice Network.

Heath, M. A., Donald, D. R., Theron, L. C., & Lyon, L. C., (2014). AIDS in South Africa:

Therapeutic interventions to strengthen resilience among orphans and vulnerable

children. *School Psychology International*, 35(3):309-337. doi:

10.1177/0143034314529912

Kaberere, V., Makewa, T., Muchee, T., & Role, E. (2013). Parental involvement in high and low performing schools in Gasabo District, Rwanda. *Education* Research, 7(7), 34-42.

Kenrick, D. (2010). *Rebuilding Maslow's pyramid on an evolutionary foundation*.

Retrieved from psychologytoday.com/.

Kenrick, D. T., Griskevicius, V., Neuberg, S. L., & Schaller, M. (2010). Renovating the

pyramid of needs: Contemporary extensions built upon ancient foundations.

Perspectives on Psychological Science. 5: 292. doi:10.1177/1745691610369469

Kenya National Bureau of Statistics. (2016). Kenya population and housing census: Population and household distribution by social economic characteristics. *KNBS Publication, 16.*

Kiambi, E. G., & Mugambi, M. M. (2017). Factors influencing performance of orphans

and vulnerable children projects in Imenti North Sub County, Meru County, Kenya.

International Academic Journal of Information Sciences and Project Management,

2(1), 179-196. Retrieved from

http://www.iajournals.org/articles/iajispm_v2_i1_179_196.pd

Kibet, K. P. (2010). *Teacher-parent partnership for enhancing quality in pre-school education: A case study of Uasin Gishu district, Kenya* (Unpublished PhD thesis). Nairobi: Kenyatta University

Kimani, G. N., Kara, A. M., & Njagi, L. W. (2013). Teacher factors influencing Students'

academic achievement in secondary schools in Nyandarua County, Kenya.

International Journal of Education and Research, 1(3), 1-14

Kombo, D., & Tromp, A. (2006). *An introduction proposal and thesis* writing. Kenya: Pauline's Publications Africa.

Kothari, C. R. (2014). *Research methodology: Methods and techniques (3rd ed.).* New Delhi: Wiley Publications.

Kurzinger (2008). *Guidance and Counseling. Teachers Handbook.* London: Oxford Press.

Langinger, N. (2011). School feeding programs in Kenya: Transitioning to a homegrown approach. *Stanford Journal of International Relations, 13(1),* 30-37.

Lekli, L., & Kaloti, E. (2015). Building parent-teacher partnerships as an effective means of fostering pupils' success. *Academic Journal of Interdisciplinary Studies, 4(1),* 101-104.

Magero, M. O. (2012). *Challenges facing vulnerable childrens' participation in public*

primary schools in Kasipul Sub County in Rachuonyo South District,

(Unpublished M. Ed. Thesis). University of Nairobi.

Makungu, P. (2005). *Psychosocial Intervention as a tool for combating Vulnerability*

among Children Orphaned by HIV/AIDS.A Study of Mathare and Gichagi Slums,

Ngong town. Unpublished M.A. Thesis. University of Nairobi.

Effect of Level of Enforcement of Knec Rules and Regulations On The Prevalence Of Examination Malpractice In Public And Private Secondary Schools In Kisii County.

Margaret Nekesa Shibo

Abstract

Examination malpractice in Kenya Certificate of Secondary Education examinations in KisiiCounty has been on the increase despite the strict enforcement of Kenya National Examinations Council (KNEC) rules and regulations that govern the exercise. Thisstudy set out to examine the effect of the level of enforcement of KNEC rules and regulations by invigilators on the prevalence of examination malpractice in Kisii County. This study employed ex post facto and survey research design.The target population comprised of 363 principals, 726 invigilators and 30 examination officers drawn from 317 public and 46 private secondary schools in Kisii County. A sample of 109 principals, 218 invigilators and 10 examination officials was selected through stratified random sampling. The study utilized questionnaires and interview schedules to collect both qualitative and quantitative data. Pearson Correlation Coefficient wascomputed using SPSS to analyze quantitative data.Qualitative data were analyzed thematically;related themes were summarized are reported in prose. The study found that level of enforcement of KNEC rules contributed to the high level of examination malpractice. Pearson correlation results were as follows: Level of enforcement of KNEC rules and regulations ($r = 0.087$; $p = 0.275$). The study recommended that:KNEC should considerengaging in extensive sensitization campaigns aimed at regularly reminding all concerned stakeholders and that,the school management should consider organizing prior assessments to check on compliance levels in respect of the set KNEC rules and regulations.

Key Words: KNEC Rules and Regulations, Examination Malpractice, Kisii County

Introduction

Recent empirical studies show that cheating by secondary school students is prevalent in all four corners of the globe, including such far-flung nations such as Australia, Germany, Costa Rica, Austria, Japan, South Africa and Morocco (Benmansour, 2000).In Africa, examination malpractice is agreat challenge and a great concern to governments across the continents. For instance, in Nigeria, Eynestboi (2013)In Zambia, Maheka (2015) and Dagyenga (2013) observe that examination malpractice is far from being resolved. Studies in Kenya reveal that academic dishonesty is commonplace at both the national and state levels. Cheating during examinations is a widespread practice in Kenya, especially in Kenya Certificate of Secondary Education (KCSE) examinations and Kenya Certificate of Primary Education(KCPE) examinations. The problem with examination malpractice is that students carry along with them this bad practice to other institutions of higher learning such as colleges, universities and polytechnics. The end result is that half-baked students who are not skilled enough to join the job market (KNEC, 2012).This study is carried out in KisiiCounty, because it has the highest number of secondary schools in the country, and it has been the most affected by examination irregularities with the release of KCSE examination every year leading to cancellation of results for the affected candidates. (MoE, 2011).

The World Bank Group (2001) indicates that learners get involved in examination irregularities and malpractice mainly because, success in a public examination can have profound, immediate and long-term impact on a candidate's life. Appropriate assessment preparation activities promote quality, long-term learning. Examinations and assessment bodies over the world should agree that the best way to promote

assessment practices is to help teachers and administrators become aware of what is and is not an acceptable practice (Michigan Department of Education,2005).Kenya National Examination Council (KNEC)Act, cap 225A (1980) states that, any person:

Who gains access to examination materials and knowingly reveals the content, whether orally or in writing, to an unauthorized party, either a candidate or not or

Willing fully and maliciously damages examination materials or

Is not registered to take part in a particular councils' examination but, with intent to impersonate, presents or attempts to take part of an enrolled candidate shall be guilt of an offence and is liable to imprisonment for a term not exceeding twelve months or a fine not exceeding five thousand shillings or both imprisonment and a fine.

The KNEC Act (2012), which was enactedin 2013, provides for stiff penalties for examination offences. Anyone found leaking papers or committing other examination malpractices are liable, upon conviction, to imprisonment for a term not exceeding five years or a fine not exceeding Ksh1 million or both. Furthermore, anyone caught impersonating a candidate risks serving a jail term not exceeding two years or two millionKenya shillings fine, or both. They will also be prohibited from taking an examination conducted by or on behalf of the council for a period not exceeding three years.

In the year 2009,199 examination centreswere involved in examination malpractice across the country, up from 118 centres in the previous year. This shows that the vice has been on the increase. Examination dishonesty, also popularly known as cheating, is a vice that has bedeviled the Kenyan education system for many years. This malpractice not only occurs in primary, but also in secondary school examinations (Nyamwange, Ondima&Onderi, 2013). This vice has been phenomenalin Kisii County(Opiyo, 2015). There have been instances of breaches of KNEC measures, leading to high examination malpractices (KNEC, 2012).

Cases of cheating in national examinations in Kisii County have been reported over the years.For example, in the year 2001, 1.5% of students who sat for KCSE examination were reported to have cheated in the examinations (Opiyo, 2015). In the year 2008, KCSE examinations in Masaba District had 0.56% cases of cheating, second to MigoriDistrict which had 0.79%, while most districts in Nyanza had no cases of cheating (Ministry of Education, Kenya, 2008). In the year 2013, Education Cabinet Secretary, Prof Jacob Kaimenyi, said 3,353 candidates who sat Kenya Certificate of Secondary Education exams in 2013 wouldnot receive their results due to cheating. Siringi (2009), Khaemba (2008) and Republic of Kenya (2008), merely reported examination malpractice but failed to investigate the effects of existing rules and regulations in managing examinations cheating in public and private secondary schools in Kisii County, Kenya. Cheating cases in Kenya between the year 2008 and 2015 were as shown in Table 1.

Table 10: Cases of Examination malpractice in Kenya

Year	Cases	No. of Students
2008	2	218
2009	3	145
2010	3	197
2011	4	58
2012	7	94

2013	3	147
2014	6	241
2015	17	294

Source, MOE (2017)

According to Gibendi (2016), there was a 70% increase in examination malpractice in KCSE 2015 compared to KCSE 2014. Interestingly, Kisii County was among the leading counties in examination malpractice in 2015.In the 2016, KisiiCounty had 1,062under-age candidates,the highest number in the country (MoE, 2017). Registration of underage is in itself a form of examination malpractice.

In spite of KNEC's efforts in tightening rules and regulations in managing KCSE examinations, there is persistent and increasing evidence of examination cheating in Kisii County, especially through collusion, impersonation, and smuggling of pre-prepared information in examination rooms and use of mobile and other electronics devices. It is on this basis that this current study set out to determine the level of enforcement of KNEC rules and regulations by invigilators on the prevalence of examination malpractice in public and private secondary schools in Kisii County, Kenya.

Research Hypotheses

H_{o1}: There is no significant relationship between level of enforcement of KNEC rules and regulations by invigilatorsand examination malpractice among public and private secondary schools in Kisii County.

Scope of the Study

The study focused on the effects of KNEC rules and regulations in managing examination malpractice in public and private secondary schools in Kisii County. The respondents will be invigilators andprincipals in both public and private secondary schools,as well as KNEC officials. The study investigated the phenomenon as represented in the period between 2008 and 2014. The researcher collecteddata from principals, teachers and examination officers from different sub-counties in Kisii Countyto supplement each other for accuracy of the information given by any one party. The data from the principals, teachers and examination officers helped the researcher fill the gaps for each of the study subjects' misinformation.

LITERATURE REVIEW

Why Students Engage in Examination Malpractice

Although many students believe that examination malpractice is wrong, many students still engage in it (Godfrey *et al,* 1998). Research shows that there are personal, institutional, and social reasons why students engage inexamination malpractice (Brimble 2005). Students engage in examination malpractice because they want to pass. Fear of failure is one of the primary reasons for examination malpractice (Sheard*et al,* 2003). Fear of failure could be due to personal factors, like

the time pressure when preparing for examinations (Shraw *et al*, 2007). Schab (1991) shows that some variables motivate students to engage in examination malpractice: fear of failure, too lazy to study, parents demanding good grades, desire to keep up with others, it is easy to engage in examination malpractice and not enough time to study.

Examination Malpractice

A study carried out by Grimes and Rezek (2005) on secondary school students in six transitional economies, Belarus, Croatia, Kyrgyzstan, Lithuania, Russia and Ukraine, along with students in the USA. The results indicated that the most consistentlysignificant determinants were personal beliefs about the ethics and socialacceptability of cheating and various attributes of the classroom environment.With the exceptions of Lithuania and Ukraine, students in each transitionaleconomy had a higher probability of cheating relative to students in the USA,ceteris paribus. The relative differences ranged from 8.9% for Belarus up to17.1% for Croatia. For Russia, the difference was a relatively high 15.4%. The results also showed that a majority of students in each nation feared the punishment ofbeing caught cheating, but many students also believed that cheating was sociallyacceptable behaviour.

Ogunji (2011) observed that from Africa to Europe and to America, the issue of examination malpractice, or academic dishonesty has become a concern for educators. In Zambia, Munachonga (2014) carried out a studyto analyse the causes and effects of examination malpracticeson educational standards, the moral character of those involved and socio-economicperformance from an ethical perspective. The research revealed that examination malpractices were a big problem in Lusaka as they tended to virtually destroy the moral integrity of the persons involved. This results in a society with a corrupt and incompetent future workforce. By distorting the very essence of education, society tended to be more at a loss than a gain in terms of socio-economic performance because, most often, the certificates achieved did not reflect the actual capabilities of the holder.

According to the West African Examination Council (WAEC) (2015), examination malpractices among students are increasing at an alarming rate. According to the exam body, a lot of these malpractices are detected by markers.In Ghana, the BrongAhaforegion alone, about 4,000 students were caught cheating in last year's Senior High Schools final examinations. Having a negligible number of five breaking the examination's rules and regulations, the Upper West Region placed last in the scheme of cheaters.In 2011 the figure jumped to 4,201, and 2012 recorded 3,439 incidences. Also students caught cheating in 2013 stood at 5,653, while in 2014 the entire Ghanaian country recorded a total of 8,051 of examination malpractices, of which 4,000 came from one region. This was quite alarming and this supports the argument that examination malpractices are a common occurrence across Africa.Eynestboi(2013) noted that examination malpractice has become one of the canker worms that have eaten deep into the fabrics of the Nigerian society.

According to a study by Nyamoita and Otieno (2016) examination malpractices have always been there in Kenya.Data in Table 2 gives a summary of the malpracticetrend in the country for some of the years showing the number of students involved in examination malpractices.

Table 11: Examination Malpractice Trend in Kenya

Year	No. of Candidates Affected
2011	2,927
2010	2,393
2009	1,711
2008	1,875
2007	679
2006	375
2005	1,874
2004	1,022
2003	1,265
2002	1,208
2001	2,880

Source, Nyamoita and Otieno, 2016.

In 2000, the candidates involved in examination malpractice in Kenya were 2,880. Nyanzaprovince to which the current Kisii County belongs had 21 centres affected out of 100 centersaffected countrywide. Kisii Central, North Kisii and Kisii South sub counties led in the examinationirregularities during this period according to Saitoti (2001).

Ragaa (2001) added that these subcounties of Kisiihad reported irregularities for five consecutive years.In 2001, a total of 121centres were involved in the examination malpractices in Kenya. Nyanzaprovince had 22 centres affected by the examination malpractice (Nyambala, 2002). In 2002,1,265 candidates were involved in examination malpractices in Kenya with the then Nyanzaprovince having 368 students involved (Ragaa, 2003). In 2003, 1,022 cases of examinationmalpractice were recorded in Kenya with the province having 40 schools involved in examinationmalpractice. The leading sub counties were Kisii Central, Gucha and Kisii North that had 12, 10and eightschools respectively involved in the examination malpractices (Gakunga, 2004).

In 2010, the Education Minister noted that there was a significant decrease in malpractices from1,711 to 534. The minister as well noted that the numbers may appear low when compared to thecandidature but it is a painful experience when results of even one candidate are cancelled due tocheating (Muindi, 2012). Muindi also noted that in 2011, 2,927 candidates in 154 examinationcentres had their results with Kisii County having sevenschools affected by examination malpractice.In 2012 Nyanza province had 32 schools whose examination results were cancelled (Miruka,2013).

Level of Enforcement of KNEC Rules and Regulations by Invigilators and the Prevalence of Examination malpractice

Enforcement of KNEC rulesand regulations is key, if curbing of examination cheating is to materialize. However, it is not clear what the level of enforcement of KNEC rulesand regulations have played in relation to examination cheating. This is not unique to Kenyan situation; it is a global phenomenon. Loock, Govender and Cesare

(2007) in a study titled"Dealing with Examination and Assessment Irregularities in an Era of RapidChange: A South African Judicial perspective"concluded that everyone who participates in the development or implementation of examination and assessment systems has a responsibility in ensuring that it adheres to the requirements of validity, reliability and fairness. In order to maintain public confidence in high stakes examinations in an era of rapid change, educational managers should continuously review the effectiveness of internal control measures including compliance validation and monitoring procedures. Non-compliance should be countered within the framework of the applicable legislation, in a manner that is judicially and constitutionally acceptable.

Njeru (2008) found out that poor invigilation of examinations was found to be a leading factor in examination malpractice. Teachers do not invigilate examinations well but rather spend time marking papers, or reading newspapers or novels. This provides a fertile ground for students to cheat. The study established that there was poor invigilation of examinations in Masaba District schools as some teachers invigilate from outside examination rooms while others sleep in class during the examination period. This gives students the freedom to cheat in the examinations. Poor invigilation of examinations was also found to be a leading factor in examination malpractice. Njeru (2008) in Thika District found that teachers do not invigilate examinations well but rather spend time marking papers, or reading newspapers or novels. This provides a fertile ground for students to cheat. The study established that there was poor invigilation of examinations in Masaba District schools as some teachers invigilate from outside examination rooms while others sleep in class during the examination period. This gives students the freedom to cheat in the examinations.

Studies by Alutu and Aluede (2006) and Kpangban, Ajaja and Umudhe, (2008), indicates that students, parents\guardians, school' management and their staff, Ministry officers and examination officers are all involved in examination malpractice. According to Kpangban, Ajaja and Umudhe (2008), at the secondary level, parents provide the resources, school heads create the enabling environment, teachers do the solving and assist in cheating, Ministry officers and examination body officials cover cheats and write that all is well in centers of interest, students copy freely while supervisors collect gratifications and all forms of inducements.

Some workers in Kenya National Examinations Council have been suspected and accused of leaking out or selling examination papers to selected potential candidates(Iqbal & Khan, 2011). Such suspicion is corroborated by the Ministry of Education's frequent suspension of examination results from some schools at the end of each examination season. A goodnumber of our interviewees accused some university lecturers for the vice. For example, when some lecturers delay giving out results of some students at the end of a semester or alter their marks, this too may be interpreted as an examination malpractice. The magnitude of examination irregularity cannot be underestimated. Hence, the parents, and teachers are apprised of the dangerous practice of cheating and its adverse effects on the moral, intellectual and social development of the youth (Iqbal & Khan, 2011).

Theoretical Framework

This study was guided by the following theories; Regulation theory by Brenner and Glick (1991), Game theory by Hendricks and Hansen, (2007), Ross (2008); and the Agency theory by Mitnick, (1975).

Regulation Theory

According to the regulation theory by Brenner and Glick (1991), public interest can further be described as the best possible allocation of scarce resources for individuals and collective goods. In western economies, the allocation of scarce resources is to a significant extent coordinated by the market mechanism. In theory, it can even bedemonstrated that, under certain circumstances, the allocation of resources by means of the market mechanism is optimal (Arrow, 1985). Because these conditions are frequently not adhered to in practice, the allocation of resources is not optimal and a demand for methods for improving the allocation arises (Bator, 1958). One of the methods of achieving efficiency in the allocation of resources is government regulation (Arrow &Shibuk, 1970). According to this theory, government regulation is the instrument for overcoming the disadvantages of imperfectcompetition, unbalanced market operation, missing markets and undesirable market results.

In Kenya admissions into colleges is determined by the grades one attained in KCSE examinations. The type of college one is admitted in determining the type of course and later employment. Employers too look at college attended to allocate job carriers to our young men and women hence the relevance of this theory, whereby the allocation of resources as far as education level is concerned, that may be the cause of cheating in KCSE examinations. Those who cheat gain advantage over others.Its relevance and foundation stems from the fact that government regulation is needed to ensure that citizens do not take undue advantage and that there is fair play ineconomic and social activities. In this case, exam cheating is not fair play and needsto be regulated.

Agency Theory

Agency theory is a concept that explains why behavior or decisions vary when exhibited by members of a group. Specifically, when it describes the relationship between one party called the principal, that delegates work to another called the agent. It explains their differences in behavior or decisions by noting that the two parties often have different goals and, independent of their respective goals, may have different attitudes towards the risk. The concept originated from the work of Adolf Augustus Berle and Gardiner Coit Means, who were discussing the issues of the agent and principle as early as 1932. Berle and Means explored the concepts of agency and their applications toward the development of large corporations (Mwanza, 2013). They saw how the interests of the directors and managers of a given firm differ from those of the owner of the firm, and used the concepts of agency and principal to explain the origins of those conflicts (Murtishaw&Sathaye, 2006).

Jensen and Meckling shaped the work of Berle and Means in the context of the risk-sharing research popular in the 1960s and '70s to develop agency theory as a formal concept. Jensen and Meckling formed a school of thought arguing that corporations are structured to minimize the costs of getting agents to follow the direction and interests of the principals (Mitnick, 1975).The theory essentially acknowledges that different parties involved in a given situation with the same given goal will have different motivations, and that these different motivations can manifest in divergent ways. It states that there will always be partial goal conflict among parties, efficiency is inseparable from effectiveness, and information will always be somewhat asymmetric between principal and agent. The theory has been successfully applied to myriad disciplines including accounting, economics, politics, finance, marketing, and sociology (Nikkinen&Sahlström, 2004).

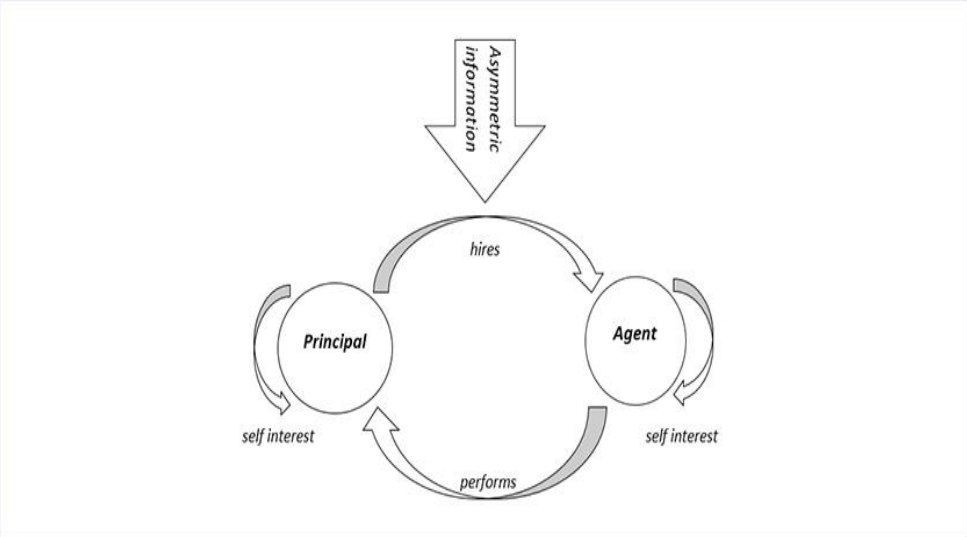


Figure 13: Illustration of Agency Theory

Source: Chelniciuc (2014)

The principals, teachers and invigilators are agents of the government who should protect the interest of the public by ensuring that there is no examination malpractice. However, the interests of the government (public) and the interest of the agents (teachers) differ and the agents take actions that are not in the best interest of the principal (government/public). This is evidenced by corrupted invigilators, mismanagement of human resources (poor remuneration of teachers), poor board oversight in school activities.

Research Methodology

Research Design:A research design establishes procedures to obtain cases for study and to determine how scores was obtained from those cases (Schwab, 2005). The study adopted both survey research design and retrospective ex post facto research design. The merit of *ex post facto* design is that it is useful where simple cause-and-effect relationships are being explored as it is the case in this study. Given the fact that the study also collected qualitative data using interview schedules, survey research design was also adopted to add value to the study. survey research designwas considered ideal, since the study also involved collecting data in order to answer questions about the current status of examination malpractice and related regulatory framework, and used formal instruments to study preferences, attitudes, practices, concerns or interest of a sample. In addition, the researcher was able to gather information regarding the respondent's opinion, perceptions, attitudes and views in a highly economical way.

Location of the Study: The study was carried out in Kisii County, Kenya. Kisii is located east of Nairobi and is approximately 239 kilometres from Nairobi. The secondary schools are distributed in the following sub-counties, KitutuChache North, KitutuChache South, NyaribariMasaba, NyaribariChache, BomachogeBorabu, BomachogeChache, Bobasi, South Mugirango and Bonchari.

Target Population: Kisii County has a total number of 363 secondary schoolsof which 317 were public schools and 46 private secondary schools. The study population

included principals, invigilators and examination officials in Kisii County. This formed the target population (Mugenda&Mugenda, 1999); For the purpose of this study the target population comprised of 363 secondary school principals, 726 invigilators (twoteachers per school, that is, those teachers who participated in the examinations invigilation / supervision exercise) drawn from 317 public and 46 private secondary schools, and 30 examination officials.

Sampling Procedure and Sample Size: The researcher used 30% of the population to arrive at the sample (Gall, Gall & Borg, 2003). Stratified random sampling enabled the researcher to capture the invigilators, examination officers, and principals in two strata, from public and private secondary schools. The researcher got 95 principals, 190 invigilators from public secondary schools and 14 principals and 28 invigilators from private secondary schools.

Research Instruments: The study utilized questionnaires to collect data fromthe principals and invigilators, while interview schedules were used for collection of data from examination officers. Prior to collection of data, the instruments were pilot tested and subjected to validity and reliability.

Data Analysis Methods: Quantitative data was obtained using closed ended questions and was analyzed using descriptive and inferential statistics with Pearson r as a methods for testing relationships. This technique shows the direction and magnitude of the relationship between given variables (Mugenda&Mugenda, 2003).All the variables were tested based on themes and relationships and were meant to supplement each other. The statistical package for social science (SPSS) programmeversion 21 was used to aid in data analysis for quantitatively collected data. Results of the analysis were presented using tables, charts and graphs. Secondary data for schools on examination irregularities at County offices was analyzed using descriptive analysis.

Findings and Discussions

Response Rate: 337 questionnaires were prepared and administered to the Principals, Invigilators, and Examination Officials, 10, 218 and 109 questionnaires respectively. However, 9respondents were not in position to help in filling the questionnaires thus only 328 were completely responded to. This translated to a response return rate of 98%. This was sufficient to enable the researcher come up with reliable conclusions and recommendations.

Demographic Characteristics of the Respondents

Gender:51% of the invigilators, 40% of the examination officials and 68% of the Principals that provided information were male, while 49% of the invigilators,60% of the examination officials and 32% of the Principals were female. The findings show that information provided reflects the views of both gender in respect to the effect of existing KNEC rules and regulations in managing KCSE examination malpractice in public and private secondary schools in Kisii county.

Principals' Working Experience: majority of the principals (83.0%) had served in their current place of work, as principals for a period 3 years or above, while 17.0% of the principals had served for a period of less than 2 years. Having worked in their respective schools for these periods, placed them a position to comment on the schools' efforts in the fight against examination malpractice.

Level of Invigilators Integrity and the Prevalence of Examination malpractice:

The findings in Figure 4 show that 69% of the invigilators indicated that KNEC made arrangements to ensure that Invigilators are trained on integrity to improve the standards of examination, while 31% disagreed. This implied that invigilators were trained well enough to improve standards of examination in KCSE. It also suffices that not all those participating in the invigilation exercise were well trained for this purpose.

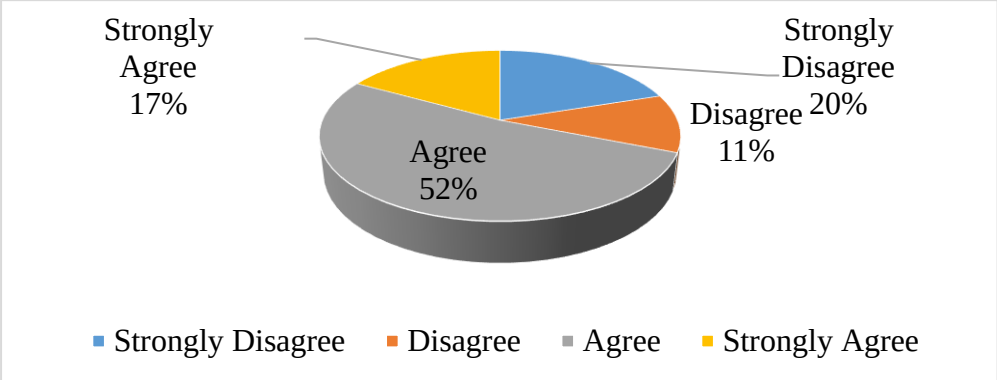


Figure 14: Effect of Invigilators training on Integrity on KNEC rules and regulations

Level of Invigilators Motivation:invigilators were well motivated, hence were committed to ensuring level of enforcement of KNEC rules and regulations for control of examination malpractices. Arguably poor motivation leads poor invigilation. Njeru (2008) found out that poor invigilation of examinations (9.58%) was also found to be a leading factor in examination malpractice. Teachers do not invigilate examinations well but rather spend time marking papers, or reading newspapers or novels.

Kenya National Examinations Council Staff colluding in selling Examination Papers: 76% of the respondents indicated that they did not believe that Kenya National Examinations Council staff colluded with students in selling examination papers to selected potential candidates. On the hand, 24% agreed to this assertion. This implied that most of the invigilators did not think that there was a collusion between students and KNEC staff. However, some did not want to disagree or agree, thus implying that there was collusion to some extent.

Level of enforcement of KNEC rules and regulations on the prevalence of examination malpractice: The study found that despite efforts to train the invigilators the situation of examination malpractice has not changed in Kisii County. Invigilators are motivated well enough to pick up the task of enforcing the KNEC rules and regulations, yet it appears that loopholes still exist in the system. The findings rule out collusion with the school management or teachers with those involved in the malpractices. However, it suffices that KNEC rules and regulations are not enforced to the letter. This could mean that invigilation was not properly done. Past studies link poor invigilation to examination malpractice. According to Badmus (2006),

extraneous variables such as poor working conditions, societal pressures and inadequate remuneration affect the school environment making students vulnerable to examination malpractice given that teachers and support staff lack necessary motivation or incentive to work hard.

Hypothesis Testing

The findings in Table 23 shows that there is a positive correlation between level of enforcement of KNEC rules and regulations and prevalence of examination malpractice at 0.087. This level is higher than the test significance level at 0.05; that is, P < 0.05, thus we reject the null hypothesis. In addition, 0.087 is less than 0.139, the study therefore, accepts the null hypothesis which read that "There is no significant relationship between the level of enforcement of KNEC rules and regulations by invigilators and the prevalence of examination malpractice among public and private secondary schools in Kisii County." The findings show a positive influence of the level of enforcement of KNEC rules and regulations on the prevalence of examination malpractice. This implied that level of enforcement of KNEC rules and regulations did influence the prevalence of examination malpractice in Kisii County. It means that the low level of enforcement of KNEC rules and regulations resulted in high levels of examination malpractice in the County.

Table 12: Pearson Correlation between Level of Examination malpractice and level of enforcement of KNEC rules and regulations

		Level of Examination malpractice	Level of enforcement of KNEC rules and regulations
Level of Examination malpractice	Pearson Correlation	1	.087
	Sig. (2-tailed)		.275
	N	212	212
Level of enforcement of KNEC rules and regulations	Pearson Correlation	.087	1
	Sig. (2-tailed)	.275	
	N	212	212

a = 0.05; df = 212, P < 0.05; Critical r = 0.139

KNEC Officials View on Level of Enforcement of KNEC Rules and Regulations by Invigilators:KNEC officials that were interviewed using interview schedules indicated that they were taking examination irregularities more seriously and if the council finds sufficient evidence linking any head teacher or deputy head teacher to examination fraud they shall take action. Interestingly almost all (8 out of 9 examination officers) respondents believed that the level of enforcement of the KNEC rules and regulations.For instance, respondent 5 stated as follows: *"The level of enforcement of KNEC rules and regulations in the school I invigilated inwas to the required standard."* According to the officers continued examination malpractices could not be blamed on the level of enforcement of KNEC rules and regulations by invigilators.

This was not the same view with the 9th respondent (examination officers) who indicated that he did not believe that the enforcement of KNEC Rules and regulations by invigilators in Kisii County carried out as required and suggested that more efforts need to be put in place that the level of enforcement of these rules and regulations is enhanced. 9th Respondent *"In some instances, there is laxity, given that, some of the invigilators do not take their work seriously"*

The arguments by the KNEC officials are contrary to an earlier study by Njeru (2008) who found out that poor invigilation of examinations was found to be a leading factor in examination malpractice. According to Njeru, teachers do not invigilate examinations well but rather spend time marking papers, or reading newspapers or novels. This provides a fertile ground for students to cheat.Njeruargued that examination malpracticewas a function of lack of seriousness on the part of the invigilators.

Conclusion of the Study

The study concludes that the level of laxity in the enforcement of KNEC rules and regulations by invigilators to a large extent had a negative effect on the prevalence of examination malpractice in the County.The study found that despite efforts to train the invigilators the situation of examination malpractice has not changed in Kisii County. Invigilators are motivated well enough to pick up the task of enforcing the KNEC rules and regulations, yet it appears thatloopholes still exist in the system. The findings rule out collusion with the school management or teachers with those involved in the malpractices. However, it suffices that KNEC rules and regulationsare not enforced to the letter. This could mean that invigilation was not properly done. Past studies link poor invigilation to examination malpractice. For instance, Njeru (2008) found out that poor invigilation of examinations was found to be a leading factor in examination malpractice. Teachers do not invigilate examinations well but rather spend time marking papers, or reading newspapers or novels. Perhaps the problem here would be whether invigilators are performing their tasks diligently. The irony would be in cases of examination leakages periods before examination, but then if the KNEC rules and regulations are enforced to the letter, this can be checked. There are still malpractices that the KNEC system has not been able to detect. Low level of enforcement of KNEC rules and regulations by invigilators could be due to collusion between invigilators and students. This is an aspect that needs to be investigated by KNEC.

Recommendations

The study recommends the following:

KNEC should engage in extensive sensitization campaigns, aimed at regularly reminding all concerned stakeholders; principals, teachers, invigilators, and parents of the consequences of examination malpractice. Joint school talks can be organized by KNEC officials. Other means of sensitization approaches can be adopted for instance the media and social gatherings.

The schoolsBoard of Management through the Ministry of Education should consider organizing prior assessments to check on compliance levels in respect of the set KNEC rules and regulations.These assessmentsshould be done within a reasonable period before examinationsto form four students, at the beginning of the examination year.

Examination malpractice methods are constantly undergoing changes with the changing technologies, therefore, KNEC should consider mobilizing resources for carrying out investigative surveys (research) on the exact nature and causes of examination malpractices. There is need to explore through empirical research behaviour characteristics that lead to dishonesty and dealing with anxiety so as to come up with measures that can help reduce elements of these, more so, student groups prone to cheating such as the lower achievers. Worse still, these take on a regional dimension.

Suggestions for Further Studies

While carrying out this study, certain issues emerged. Since such issues did not fall entirely within the spectrum of this study. The researcher suggests as follows:The study sought to examine the effect of level of enforcement of KNEC rules and regulations on the prevalence of examination malpractice in public and private secondary schools in Kisii County. The study did not examine the challenges facing the various stakeholders in enforcement of KNEC rules and regulations. Questions remain unanswered as to whether there are any difficulties experienced and how this can be addressed.A study to examine the challenges faced by various stakeholdersin enforcing KNEC rules and regulations for managing examination malpractice in public and private secondary schools in Kisii County.

References

Arrow, K. J. (1985). Issues in Contemporary Microeconomics and Welfare.inFeiwel, G.R. (ed.).*The Potentials and Limits of the Market in Resource Allocation*',London; The Macmillan Press.

Arrow, K.J. (1970).*The Organization of Economic Activity: Issues Pertinent to theChoice of Market Versus Nonmarket Allocation*', in Haveman, Robert H. andMargolis, Julius (eds), Public Expenditure and Policy Analysis, Chicago, Rand MacNally College Publishing Company, 67-81.

Bator, F. M. (1958). The Anatomy of Market Failure.*Quarterly Journal of Economics,* 75, 351-379.

Benmansour, N. (2000). Motivation, Satisfaction, Success Attributions and Cheatingamong High School Students in Morocco', Mediterranean *Journal ofEducational Studies, 52,* pp. 83–102.

Brenner. R.,& Glick M. (1991).*The Regulation approach: Theory and history.* New leaf review vol 188.

Chelniciuc, A. (2014).*What Does the Agency Theory Refer to?*retrieved on 11th October, 2016 at http://www.performancemagazine.org/what-does-the-agency-theory-refer-to-2/

Dagyenga, M. (2013). *Time to make our Polytechnics Purely Technological Institutes.* Retrieved from http://www.modernghana.com/news/478399/1/time-to-make-our polytechnics-purely technological.

Eynestboi,O. (2013). *Penalty for Examination Malpractice in Nigeria.* Retrieved October 30 from

http://www.nairaland.com/142619/cheat-waec-examinations-wassce-get.

Gakunga, A. (2004, March 3). *Cases of Cheating Reduced.* Kenya Times, p. 11.

Gibendi, R. (2016). *KCSE 2015: Relief to schools with exam cheating cases.* Retrieved on 18th February, 2016 from https://www.tuko.co.ke/102051-kcse-2015-new-rules-hand-lifeline-schools-exam-cheating-cases.html#102051

Godfrey, J; R. & Waugh, R. F. (1998). The perceptions of students from religious schools about academic dishonesty. *Issues in Educational Research, 8(2), 95-116*

Grimes, P. W., &Rezek, J. P. (2005). The Determinants of Cheating by High SchoolEconomics Students: A Comparative study of Academic Dishonesty in the Transitional Economies.*International Review of Economics Education,4 (2),*23-45.

Hendricks, V., & Hansen, P. (2007). Game Theory: 5 Questions*. Automatic Press.Information Systems Audit and Control Association (ISACA).* Irregularitiesand illegal acts. Illinois. USA.

Iqbal,K. L., Muhammad, J., &Khan, J.(2011). Socio-economic Status of Students andMalpractices used in Examination in Urban areas of District Peshawar.*European Journal of Scientific Research, Vol. 49 (4),* pp.601-609.

KNEC (2006).*KCSE Examination Report: Top 50 KCSE schools per province*, Nairobi: Government Printers.

Maheka, G. (2015).*Nature and Causes of Examination Malpractices in Selected Secondary Schools in Kitwe District, Zambia*. The University of Zambia

Michigan Department of Education (2005).*Professional Assessment andAccountability practices for Educators.* Michigan Department of Education.

Mitnick.B., M. (1975). The Theory of Agency.*Public Choice.Vol 24, (1)*pp 27-42

Ministry of Education, (2011). *Use of Mobile Phones during Examinations.* MOE/CON/G111/41/5 Nairobi: Government Printers

MOE (2001).*Report of the Task Force of Students Discipline and Unrest in SecondarySchools*. Nairobi: Government Printer.

Munachonga, M. (2014).*An Ethical Evaluation of the Causes and Effects of Examination Malpractices in Zambia: A Case Study of Selected Schools in Lusaka District.* The University of Zambia.

Murtishaw, S., &Sathaye,J. (2006).*Quantifying the Effect of the Principal-AgentProblem on US Residential Energy Use.LBNL-59773.* Berkeley, Calif.:Lawrence Berkeley National Laboratoryhttp://ies.lbl.gov/iespubs/59773Rev.pdf

Nikkinen, J.&Sahlström,P. (2004). Does Agency Theory Provide a GeneralFramework for Audit Pricing?*International Journal of Auditing 8(3),* pp 253–262.

Nyambala, M. (2002, February 26).*Irregularities reported.* East African Standard,p.4.

Nyamoita, G. &Otieno, K. (2016). Effectiveness of Kenya National Examinations Council Measures inCurbing National Examination Malpractices in Public SecondarySchools in Kisii County. *International Journal of scientific research and management (IJSRM). 4, (2), 3882-3907.*

Nyamwange, C., Ondima, P., &Onderi P. O. (2013).*Factors Influencing Examination malpractice Among Secondary School Students: A Case of Masaba South Districtof Kisii County, Kenya.* Elixir Psychology, vol56, 13519-13524

Ogunji, J. (2011). Examination Managementand Examination Malpractice: The Nexus. *Journal of International Education Research – Fourth Quarter Volume 7, Number 4, 53 -64.*

Ragaa, R. (2001, February 28).*Irregularities detected in 100 centres.* Kenya Times,p. 10.

Ross, D. (2008).*Classical game theory, socialization and the rationalization ofconventions*. Topoi, 27: 57–72.

Ross, D. (2008). Game Theory. *The Stanford Encyclopedia of Philosophy*. Edward N. Zalta (ed.). Retrieved -08-21

Schwab, D. (2005).*Research Methods for Organizational Studies* (2nd Ed). London, United Kingdom: Lawrence Erlbaum Associates.

Siringi, S. (2009).*Over 60% of college and University students admit to Cheating inschool examinations.* The Standard Newspapers. PP. 23-25.

The World Bank Group. (2001). *Public examination system: Topics-Malpractice.The World Bank Group.*2001.http://www.worldbank.org.education/exams/malpractice/asp.

E-Learning: The Emerging Technologies In Instruction

Dr. Mercy Wanja Njagi

Department of Education

Chuka University

Kenya.

ABSTRACT

The digital revolution has triggered huge changes in how learners access, consume, discuss and share knowledge. E-learning encompasses a wide variety of online initiatives including utilizing electronic technologies to access educational curriculum. E-learning is being adopted as an additional method in the educational process for it extends and enrich the learning opportunities hence it is necessary for instructional designers to discover innovative ways to make e-learning more effective for learners. The e-learning is a more modern, efficient and flexible alternative thus there is need to shift to it. The researcher used mixed-method analysis of research articles to find out available and valid information on e-learning. Thus researcher conducted an extensive literature review to collect the communicable knowledge on e-learning from various sources where e-learning is analysed and discussed such as books and book chapters related to e-learning, academic and scientific journals and open virtual spaces by recognized authors. The paper reveals vital information on definitions of e-learning from the field of education and information and communication technology, myths and facts about e-learning, goals of e-learning, potential benefits and demerits of e-learning. The paper is designed to provide practitioners, instructional designers, researchers and policy makers with some insights about e- learning. The recommendations are drawn highlighting areas that academic scholars and researchers can do further research to increase the effectiveness and scalability of e-learning. It should be acknowledged that the information is by no means exhaustive but rather a starting point for critical and informative discussion on e-learning.

Keywords: e-learning, Online Education, Electronic Technologies.

INTRODUCTION

In recent decades, the use of Information and Communication Technologies (ICT) for educational purposes has increased and the spread of network technologies has caused e-learning practices to evolve significantly (Kahiigi, Ekenberg, Hansson, Tusubira, & Danielson, 2008). The concept of e-learning and society are in state of constant flux so e-learning can be expected to continuously evolve. It is also subject to constant change since it is understood from many angles and used with different meanings in the scientific community (Stein, Shephard & Harris, 2011).

E-learning provides an ideal learning environment through the effective adoption of modern Information Technology (IT) and the curriculum to achieve a new learning style which can fully

reflect the main role of the students to thoroughly reform the traditional teaching structure and the essence of education, to train large numbers of high quality personnel (Ma, Wang, & Liang, 2008). In order to keep pace with the changing trends, educational systems all around the world are in the process of integrating ICTs to enhance the learning experience of students (Qureshi, Ilyas, Yasmin and Whitty, 2012). New and latest technologies are providing new ways for knowledge generation and to develop, enhance and expand learning activities (Michau, Gentil and Barrault, 2001). Hence adopting and adapting to the new technology is necessary for everyone in society and in particular in the educational context (Collis & Moonen, 2005).

E-learning has been developed to cost-effectively provide auxiliary and improved learning experiences beyond those available in the classroom (Anderson & McCormick, 2005). E-learning expands the learning opportunities of students who are time limited, live in remote communities, and/or have work or family commitments or other barriers that prevent them from attending a traditional classroom learning environment. Thus students facing economic, family, physical or geographic constraints can take advantage of e-learning opportunities. Also e-learning enables tutors to invest in more innovative teaching, whereas students are active in their own learning thus bridging the gap between the learner and facilitator, which help to improve the teaching methods and reduce pressure on resources (Makokha & Mutisya, 2016).

E-learning represents an innovative shift in the field of learning, providing rapid access to specific knowledge and information. It provides opportunities for students to complete the course content at their own pace by being flexible and time-friendly because it can adapt to varying schedules, timings and even physiological challenges and disabilities that a learner might face in life. Online educational courses can be taken up by office goers and housewives too, at the time that suits them (Gupta, 2017). E-learning also offers online instruction that can be delivered anytime and anywhere through a wide range of electronic learning solutions such as Web-based courseware, online discussion groups, live virtual classes, video and audio streaming, Webchat, online simulations, and virtual mentoring (Nagararajan & Jiji, 2010).

DEFINITIONS OF E- LEARNING

Due to the existence of different perspectives on the concept of e-learning it has been difficult to devise an all inclusive definition of e-learning. In this paper the definition of e-learning adopted are communication oriented and education driven. Guri-Rosenblit (2005) defined e-learning as the use of electronic media for a variety of learning purposes that range from add-on functions in conventional classrooms to full substitution from the face-to-face meetings by online encounters. This implies using any electronic educational applications and processes to deliver learning and training programs to aid acquisition and development of knowledge, skills and attitudes among learners. The set of electronic educational applications and processes include computer based learning, web-based learning, computer-aided instruction, virtual classrooms and digital collaboration.

Gonzalez-Videgaray (2007) defined e-learning as learning that is based on information and technologies with pedagogical interaction between students and the instructors or among students through the web. Also Lee and Lee (2006) described e-learning as an online education defined as the self-paced or real-time delivery of training and education over the internet to an end-user device. While Meredith and Newton (2003) defined e-learning as learning facilitated by internet and world wide web technologies, delivered via end-user computing that creates connectivity between people and information and creates opportunities for social learning approaches. E- learning includes the delivery of content inform of text, audio, images, animation

and streaming video via internet, intranet/extranet (LAN/WAN), audio and videotape, satellite broadcast, interactive TV, CD-ROM and more.

According to Jereb and Smitex (2006), e-learning refers to educational processes that utilise ICT to mediate synchronous as well as asynchronous learning and teaching activities. The e-learning environment can be divided into two categories synchronous and asynchronous depending on the tools and technologies involved. Synchronous e-learning require students and instructors to be online and involves studies through any learning tool that is real-time such as chat, webcasts, videoconferencing, teleconferences, instant messaging and podcasts. This allows students to easily interact and share with fellow students and their instructors during the course. Asynchronous mode allows all participants to post communications to any other participant over the internet (Algahtani, 2011). Asynchronous e-learning involves use of e-mails, web, discussion boards, social networking (blogs, YouTube, wikis and others) and messages. It is a key component of flexible e-learning since the learners can access information at any time and so it has no scheduling conflicts.

MYTHS AND FACTS ABOUT E-LEARNING

E-learning has been surrounded by several myths. The myths and misconceptions have led to several people criticizing the quality, viability and authenticity of e-learning. The common myths should then be busted and the real facts about e-learning exposed.

Myth 1: Getting an online degree or academic certificate is taking the easy way.

Fact: The e-learning format is more flexible but that does not make the coursework any less rigorous. Most online courses feature the same content and requirements as traditional courses and so to earn an academic certificate online is as challenging as doing it through traditional courses (Vos, 2016). It takes a serious student with a lot of self-discipline and time management skills to succeed in an online program. Students in e-learning courses must be more engaged because the responsibility is on students to attend and interact. E-learners are set up to be more active because they have made the choice to show up to their gadgets for the class even when no one is formally taking attendance. E-learning is not the lazy way out for it involves rigorous reading, writing and research assignments that require substantial time commitment and dedication. E-learning can also be quite labor intensive, requiring at least as much time as an on-campus course (Williams, 2015). It may offer a more flexible time commitment but the student must be fully engaged in the learning process in order to succeed. Students opt for e-learning because of flexibility, reduced cost, the ability to work while learning and not because it is the easy way out.

Myth 2: E-learning is isolating, lonely and unsocial giving solitary experience.

Fact: E-learners have the opportunity to interact with people from all over the world. E-learning can include social elements that let learners interact with others, collaborate, brainstorm and feel connected (Gutierrez, 2016). Teachers and students continue to interact through the additional channels of communication provided by e-learning technologies. E-learning presents an opportunity to create an interactive learning experience where the learner actively participates in his or her educational experience. The e-learning mode of interactivity provides learners with opportunity to explore and discover the learning themselves. Also use of interactive designs makes e-learning not only engaging for the users but valuable as a lesson delivery

medium. In fact they have access to a highly personalized *learning* as they are able to have one-on-one interactions with teachers and fellow *students* through the internet. They can join clubs, groups and take part in online activities (Felton, 2013).

Myth 3: E-learners do not learn much through e-learning.

Fact: There is no significant difference in learning between traditional and e-learning since both hold to the same academic standards. E-learning classes are exact replicas of the traditional face-to-face syllabus. The tasks to be done in e-learning (essays to write, exams to pass and other assignments to accomplish) are of the same amount as in traditional courses (Vos, 2016). Students who embark on an e-learning class can receive the same instructions as traditional students. The quality of the curriculum is directly related to the instructor who put it together. The method of delivery does not affect its quality in any way. E-learning courses have the same tools for measuring success as a traditional classroom.

Myth 4: E-learning is just for the millennial implying it is designed for certain type of learners.

Fact: E-learning is for anyone, anywhere, anytime. E-learning has inimitable design and so all demographics can utilize e-learning resources. Not only tech savvy or technologically advanced *students* can take up **e-learning** but all *students* who have a basic knowledge of the computer may be able to enroll for **e-learning** (Felton, 2013). E-learning courses can be personalized and designed with a content specific material for the learner (tailored to learners needs). No one is left behind. E-learning is designed intuitively to make it user-friendly as possible in that all learners should be able to execute it with little or no trouble.

Myth 5: E-learning is just about technology.

Fact: The ultimate objective for e-learning is to impart learning. Technology is not the focus but exists only to aid the learning process as an enabler. The content determines how effective and appealing an e-learning course is. It is the content that addresses "why" and "what" to learn. Technology is about "how" to deliver the learning (Gutierrez, 2016). The students focus on what they want to accomplish in the course.

Myth 6: With e-learning there is no need for an instructor anymore for it replaces the teachers.

Fact: The instructors roles are extremely demanding since their roles changes, expand and diversifies. The instructors need to balance organizational, didactic (traditional teaching) and facilitation roles. The instructor is expected to facilitate e-learning sessions, provide coaching, take part in online discussions manage courses by organizing and formatting instructional material to suit independent study and digital delivery and provide feedback on work submitted by learners over video, chats and emails (Gutierrez, 2016). E-learning allows instructors to spend less time on basic knowledge and skill development and also make them communicate differently, thinking about engagement and effectiveness of their work.

Myth 7: E-learning moves too quickly to understand and process the information.

Fact: A lot of e-learning is about slowing down the learning process, giving participants time and space to reflect on interactions. E-learning gives learners the chance to absorb and retain

information at their own pace since it will provide the opportunity to stop, pause, or replay (Foutz, 2015).

GOALS OF E-LEARNING

The major goals of e-learning are improving access for both traditional-age and nontraditional students who are not otherwise able to attend a traditional, campus-based program and improving student choice over when, where, and how to engage in the learning process; and improving efficiency and effectiveness by using e-learning media and methods to control cost or provide other efficiencies or to make large-enrollment courses more effective for students (Mayadas, Miller, & Sener, 2015). The Other goals include the following: to reduce the need for classroom training, to track employee progress, to track training effectiveness (or absorption), to link training with knowledge management, to reduce time away from the job, to improve job performance, to improve flexibility of course delivery and to reduce learning costs (Nagararajan & Jiji, 2010).

BENEFITS OF E-LEARNING

E-learning is more convenient and flexible with respect to time and place for it can be delivered virtually anywhere and anytime (real-time access). Smedley (2010), notes that the adoption of e-learning provides the institutions as well as their students or learners the much flexibility of time and place of delivery or receipt of learning information. The learners have freedom to learn conveniently, advance at their own pace and the learning sessions are available all time. A remarkable feature that only e-learning can provide for is that it is self-paced in that it gives the learners a chance to speed up or slow down as necessary. E-learning therefore increases satisfaction and decreases stress (Algahtani, 2011) for it is accessible and can be done in short chunks of time that can fit into learners' schedule. The learners also may review course material as often as needed in that they can access the content an unlimited number of times (Gupta, 2017). Thus learners have control over their learning process and can better understand the material. Students can customize the course material as per their own needs (Fioriello, 2018) in that they can read materials online or download them for studying later. The learners have options to choose instructor-led or self-study courses and even the materials they like or enjoy to study. Thus e-learning allows learners to access material when needed and study at their own preferred pace without the stress of missing important information (Roy & Raymond, 2005).

E-learning can be tailor-made to suit the learners' level of proficiency and needs. Students have multiple learning styles for they have differences in cognitive, physiological, cultural and learning preferences. E-learning as a mode of study takes into consideration the individual learners differences (Arkorful & Abaidoo, 2014) in that it accommodates learners' preferences hence it is student-centred. The learners may use tools best suited to their learning styles. The variety of delivery methods used to reach different types of learners facilitates high retention in students as compared to traditional classroom. The instructors can also build different learning paths into their courses to provide learners with a more personalized experience.

E-learning has no boundaries and is unrestricted. This is because e-learning is not constrained by geographical considerations and time zones thus open up broader education options. Learners can learn in remote locations without physical attendance and distance is no longer a barrier to learning. E-learning simplifies the learning process greatly, allowing students from all over the world to complete courses created by world's best universities (Nolan, 2017). Delivery through

E-learning allows for portability of the training like use of tablet, i-pad, laptop and mobile phones which makes the learning convenient and on-the-go (Wong & Sixl-Danieli, 2017). E-learning facilitates learning without having to organize when and where everyone who is interested in a course can be present. The learners are unbound by place so they can study at home, work or anywhere (they can access their courses no matter where they are) implying that with e-learning there is increased reach to education. With e-learning culture and nationality is no longer a barrier because the instructors can customize the courses to address different cultures in various languages making the content travel all round the world and reach the widest possible audience. This also benefits native students too, allowing them to communicate and study along with people coming from different cultures (Nolan, 2017).

E-learning is cost effective thus the costs of learning and development are drastically reduced. E-learning reduces the need for a campus site and the accompanying costs of maintaining the facilities and equipments. The travel and accommodation expenses associated with undertaking a course are cut down hence e-learning is a cheaper option. E-learning also eliminates the cost and inconveniences of getting instructor and learners in the same place (Fioriello,2018) Teachers do not have to pay for classroom rentals, travel fees, or printing costs since e-learning activities take place online (Stoeva, 2018). A lot of training time is reduced with respect to trainers, travel, course materials, and accommodation (Gupta, 2017). There is low delivery cost since once the material is developed and uploaded online it has no expiry date and could be utilized anywhere by numerous learners worldwide (Allen, 2011) and this leads to scalability of E-learning. Also with a good Learning Management System (LMS) or Massive Open Online Course (MOOC), expert knowledge can be communicated to and captured effectively by an unlimited number of learners supported by interactive user forums and communities, while updated content and information can be disseminated quickly and cost effectively (Wong & Sixl-Danieli, 2017).

E-learning is delivered with speed and ease thus there is faster delivery of content and learners get courses when they need them. According to Kearsley (2005), e-learning reduces learning time by at least 25 to 60 percent when compared to traditional learning. There is reduced time for training in e-learning because it does not take as long to roll out a learning session. Through e-learning objectives can be accomplished in the shortest time with least amount of effort (Rabah, 2005). Also learners can focus and concentrate on components of a courses they need to learn and can skip what they already know (Andrew, 2010). In other words, students can customize the course material as per their own needs and have an option to choose what they like and retrieve information when required. Learning online enables the learner to access updated content whenever they want it (Gupta, 2017). The students get fresh, consistent content and immediate access to the most current data since the instructors can update lessons and materials in the entire network instantly. In e-learning there is deep learning since the learners are required to critically engage with the bundles of information available online which induces active and deep learning rather than surface learning (Johns, 2003).

The practical benefits of e-learning to teachers can be measured in terms of time-based efforts, workload reduction, ability to track the submission of digital assignments, and reuse or reconstruct a course (Yupangco, 2018). E-learning is a channel and tool through which teachers can improve their teaching styles and focus their energies on pedagogical functionality. E-learning platforms allow teachers to stay connected to their students outside of school hours in order to exchange resources, videos, ideas, methodologies, and pedagogical practices (Stoeva, 2018). Also e-learning is flexible for it offers a variety of schedules and times for asynchronous and synchronous learning and combines a huge variety of different resources such as videos,

texts, presentations, and quizzes in that it gives teachers the opportunity to adapt their teaching methods to the learning styles of their students. The teachers also have ability to automate marking, digitally issue tests and quizzes, and track student progress with reporting tools and analytics makes the education landscape a more accommodating and innovative industry that puts students first (Yupangco, 2018).

Teachers can be innovative and creative since the use of new technologies gives them the freedom to experiment in their teaching practice and have the ability to make changes if something doesn't work. The online platforms are accessible all the time so they allow teachers to develop and create their materials whenever they want to and according to their schedules. E-learning enables educators to get a higher degree of coverage to communicate the message in a consistent way for their target audience (Gupta, 2017) which ensures that all learners receive the same type of training with this learning mode. The teaching materials can be reviewed by instructors as many times as needed to suit the learners' needs. Online platforms allow teachers to support their students outside the classroom where they do not have much time together in that teachers have the opportunity to lead students to success both during and after school hours. E-learning mode allows teachers to receive constant and real-time feedback from their students and colleagues so the mode can be said to be efficient.

An e-learning platform is one of the channels that educators can use to deepen their knowledge and increase their skills so it can provide for **lifelong learning** for teachers. Thus through e-learning instructors can improve their professional development. Also using a variety of online resources for an online training it provokes and develops the creative thinking processes of educators (Stoeva, 2018). E-learning helps to build **a community** since online platforms allow educators to stay connected with colleagues from all over the world, as well as to share ideas and gain inspiration. Aspiring teachers can use e-learning platform to assess their subject knowledge, create a roadmap and enhance their interactivity (Anderson, 2018).

SHORTCOMINGS OF E-LEARNING

One of the disadvantages of e-learning is that practical skills that require hands-on experience are somewhat harder to acquire from online resources. Therefore, e-learning may be less appropriate in fields or discipline that need to develop practical skills (Arkorful & Abaidoo, 2014). With e-learning there is less face-to-face interaction and some learners may feel a sense of isolation. According to Arkorful and Abaidoo, (2014) e-learning as a method of education makes some learners undergo contemplation, remoteness, as well as lack of interaction or relation. E-learning is a solo act for the most part, which may give the learner the feeling that they are acting completely alone and do not have the support and reassurance that the physical presence of an instructor provides. Even though, according to Wong and Sixl-Danieli (2017), this can be overcome with the increased use of synchronous tools in the e-learning environment.

E-learning requires learners to be self disciplined since their progress may not be closely monitored in order for them to perform. Being able to learn at a comfortable pace and organize their learning on their own is a disaster for some students (Nolan, 2017). It can be challenging for some students to stay engaged and motivated in an online class. The learners may also lack control over their e-learning experience and just go through the material without paying any sufficient attention. Learners with low motivation tend to fall behind when using e-learning as there are no fixed schedule or routine to carry out various activities and so there may be danger of procrastination leading to difficulties to complete the studies successfully. E-learning also

leads to devaluation of oral discourse/discussion practices due to lack of face-time between students and teachers.

CONCLUSION

Although there are several myths and misconceptions, e-learning is an emerging technology that we cannot wish away because it has wide set of benefits such as making learning flexible, more accessible, provide just in time learning, cost effective, faster and not restricted geographically as it removes time, place and situation barriers. E-learning also provides for increased interaction amongst learners, offers greater accountability as some platforms can monitor students' activities and participation and is also very effective in supporting life-long learning. E-learning represents an innovative way in the field of learning that provides rapid access of specific knowledge and information as needed by learners who could be working or restricted by other factors to attend traditional type of instruction. The manpower requires to keep abreast with required knowledge, abilities and technology trends which improve effectiveness in service delivery. Therefore, e-learning is a potential alternative and innovative mode of learning and a technology whose time has come.

RECOMMENDATIONS

E-learning is becoming increasingly viable and accessible for educational purposes and it is not a technology that is passing away thus more studies need to be carried out to explore the future of e-learning in order to improve the chances of successful e-learning adoption. There is also need to explore the digital and knowledge environment in which e-learning can be designed and delivered optimally. Research could be conducted to provide feedback to facilitate necessary revisions and keep improving the e-learning. Effective usage of e-learning tools and technologies used in e-learning should be investigated to provide tips to produce great results by decreasing costs and improving performance. The functionality of e-learning platforms could also be explored to find out how they impact on learning in order to increase the effectiveness of e-learning. Studies could also be carried out to find out the concerns of students, the issues of absenteeism, completion rate and dropout rate in relation to e-learning, in order to improve the educational perspectives of e-learning.

REFERENCES

Algahtani, A.F. (2011). *Evaluating the Effectiveness of the E-learning Experience in some Universities in Saudi Arabia from Male Students' Perceptions*, Durham theses, Durham University.

Allen, M. W. (2011). *Michael Allen's 2012 e-learning Annual* (Vol. 54). John Wiley & Sons.

Anderson, K. (2018). Why e-learning is Beneficial for Aspiring Teachers. Retrieved from http://edtechreview.in/e-learning/3148-why-e-learning-is-beneficial-for-aspiring-teachers

Anderson, J. & McCormick, R. (2005). *Ten Pedagogic Principles for e-learning*. Insight–Observatory for new technologies and education, Brussels, Retrieved from

http://www.xplora.org/ww/en/pub/insight/thematic_dossiers/articles/quality_criteria/equality2.htm

Andrew, B. (2010). E-learning Featured, Instructional Design Resources.

Adrich, C. (2004). *Simulations and the Future of Learning*. San Francisco: Pfeiffer.

Arkorful, V. & Abaidoo, N. (2014). The Role of e-learning, the Advantages and Disadvantages of its Adoption in Higher Education. *International Journal of Education and Research* **2 (12):** 397-410

Collis, B. A., & Moonen, J. (2005). *An On-going Journey: Technology as a Learning Workbench.* Public address, University of Twente, Enschede, The Netherlands. Retrieved from http://www.BettyCollisJefMoonen.nl/rb.htm

Felton, J. (2013). *Myths And Realities Surrounding Online Learning*. Retrieved from https://elearningindustry.com/elearning-authors/jan-felton

Fioriello, P. (2018). 14 Advantages of E-Learning. Retrieved from https://drpfconsults.com/14-advantages-of-e-learning/

Foutz, J. (2015). *5 Common E-learning Myths Debunked*. Retrieved from http://elearningbrothers.com/5-common-elearning-myths-debunked/

González-Videgaray, M. (2007). Evaluación de la reacción de alumnos y docentes en un modelo mixto de aprendizaje para educación superior. *RELIEVE, 13*(1). Retrieved from http://www.uv.es/RELIEVE/v13n1/RELIEVEv13n1_4.htm.

Gupta, S. (2017). 9 Benefits Of E-learning For Students. E-iearning Industry. Retrieved from https://elearningindustry.com/9-benefits-of-elearning-for-students

Guri-Rosenblit, S.,(2005). 'Distance Education' and 'e-learning', Not the same thing. *Higher Education 49 (4), 467-493.*

Gutierrez, K. (2016). *What's True and What's Not: 6 eLearning Myths Busted*. Retrieved from http://info.shiftelearning.com/blog/elearning-myths-busted

Nolan, R.. (2017). Advantages and Disadvantages of E-learning Technologies for Students. Retrieved from https://www.joomlalms.com/blog/guest-posts/elearning-advantages-disadvantages.html

Jereb, E., & Smitek, B., (2006). Applying Multimedia Instructions in e-learning. *Innovations in Education and Teaching International,* **43 (1):** 15-27.

Johns, R. (2003). Application of Web-based Learning in Teaching Social Work Law. *Social Work Education,* **22(5):** 429–443.

Kahiigi, E.K., Ekenberg, L., Hansson, H., Tusubira, F. F. & Danielson, M.,(2008). Exploring the e-learning State of Art. *The Electronic Journal of Learning* **6 (2):** 77-88.

Kearsley, G. (Ed.) (2005). *Online Learning: Personal Reflections of the Transformation of Education.* Englewood Cliffs, NJ, Educational Technology Publications.

Lee, T. & Lee, J. (2006). Quality Assurance of Web-based e-learning for Statistical Education. COMPSTAT: *Proceeding in Computational Statistics: 17th Symposium,* Rome.

Makokha, G. L. & Mutisya, D. N.(2016). Status of E-Learning in Public Universities in Kenya. International Review of Research in Open and Distributed Learning **17(3):**

Ma, X., Wang, R., & Liang, J. (2008). The e-learning System Model Based on Affective Computing. *In Proceedings of the Seventh International Conference on Web-based Learning. College of Computer and Information Engineering,* Tianjin University, China.

Mayadas, F., Miller, G. & Sener, J (2015). Definitions of E-Learning Courses and Programs Version 2.0. Retrieved from **https://onlinelearningconsortium.org/updated-e-learning-definitions-2/**

Meredith, S. & Newton, B. (2003). Models of eLearning: Technology Promise vs Learner Needs Literature Review, *The International Journal of Management Education,* **3(3):** 43-56.

Michau, F., Gentil, S. & Barrault, M. (2001). Expected Benefits of Web-based Learning for Engineering Education: Examples in Control Engineering. *European Journal of Engineering Education,* **26(2):** 151-168.

Nagarajan, P. & Jiji, G.W. (2010). Online Educational System (e-learning). *International Journal of u- and e- Service, Science and Technology,* **3(4):** 37-48.

Qureshi, I.A., Ilyas, K., Yasmin, R. & Whitty M. (2012). Challenges of Implementing e-learning in a Pakistani University. *International Journal of Knowledge Management & E-learning* **4(3):** 310–324.

Rabah, M. (2005). *E-learning,* Jordan: Dar Almnahej Publisher.

Roy, A. & Raymond, L. (2005). e-Learning in Support of SMEs: Pipe dream or reality. *Proceedings of 5th European Conference on E-Learning (pp. 283).*

Smedley, J. K. (2010). Modelling the Impact of Knowledge Management using Technology. *OR*

Insight (2010) **23:** 233–250.

Stein, S. J., Shephard, K., & Harris, I., (2011). Conceptions of e-learning and Professional Development for e-learning held by Tertiary Educators in New Zealand. *British Journal of Education Technology,* **42(1):** 145-165.

Stoeva, Z. (2018). What are the Benefits of e-learning for Teachers. VEDAMO Virtual Classroom. Retrieved from https://www.vedamo.com/knowledge/benefits-of-e-learning-for-teachers/

Vos, L. J. (2016). *7 Dirty Myths about e-learning Students still Believe*. Retrieved from https:// elearning industry.com/7-myths-about-elearning

Williams, T. (2015). *7 Myths About Online Education*. Retrieved from https://www.usnews.com/education/online-education/articles/2015/03/09/7-myths-about-online-education

Wong, A. & Sixl-Danieli, K. (2017 The Importance of e-Learning as a Teaching and Learning Approach in Emerging Markets. International Journal of Advanced Corporate Learning 10 (1) 45-54

Yupangco, J. (2018). Top 5 Benefits of Online Learning for Teachers. Retrieved from https://blog.lambdasolutions.net/top-5-benefits-of-online-learning-for-teachers.

An Investigation On Student-Teachers' Acquisition Of New Knowledge During Teaching Practice Exercise. A Case Study Of University Of Embu.

Dr Milcah Nyaga

University of Embu

Box 6-60100 Embu

0721543259

milcahnyaga1@gmail.com

Abstract

Teaching practice gives student -teachers an opportunity to apply theoretical knowledge into practical knowledge. The student- teacher is able to interact with school administration, teachers and learners as well as non- teaching staff. The study investigated student –teachers' acquisition of new knowledge during teaching practice exercise. A descriptive survey design was employed. The respondents were one hundred and sixty and they were randomly selected from four hundred and ninety-five student-teachers. The instruments for data collection were student's questionnaire, interview schedule and researcher's observation schedules. The data was analysed through descriptive statistics. The findings revealed that some student-teachers acquired new knowledge on professional ethics in teaching career while other student-teachers acquired new knowledge of interacting with school administration, teachers and learners as well as non-teaching staff. In addition, the study reported that the student- teachers acquired knowledge on how to cope with different personalities while other student- teachers acquired soft skills. Further, the study indicated that some student- teachers acquired knowledge on innovations and improvisation of teaching learning resources while other student-teachers sharpened their knowledge in co-curriculum activities. Therefore, the study recommended that all student-teachers should actively be involved in teaching practice exercise. Further, the study recommended that proper induction for student -teachers proceeding for teaching practice exercise is paramount. Moreover, the schools providing attachment to student -teachers need to provide conducive environment. The findings from this study will help universities and colleges when preparing student -teachers for teaching practice.

Key words: Student- teachers, Knowledge, Teaching practice, Acquisition, Learners.

1.1 Background

Teaching practice is mandatory for all student -teachers pursuing education profession in Kenya. The student- teachers are exposed to real teaching –learning environment. Mostly the exercise is conducted in a classroom set up, though the teacher can still conduct it outside classroom such as field trips and visiting the surrounding environment. This helps the student -teachers to embrace different teaching methodology (Oluloagemi, 2010). Therefore, adequate induction needs to be done before the teaching practice commences. According to Darling- Hammond et

al, (2017), student-teachers who were exposed to classroom management, emerging technology and use of relevant teaching-learning resources as well as learner centred methodology usually became effective teachers. Ronfeldt et al (2015) argued that classroom management is key for effective teaching and achieving expected outcomes. In addition, Solheim et al (2018) reported that classroom management is a vital pedagogical skill since it helps a teacher to effectively deliver content. Further, Solheim (2017) observed that the teacher develops proficiency skills and mastery of new knowledge. Therefore, according to Muraina (2017) student-teachers need to observe experienced teachers in classroom teaching. This might help them to correct mistakes as well as strengthening their strong skills. It is also equally important for assessors to give student- teachers constructive criticism as well as positive reinforcement. According to Kiggundu &Naymulill, (2009) most student- teachers were usually motivated in the teaching profession due to acquisition of different skills. Further, during teaching practice student-teachers participate in school activities such as attending staff meetings, participating in co-curriculum activities, marking learners' assignment and examinations as well as classroom management and being on duty. In addition, Quick & Sieborger (2005) observed that teaching practice exposes student-teachers to real teaching world and contextualise their theoretical knowledge to practical knowledge. It is against this background that prompted the researcher to carry out an investigation on student-teachers' acquisition of new knowledge during teaching practice exercise.

1.2 Statement of the Problem

Teaching practice is mandatory for all student -teachers pursuing Bachelor of Education in Kenya as their profession. Teaching practice gives student- teachers an opportunity to apply theoretical knowledge into practical knowledge. The student- teacher is able to interact with school administration, teachers and learners as well as professional documents from Teacher service commission (TSC). Health interaction results to acquisition of new knowledge which might help in gaining a positive attitude towards teaching career. Therefore, student- teachers need to prepare adequately for teaching practice exercise. This will help them to gain necessary skills which will prepare them to be effective teachers. Due to Kenyan examination system which is examination oriented, the learners usually focus on high grades during assessment. Therefore, forgetting that they are supposed to gain skills which will help them to be effective teachers. This has prompted the researcher to investigate student –teachers' new knowledge acquisition during teaching practice exercise.

This helps the teacher to gain skills in preparing professional documents and interpersonal relationship with learners and other members in the school.

1.3 Objectives of the Study

The study was guided by the following objectives:

To investigate the knowledge acquired by student- teachers during teaching practice exercise

To establish the extent of knowledge acquired by student- teachers during teaching practice exercise

1.3 Significance of the Study

The study findings will be useful to student -teachers, teachers, school and university administration and assessors. Therefore, the study will reveal new skills acquired by student-teachers during teaching practice exercise. The knowledge gained will help student-teachers to make teaching practice as practical as possible by being involved with various activities in school.

2.1 Methodology of the Study

The study adopted descriptive survey research design to investigate the knowledge acquired by student- teachers during teaching practice exercise. The respondents were student-teachers from University of Embu who carried out their teaching practice in May- August 2018 and principals of teaching practice schools. The sample consisted of one hundred and sixty student-teachers who were randomly selected from four hundred and ninety five student- teachers. Data collection was done through student's questionnaire, interview schedule and researcher's observation schedules. The data was thematically analysed.

3.0 Discussion and findings of the study

3.1: To Investigate the Knowledge Acquired by Student- Teachers during Teaching Practice Exercise.

The study sought to investigate the knowledge acquired by student- teachers during teaching practice exercise. The study revealed that 47.1% of the student- teachers reported that they gained new knowledge in professional ethics while 22.4% of the student- teachers indicated that they gained new knowledge in interacting with learners. In addition, the study revealed that 20 % of the student- teachers observed that they gained new knowledge in interacting with teachers and Non-teaching staff while 7.1 % of the student- teachers observed that they gained new skills through team work. Further, the study indicated that 3.5 % of the student- teachers observed that they gained new knowledge in preparing teaching resources. It is interesting to note that most student -teachers gained new knowledge in social life. Therefore, during induction the student can be inducted on how to interact and work with people.

3.2 To Establish the Extent of Knowledge Acquired by Student- Teachers during Teaching Practice Exercise

The study sought to establish the extent to which of knowledge is acquired by student-teachers on professional ethics, interacting with learners, teachers and non-teaching staff besides preparing teaching resources during teaching practice exercise.

3.2.1 To Investigate New Knowledge gained in Professional Ethics

The study revealed that out of 47.1% of the student- teachers that indicated that they gained new knowledge in professional ethics, 51.6% of the student- teachers gained the new knowledge in time management, commitment, organisation of professional documents as well as increasing their confidence. On the other hand, 25.8% of the student- teachers gained the new knowledge in delivering content by integrating different pedagogical skills. In addition, 22.6% of the student- teachers gained the new knowledge in having a positive attitude towards teaching

profession. Through teachers code of ethics, the student teacher gained new knowledge in maintaining professional distance with learners and also through to professional dress code. Moreover, the student-teachers learnt new methods of behaviour modifications while dealing with indiscipline learners. Over and above, the student- teachers were able to understand the importance of TSC code of ethics. It is noteworthy to note that, majority of student- teachers were able to gain positive attitude towards teaching career.

3.2.2 To Investigate New Knowledge gained in Interacting with Learners

The study revealed that out of 22.4% of the student- teachers that indicated that they gained new knowledge in interacting with learners 52.2% of the student- teachers reported that they were able to interact and associate with learners with individual differences. This helped them to prepare remedial lessons for weak learners and giving more work to bright learners. They also reported that they were able to vary teaching methodology depending on the ability of learners. The study indicated that student-teachers gained skills on how to make the lesson learner-centred by involving learners through discussions, role play and group work as well as class experiment. Moreover, 47.8% of the student- teachers reported that they gained skills on decision making while handling indiscipline learners as well as guidance and counselling sessions. The study observed that student-teachers gained skills on handling big classes as well as small classes. This helped them to build health relationship with learners and to prepare in order to handle different classes. The findings supported Solheim et al (2018) who reported that classroom management is a vital pedagogical skill since it helps a teacher to effectively deliver content. It is clear from this study that majority of student - teachers understood that though learners are in the same class they are usually very different.

3.2.3 To Investigate New Knowledge gained in Interacting with Teachers and Non-Teaching Staff

The study observed that out of 20% of the student- teachers that indicated that they gained new knowledge in interacting with teachers and Non-teaching staff, majority indicated that they gained soft skills such as patience, cooperation and team work as well as integrity, commitment and decision making. It is interesting to note that student- teachers learnt that it is important to apply team work at all times since it usually gives the best outcome. In addition, the student-teachers learnt that soft skills are very important in life. The findings supported Muraina (2017) who observed student-teachers need to observe experienced teachers in classroom teaching. This might help them to correct mistakes as well as strengthening their strong skills.

3.2.4 To Investigate New Knowledge gained in Team Work.

The study indicated that out of 7.1 % of the student- teachers who gained new skills in team work 50% of the student- teachers expressed that team work is key in performance of any school. On the other hand, 20 % of student- teachers indicated that team work require cooperation from administration, learners and non-teaching staff. In addition, 18% of student- teachers argued that they will start applying team work in their daily today life while 12% of student- teachers established that team work gives the best results. The findings supported Kiggundu &Naymulill, (2009) who indicated that most student- teachers were usually motivated in the teaching profession due to acquisition of different skills. Further, during teaching practice student-teachers participate in school activities such as attending staff meetings, participating in co-curriculum activities, marking learners' assignment and examinations as well as classroom

management and being on duty. It is important therefore to note that team work is a pedagogical skill in producing the best results.

3.2.5 To Investigate New Knowledge gained in Preparing Teaching Resources

The study reported that out of 3.5 % of the student- teachers who gained new knowledge in preparing teaching resources, 60% of the student- teachers reported that relevant teaching-learning resources helped the learners to understand the concept being taught and also enhance active participation by learners. In addition, 40 % of the student- teachers observed that relevant teaching-learning resources brought reality of the concept being taught as well as assisting them to demonstrate ideas effectively. This findings supported Darling- Hammond et al, (2017) who reported that student-teachers who were exposed to classroom management, emerging technology and use of relevant teaching-learning resources as well as learner centred methodology usually became effective teachers. It is important to note that the student- teachers learnt that learners can contribute in making and gathering teaching-learning resources. The student- teachers reported that surrounding environment is easily available teaching-learning resource

4.1 Conclusion of the Study

Teaching practice helps the student-teachers to acquire skills which are beneficial in teaching career. During the exercise the student-teachers were able to practice theories and principles of education. The student-teachers gained knowledge on: TSC professional ethics, interaction with learners and teachers, importance of teaching learning resources and skills to handle different personalities. It is evident from the study that student-teachers gained soft skills which are very important in teaching career. It is noteworthy to note that most students discovered that secondary schools syllabus has changed and also discipline of student has deteriorated as compared to when they were in school. From the findings of this study, teaching practice need to provide experiential learning which will help student-teachers to acquire different skills which are useful for effective teaching.

5.1 Recommendations of the Study

Based on the findings of the study, the following recommendations were made:

Effective induction for student- teachers proceeding for teaching practice exercises would help them to prepare for the exercise.

The teaching practice schools to provide conducive environment for student-teachers during teaching practice period.

Student-teachers should be actively involved in schools activities

The student-teachers need to be assessed and given feedback by the assessors on how to improve on the weak areas

The universities should ensure that assessors are qualified and knowledgeable on issues of teaching practice.

REFERENCES

Darting Hammond, L., Hyler,M.E., & Gardener M. (2017). Effective Teacher Professional Development.

Ksenia, S., (2017).Importance of Teacher learning for students achievement.Centre for learning environment University of Stawanger

Kiggundu., Naymolill, S., (2009). Teaching practice:a make or break phase for student teachers .South Africa Journal of Education 29:3

.Muraina, M..B. (2017).Teaching practice exercise and classroom performance of ideal teachers in public secondary schools in Kwara state,Nigeria.Teacher Educational and Curriculum Studies Vol.1,no.2,2016 pg 49-53 dol:10.11648/j.tecs.20160102.15

Ronfelt,M., Farmer,S. O., MCQueen,k., Grissa,J.A. (2015). Teacher collaboration in instructional terms and student achievement. American Educational Research Journal ,52(3) 475-514

Solheim,K., Ertrsuag,S.K., Berg, G.D., (2018). How teachers can improve their classroom interaction with students,new findings from teachers themselves. Journal of Educational Change,1-28.

Kenyan Curriculum and Self-reliance: A Decolonizing Perspective

Authors: Murungi, J. M., Njoki Wane and Muthaa, G.M

Chuka University, Department of Education. P.O Box 109-60400, CHUKA.

Corresponding Author email: jamesmwenda11@gmail.com

Abstract

Education is meant to develop capacity and enable members of society to become productive. African indigenous education systems inculcated self-reliance among members of society and every individual had a specific defined role within the society. The colonial education system introduced the aspects of unemployment, underemployment and job seekers. In an effort to address growing mismatch between expectations by graduates and societal employment provisions, the government has regularly formed commissions and made reforms in the education system. Despite these efforts there has been growing concerns on the effectiveness of the current education system to inculcate self-reliance among graduates. This study sought to establish the influence of decolonizing the Kenyan education system on self-reliance among students. The study was carried out in universities in Kenya. This study utilized the descriptive survey design and the correlational research design. A sample size of 384 respondents made up of 60 members of teaching faculty and 324 fourth year bachelor of education students was selected to participate in the study. Data collection was done using questionnaires and interview schedules. Descriptive statistics was used for measures of central tendencies including mean, standard deviation and coefficient of variation. Inferential statistics through correlation analysis using the Pearson's coefficient of correlation was applied to measure the degree of influence of decolonizing curriculum on self-reliance. To test hypothesis, simple linear and multiple regression models were used to test significance between independent and dependent variable. Qualitative data from interviews was organized into themes, categories and patterns pertinent to the study. The study found that the contemporary Kenyan curriculum influenced self-reliance to a moderate extent and that integration of selected elements of African indigenous curriculum was capable of improving the Kenyan curriculum to a large extent. It was concluded that decolonizing curriculum had a statistically significant relationship with self-reliance among students in the Kenyan education system

Key words: self-reliance, decolonization, curriculum, indigenous knowledge, integrating, anti-colonial

Introduction

The proponents of the 8-4-4 systems argued that it was relevant for the needs of the nation or it would meet the national demands for self-employment and self-reliance (Ambaa, 2015). The school curriculum adopted for 8-4-4 included learning opportunities which were meant to enable pupils to acquire a suitable basic foundation for the world of work in the context of economic and manpower needs of the nation, and to appreciate and respect the dignity of labor (Eshiwani 1993). To achieve the stated objectives, three subjects were emphasized as being of special importance: Art and Craft, Agriculture and Home Science. Art and Craft education featured content areas such as collage and mosaic, drawings, paintings, graphic design, clay and pottery, leatherwork, modeling and carving; fabric design, puppetry, wood work and metalwork. Learners in these courses were expected to produce functional and aesthetically appealing articles (Ambaa, 2015). Ideally, pupils were supposed to use the acquired knowledge and skills in order to design, implement and control small scale projects that would provide opportunities for self-reliance for both the learner and other members of the community (Eshiwani, 1993)

Other subjects introduced through 8-4-4 with the aim of training pupils for self-reliance were Agriculture and Home science. In Agriculture the learner was expected to acquire practical skills such as growing of vegetables, learning about domestic animals; poultry and bee keeping,

making farm tools and caring for the soil and the environment (Eshiwani, 1993). Home science, which the syllabus defines as the study of home and family living within the environment, was designed to develop and apply knowledge, skills, principles and attitudes which would help the leaner to relate better to the social and economic realities of the community and the country (Ambaa, 2015). Its specific objectives were to give pupils basic knowledge useful in promoting the welfare of the home and family and setting standards for community living. The subject comprised three areas of learning namely, home management, clothing and textiles and food and nutrition while business education was meant to equip learners with entrepreneurship skills. However, these subjects were eventually given less prominence in the primary school curriculum remaining only as non-examinable subjects at this level (Karanja, 2008).

Various studies have been carried out examining the 8-4-4 education system with regard to its goal of producing self-reliant individuals for the Kenyan society. Ambaa (2015) observed that while the 8-4-4 system curriculum allowed for more options in technical and vocational subjects, it experienced serious shortages or lack of essential resources and facilities and the local communities could not be mobilized to provide the facilities required. This is also emphasized by Amutabi (2003) who noted that that 8-4-4 encountered numerous challenges such as lack of involvement of relevant stakeholders, infrastructures such as classrooms, workshops, curriculum, trained personnel, literature and pedagogy. This indicates that the goal of training graduates for self-reliance through introduction of a vocational oriented curriculum was bound to fail since the new curriculum required many facilities for practical subjects such as art and craft, agriculture, music and home science which were not available. Kenya has continued to grapple with the problem of production of graduates and school leavers who lack the basic capacity to be self-reliant and live their lives independently. There is growing economic dependency among the youth of Kenya.

Kenya started the process of overhauling its education system for the first time in 32 years in January 2018. The 8-4-4 system of education that the country has been operating on and whose guiding philosophy was education for self-reliance will gradually be replaced by the competency based 2-6-6-3 curriculum. Part of the reasons behind this huge overhaul is the realisation that Kenya isn't doing enough to produce school-leavers who are ready for the world of work (Sifuna, 2016). The government's own assessments have showed that the current system isn't flexible. It struggles to respond to individual pupils' strengths and weaknesses. The Kenya Institute of Education produced an evaluation report about the 8-4-4 system in 2008 which identified several weaknesses with the system of education: It found that the system was very academic and examination oriented; the curriculum was overloaded; most schools were not able to equip their pupils with practical skills and many teachers also weren't sufficiently trained (Sifuna, 2016). In this sense, the 8-4-4 system could be said to have failed in its core aim of preparing all learners to be self-reliant.

The core aim of the 8-4-4 system from its inception was to prepare learners to be self-reliant individuals. The content of the curriculum was arranged so as to impart vocational type of skills to learners, with the hope of preparing them to be self-reliant. However, it is observed that the 8-4-4 was hurriedly implemented, without adequate consultation and involvement of stakeholders, provision of adequate facilities and infrastructure and training of teachers for implementing the new curriculum (Sifuna, 2016; Ambaa, 2015, Simiyu, 2001; Amutabi, 2003; Eshiwani, 1993; RoK, 1988). Parallels have been drawn between the manner in which the 8-4-4 education sytem was introduced and the way the 2-6-6-3 system was introduced at the beginning of 2018. Sifuna (2016) raised concerns over the cost of the new curriculum and the extent to which teachers and other implementers of the curriculum were prepared for the new

curriculum approach. Kenya continues to produce graduates at all levels of education who lack knowledge, skills and attitude to rely on themselves and dependency levels continue to be a major challenge to the economy of this country. Not much attention has been payed to the role played by colonialism and the legacy of colonial education as well as the adoption of a Eurocentric type of curriculum after independence.

This study sought to deconstruct the Kenyan education system with regard to its role in inculcating self-reliance among students. Based on the gaps identified in the literature review, the researcher situated this study in the Anti-colonial theoretical framework in order to fill the gaps. Education in the African indigenous dimension trained all members of society through its curriculum, pedagogical approach, learning environment and evaluation to be self-reliant. However, colonization and introduction of a Eurocentric type of education had long lasting effects on education for Africans. This study sought to explore the influence of integrating aspects of indigenous curriculum in Africa into the contemporary Kenyan education in order to inculcate knowledge, skills and the spirit of self-reliance among learners.

Results and Discussions

The objective of this study was to determine the extent to which decolonizing curriculum promotes self-reliance among students in the Kenyan education system. A decolonizing curriculum was conceived in terms of integrating aspects of African indigenous curriculum into the contemporary Kenyan curriculum. Two sets of items were included in the questionnaire to measure the variety of subjects taught, content of subjects taught, and choice of subjects by the learner as well as the source/origin of content taught in both the contemporary Kenyan education system and in the indigenous African education system.

Contemporary Curriculum

The respondents were requested to indicate the extent to which they agreed with selected statements about the Kenyan education system. Selected statements capture indicators of a curriculum which according to literature reviewed would be associated with self-reliance. They were given fourteen items rated on a five point Likert scale ranging from: of SD – Strongly Disagree; D – Disagree; N – Neutral; A – Agree; and SA – Strongly Agree from which to choose. The findings are presented in Table 1

Table 1

Frequencies and Percentages on Contemporary Curriculum

Statement	SD	D	N	A	SA
Curriculum focuses on community-centred knowledge and skills	74 (19.3%)	122 (31.8%)	69 (18%)	95 (24.7%)	24 (6.25%)
Music and drama are highly encouraged in educational institutions	65 (16.9%)	100 (26.0%)	69 (18.0%)	102 (26.6%)	48 (12.5%)

Students have ample time to participate in communal programmes	72 (18.8%)	155 (40.4%)	78 (20.3%)	58 (15.1%)	21 (5.5%)
Technical subjects feature prominently in the education system	73 (19.0%)	112 (29.2%)	57 (14.8%)	89 (23.2%)	53 (13.8%)
Subjects in the education system enable learners to explore their creativity	55 (14.3%)	98 (25.5%)	64 (16.7%)	111 (28.9%)	56 (14.6%)
Content of curriculum enables students to develop their potential and talents.	55 (14.3%)	96 (25.0%)	71 (18.5%)	105 (27.3%)	57 (14.8%)
There's a wide variety of subjects provided in the education system	29 (7.6%)	55 (14.3%)	42 (10.9%)	151 (39.3%)	107 (27.9%)
Students are exposed to a work-oriented curriculum	68 (17.7%)	111 (28.9%)	65 (16.9%)	88 (22.9%)	52 (13.5%)
Subjects taught in the education system enable students develop strong self-esteem	36 (9.4%)	95 (24.7%)	89 (23.2%)	104 (27.1%)	60 (15.1%)
Content of curriculum nurtures spirit of independence	40 (10.4%)	110 (28.6%)	82 (21.4%)	115 (29.9%)	37 (9.6%)
Choice of subjects to study is not entirely made by learners	55 (14.3%)	71 (18.5%)	61 (15.9%)	122 (31.8%)	75 (19.8%)
Content of subjects taught in educational institutions is derived from the immediate/local environment	90 (23.4%)	125 (32.6%)	73 (19.0%)	68 (17.7%)	28 (7.3%)
Kenyan curriculum exposes learners to the world of work	63 (16.4%)	92 (24.0%)	81 (21.1%)	102 (26.6%)	46 (12.0%)
Students are presented with a challenging curriculum designed to develop independent thinking.	65 (16.9%)	91 (23.7%)	70 (18.2%)	89 (23.2%)	69 (18.0%)

Analysis of the results in Table 1 on the contemporary curriculum, reveal that majority of the respondents disagree that in the Kenyan education system, the curriculum focuses on community-centred knowledge and skills(31.8%), students have ample time to participate in communal programmes (40.4%), technical subjects feature prominently in the education system (29.2%), students are exposed to a work-oriented curriculum (28.9%), content of subjects taught in educational institutions is derived from the immediate environment(32.6%) and that students are presented with a challenging curriculum designed to develop independent thinking (23.7%).

A majority of respondents agreed that music and drama are highly encouraged in education institutions (26.6%), there is a wide variety of subjects provided in the education system according to the majority of respondents (39.3%), that subjects in the education system enable learners to explore their creativity (28.9%), content curriculum enables students to develop their potential talents (27.3%) content of curriculum nurtures the spirit of independence (29.9%),

Subjects taught in the education system enable students develop strong self-esteem (27.1%) and that Kenyan curriculum exposes learners to the world of work (26.6%).

The frequencies presented on Table 1 show that the majority of the respondents disagreed about the presence of curriculum aspects that would promote self-reliance among students in the Kenyan education system. The findings in this study are supported by other studies on curriculum in Kenya which found that although the 8-4-4 system of education was designed to prepare learners for a life of self-reliance through inculcating in them skills that would lead to self-employment; the implementation of this curriculum has been largely ineffective. Simiyu (2001) found that although the 8-4-4 system curriculum provided for more options in technical and vocational subjects, training in these areas did not bear the expected results since there were no trained technical and vocational subjects teachers and local craftsmen could not be used. Amutabi (2003) found that the Kenyan education system was theoretically oriented due to lack of infrastructure and therefore did not adequately provide learners with adequate skills for self-reliance. According to Owino (1997) vocational subjects and activities introduced in the 8-4-4 curriculum to provide students with skills for self-reliance were viewed by teachers and students as an extra burden both in practical daily activities in schools and in national examination.

African Indigenous Curriculum

Decolonizing the curriculum involves integration of African indigenous curriculum elements into the contemporary Kenyan curriculum. Respondents were requested to rate the extent to which integrating of selected elements of the indigenous African curriculum could enhance the Kenyan education system using a scale of NE – To no extent ;SE – To a small extent; N – Neutral; LE – To a large extent; and VLE – To a very large extent; The findings are presented on Table 2

Table 2

Frequencies and Percentages on Decolonizing curriculum

Statement	NE	SE	N	LE	VLE
Aligning content to immediate needs of society	22 (5.7%)	57 (14.8%)	57 (14.8%)	142 (37.0%)	106 (27.6%)
Teaching subjects that develop practical skills	17 (4.4%)	43 (11.2%)	49 (12.8%)	122 (31.8%)	153 (39.8%)
Teaching subjects that emphasize hands-on experiences	18 (4.7%)	38 (9.9%)	60 (15.6%)	131 (34.1%)	137 (35.7%)
Emphasizing on individual talents in the choice of subjects	29 (7.6%)	50 (13.0%)	39 (10.2%)	103 (26.8%)	162 (42.2%)
Teaching subjects that promote creativity among learners	16 (4.2%)	45 (11.7%)	47 (12.2%)	124 (32.3%)	152 (39.6%)
Presenting learners with a curriculum that instills skills to exploit their immediate environment	20 (5.2%)	47 (12.2%)	48 (12.5%)	123 (32.0%)	146 (38.0%)
Focusing on the local environment as the main source of content for the curriculum	42 (10.9%)	65 (16.9%)	47 (12.2%)	118 (30.7%)	112 (29.2%)
Integrating objectives of African indigenous education in the curriculum	32 (8.3%)	81 (21.1%)	66 (17.2%)	116 (30.2%)	89 (23.2%)
Involvement of local communities in curriculum development	39 (10.2%)	66 (17.2%)	58 (15.1%)	109 (28.4%)	112 (29.2%)

Analysis of results in Table 1 indicates that "teaching subjects that develop practical skills" was rated as useful to a very large extent by majority of the respondents (39.8%). Other elements of the indigenous African curriculum rated by the majority of respondents as useful to a very large extent include: teaching subjects that emphasize hands-on experiences (35.7%), Emphasizing of individual talents in the choice of subjects (42.2%), Teaching subjects that promote creativity among learners (39.6%), presenting learners with a curriculum that instills skills to exploit their immediate environment (38.0%) and involvement of local communities in curriculum development (29.2%). African indigenous curriculum elements rated as useful to a large extent by majority of the respondents include: aligning content to immediate needs of society (37.0%), integrating objectives if of African indigenous education in the curriculum (30.2 %) and focusing on the local environment as the main source of content for the curriculum (30.7%).

The findings in this study confirm the assertion by Omolewa (2007) that following the indigenous African model of teaching, it is wise to start with the knowledge about the local area, which students are familiar with, and then gradually move to the knowledge about regional, national and global environments. Omolewa further observed that indigenous people have

developed enormous volumes of knowledge over the centuries about different subject matters especially in the areas of informal and vocational training, where each person in the community is practically trained and prepared for his/her role in society. Ambaa (2015) also reported that teaching in learning institutions in Kenya should be related to one's interest and experience and as a result, the inherent abilities that individuals possess will be developed which may be vital in realizing self-reliance as an aim of education.

Correlation Analysis for Curriculum and Self-reliance

The Pearson's Product Moment technique was used to carry out Correlational analysis to determine the relationship between indicators of contemporary Kenyan curriculum, indigenous African curriculum, decolonized (integrated) curriculum and self-reliance. It was meant to identify the strength and direction of the association between the indicators of these variables. Values of correlation coefficient range from -1 and +1. A correlation coefficient of +1 indicates that the two variables are perfectly and positively related in a linear sense, while -1 shows that the two variables are perfectly related but in a negative linear sense. Hair et al (2006) observe that correlation coefficient (r) ranging from 0.81 to 1.0 is very strong; from 0.61 to 0.80 is strong; from 0.41 to 0.60 is moderate; from 0.21 to 0.40 is weak; and from 0.00 to 0.20 indicates no relationship. The results are presented on Table 3.

Table 3

Correlation Analysis of Curriculum and Self-reliance

		Contemporary Curriculum	Decolonizing Curriculum	Self-reliance
Contemporary Curriculum	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	384		
Decolonizing Curriculum	Pearson Correlation	.869**	1	
	Sig. (2-tailed)	0.000		
	N	384	384	
Self-reliance	Pearson Correlation	.786**	.736**	1
	Sig. (2-tailed)	0.000	0.000	
	N	384	384	384

**. Correlation is significant at the 0.01 level (2-tailed).

Results on Table 3 indicate a strong positive and significant correlation between the indicators of the contemporary curriculum and self-reliance (r=786, p-value 0.000<0.01). There is also a strong positive and significant correlation between the decolonizing curriculum (integrated curriculum) and self-reliance (r=736, p-value 0.000<0.01).

Regression Analysis and Hypothesis Testing for Decolonizing Curriculum and Self-reliance

The objective of the study was to determine the extent to which decolonizing curriculum promotes self-reliance among students in the Kenyan education system. A decolonizing curriculum was conceived in terms of integrating elements of African indigenous curriculum into the contemporary Kenyan curriculum. The measures of the curriculum comprised the variety of subjects taught, content of subjects taught, and choice of subjects by the learner as well as the source/origin of content taught in both the contemporary education system and in

the indigenous African education systems. Respondents had been asked to indicate the extent to which the Kenyan education system focused on the selected curriculum dimensions. Respondents were also asked to rate the usefulness of integrating the curriculum dimensions conceived from an African indigenous perspective into the Kenyan education system. Self-reliance measures were composed of attitude, creativity, responsibility, autonomy, hard work, confidence in own capabilities and self-esteem. To determine the relationship between decolonizing curriculum and self-reliance, the following hypothesis was tested.

H_{01}: There is no statistically significant relationship between decolonizing curriculum and self-reliance among students in the Kenyan education system.

The regression results are presented on Table 4.

Table 4

Regression Analysis of Curriculum and Self-reliance

a). Goodness of Fit

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
Contemporary	.786[a]	0.617	0.616	0.40308
Decolonizing	.736[a]	0.542	0.541	0.44091

b).The Overall Significance of the Model

Model		Sum of Squares	df	Mean Square	F	Sig.
Contemporary	Regression	100.113	1	100.113	616.185	.000[b]
	Residual	62.065	382	0.162		
	Total	162.178	383			
Decolonizing	Regression	87.918	1	87.918	452.256	.000[b]
	Residual	74.260	382	0.194		
	Total	162.178	383			

c).The Individual Significance of the Model

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
Contemporary	(Constant)	0.506	0.117		4.340	0.000
	Curriculum	0.827	0.033	0.786	24.823	0.000
Decolonizing Curriculum	(Constant)	-0.050	0.162		-0.312	0.755
	Curriculum	0.936	0.044	0.736	21.266	0.000

a. Dependent Variable: Self-Reliance

The results in Table 4 show that decolonizing curriculum had a statistically significant relationship with self-reliance. The coefficient of determination is 0.617 for the contemporary curriculum and 0.542 for the Decolonized curriculum. This suggests that 61.7% of variation in Self-reliance is explained by the contemporary curriculum. In addition, Decolonizing curriculum explained 54.2% of variation in self-reliance. On the basis of this result the study revealed that Decolonizing curriculum has marginal significance towards self-reliance.

Results on Table 4 further reveal that the contemporary curriculum significantly influenced self-reliance with F Statistic =616.185 and a P-value of 0.000<0.05. Similarly, the decolonized curriculum, with an F statistic=452.256 and a P-value of 0.000<0.05 was also shown as having significant relationship with self-reliance. This implies that the model is statistically significant at 5% level of significance.

The results on Table 4 also reveal that the contemporary curriculum was considered statistically significant with a regression coefficient of 0.827, a t-value of 24.823 and a P-value of 0.000<0.05. This suggests that one unit change in the contemporary curriculum corresponds to increase in self-reliance by a factor of 0.827. Further, the study reveals that there exists a significant relationship between decolonizing curriculum and self-reliance at 5% level of significance (regression coefficient=0.936, P-value 0.000<0.05). This implies that for one unit change in decolonizing curriculum, there is an increase in self-reliance by a factor of 0.936.

In conclusion the study revealed that the current curriculum and the decolonizing curriculum contributed significantly towards self-reliance. The Null hypothesis that there is no significant relationship between decolonizing curriculum and self-reliance is not supported in the current study. The regression model for the prediction of self –reliance can be stated as follows:

$Y = 0.506 + 0.827X_{11}$

$Y = 0.936X_1$

Where:

X_{11} = Contemporary Curriculum

X_1 =Decolonizing Curriculum

Y = Self-reliance

0.506 = Y-intercept (constant). Estimate of expected value of self-reliance when contemporary curriculum is Zero.

0.827 = an estimate of the expected increase in Self-reliance in response to a unit increase in contemporary curriculum

0.936= an estimate of the expected increase in Self-reliance in response to a unit increase in Decolonizing curriculum.

Based on the findings of this study, it was revealed that decolonizing curriculum (with a regression coefficient =0.936) would improve the contemporary curriculum (regression coefficient= 0.827) in promoting self-reliance among students. Although studies on decolonizing curriculum for self-reliance are difficult to find, many studies have been carried out on integration of Indigenous knowledges to contemporary education systems. Since integrating of indigenous knowledges into contemporary curriculums is part of the efforts to decolonize education, reference can be made on these studies. The results of this study support Hamilton-Ekeke and Dorgu (2015) who posited that since indigenous knowledge was generated from the local wisdom and culture, it fits to the local situation natively and that this knowledge could contribute to solve existing problems and achieving the intended objectives. The findings also supports Omolewa (2007) who observed that integration of traditional education into school curriculum enables schools to act as agencies for transferring the culture of the society from one generation to the next and links the learning process more closely to learners' everyday experience in order to help them to make better sense of what they learn

5.3 Conclusions

Judging from the findings resulting from the data collected for this study, the results reveal some vital facts upon which the conclusions can be drawn. We can conclude from this study that decolonizing the curriculum in the Kenyan education system would have a positive influence on self-reliance among students. The study revealed that decolonizing curriculum through integrating aspects of the indigenous African curriculum had significant relationship with self-reliance among students. Teaching subjects that develop practical skills, those that promote creativity among learners and those that promote hands-on experiences were considered as crucial for promoting self-reliance. Presenting learners with a curriculum that instills skills to exploit their immediate environments was also highly rated in promoting self-reliance.

5.4 Recommendation

Based on the findings of the current study, the researcher made the following recommendations:

The is need for curriculum developers to focus more on the learner's immediate environment so as to develop curricula that responds to immediate needs of the learner.

There is need for curriculum developers to explore ways of developing and designing locally and regionally relevant curricula where focus is on instilling skills and competencies relevant for survival in the learner's immediate environment and to ground them firmly in their own cultures before introducing them to knowledge from other areas and cultures.

Curriculum planners should be encouraged to help to integrate self- reliance skills modeled along the lines of African indigenous educational practices into contemporary Kenyan education.

REFERENCES

Ambaa, C. (2015). *Analysis of the Kenyan 8-4-4 System of Education in Relation to Aims of Education for Self-Reliance*. Unpublished M.ed Thesis, University of Nairobi.

Amutabi, N. (2003). The 8-4-4 system of education. *International Journal of Educational*

Development. Vol.23 No.3: April, 2003.

Eshiwani G.S. (1990). Implementing Educational Policy in Kenya. *World Bank Discussion Papers.* Washington D.C, the World Bank.

Eshiwani, G. S. (1993). *Education in Kenya since Independence*. Nairobi: East African Educational Publishers Ltd

Hamilton-Ekeke, J.T & Dorgu, E. T.(2015). Curriculum and Indigenous Education for

Technological Advancement. *British Journal of Education Vol.3, No.11, pp.32-39,* November 2015

Karanja, S. (2008). *Education for Self-reliance, analytic perspective. Unpublished MA Dessertation.* University of Nairobi

Omolewa, M. (2007). Traditional African modes of education: their relevance in the modern

world. *In International Review of Education (2007) 53:593–612*

Owino, C. (1997). "Vocational education in primary schools in Kenya and Tanzania: A

comparative study with special reference to Kenya." Eldoret: Moi University (Faculty of education). MA dissertation (unpublished)

Republic of Kenya. (1988). *Report of the Presidential Working Party on Education and manpower Training for the next Decade and Beyond*, Nairobi, Government printers.(Kamunge Report)

Sifuna, D.N. (2016). *Why Kenya Wants to Overhaul its Entire Education System*. Downloaded from http:// the conversation.com/explainer-why-Kenya-wants-to-overhaul-its-entire-education-system-62840 on 1/07/2018

Simiyu, J.W. (2009). *Revitalising a Technical Training Institute in Kenya. A Case Study of Kaiboi Technical Training Institute, Eldoret, Kenya.* Bohn: UNESCO-UNEVOC international centre for TVET.

The Educational Role of *Nation* And *Standard* Newspapers In Creating Awareness On Functions Of County Governments Among Residents Of Embakasi East Sub County, NAIROBI

Nicholas Anyu

Abstract

After the promulgation of the Constitution in 2010 and the inception of devolution in 2013, it was necessary for Kenyans to understand the functions of the devolved units. Media, through educational role is one of the institutions that is expected to make people aware about the functions of the county governments. This study, therefore, assessed the role the media play in educating its audience to create awareness about the functions of the Kenya's devolved governance. Specific objective of the study was to examine the extent to which The Nation and The Standard newspapers have educated Kenyans about the functions of county governments. The researcher used the Framing theory, developed by Bates (1974). Framing theory is the schemata of interpretation that enables individuals to locate, perceive, identify and label occurrences or life experiences. The study covered five thematic areas representing the devolved functions, namely: health, water, education, transport and lands. The study used sequential mixed method design where qualitative and quantitative designs were combined in data collection. For quantitative data, questionnaires were administered to collect data, which was analysed and presented in forms of tables and texts. The researcher analysed the contents of The Nation and The Standard newspapers for qualitative data and analysis done; the results were presented in forms of tables and texts. The Systematic Random sampling procedure was used to reach respondents while purposive sampling procedure was used to pick the required 208 weekend newspapers of The Nation and The Standard for a period of 12 months for content analysis. The study was conducted in Embakasi East Sub County of Nairobi County that had a study population of 48, 983 households. The research used the Yamane's formula to determine sample size of 399 households. The study is significant as the results may be used to come up with policies and bills or supplement on the existing ones on matters devolution. It may also assist in promoting the Sustainable Development Goals' tenet of peace, justice and establishment of strong institutions.

Introduction

Devolution is a form of governance that for the second time has been included in the Kenya's Constitution that was promulgated in 2010. The struggle to have the current county governments in the Constitution of Kenya 2010 involved efforts from different stakeholders such as political class, civil rights organizations and the media. Kenyan media worked hand-in-hand with these groups to champion for justice and democracy, including decentralization for equal and equitable sharing of resources.

However, after attainment of devolution, many people still have not known the functions of the devolved units and therefore have not been able to distinguish the roles the county governments should perform, the ones left to the national government and those shared by the two levels of government (Olang', 2014). Therefore, the purpose of this study was to examine the role media, specifically print, plays in educating Kenyans about the functions of the county governments to

enhance people's knowledge on the roles of devolved governments. Providing education to the people is one of the major roles of media that can narrow the knowledge gap about what functions are fully devolved, which ones have been left to the national governments and the roles the two levels of government are sharing.

Educating people about roles of county governments offer opportunity for the media audience to understand and know the structures of the devolved governments and so can hold the office holders liable in order to achieve good governance (Kimanthi, 2018). Many studies have been conducted on media and devolution. But few have been done to assess the educational role of media on functions of the county governments. Most of these studies especially on print media have majorly looked at the general media coverage of Kenya's devolution where they analyse the general stories on devolution (Iberi, 2014).

But in this study the researcher has looked at specific roles of print media (*Nation* and *Standard* weekend newspapers) in educating people about functions of Kenya's devolution in regards to five thematic areas, namely; Water, Health, Transport, Education and Lands. Even though county governments have many functions as stated above, this study has narrowed down to only five thematic areas since they are the key in the devolved units, according to National Gender and Equality Committee (2013).

Theoretical Framework

The study has used *Framing* theory whose concept was first developed by an anthropologist, Gregory Bates in his 1972 book, *Steps to An Ecology of Mind*. The concept was later expounded on by Goffman in 1974. Goffman defined Framing as 'a schemata of interpretation that enables individuals to locate, perceive, identify and label occurrences or life experiences' (Goffman in Cissel, 2012).

However, another scholar, Robert Efman, modernized this definition that 'to frame a communicating text or message is to promote certain facets of a perceived reality and make them more salient in such a way that endorses a specific problem definition, causal interpretation, moral evaluation, and/or a treatment recommendation' (Efman in Cissel, 2012).

It is where the media tries to draw the attention of the people to some topics; the way media and media gatekeepers organize and present the events and issues that they cover in their daily duties, and also the way audiences interpret what they are provided with by the media. This theory further states that information in newspapers is given meaning depending on the themes and news angle taken and its effects are due to how a given piece of information is being framed in public discourse.

Therefore, this theory is relevant to this study in that the two newspapers frame their news stories in a way that contents talk about functions of county governments under the five sectors of lands, water, education, health and transport discussed in this research.

Literature Review

This study is within the broader scholarly research on media content and effects as it seeks to establish the role media plays on the functions of county governments. The literature review discusses media's educational role on functions of the governments.

Role of media in educating citizens on functions of government

Media is very instrumental in educating its audience on matters that happen in the society. As an educator, in some cases, Ochilo & Wanyande (2011) argue, media has made constructive suggestions on how to improve democracy.

This, the media, especially newspapers, have dedicated columns to educate the public on matters democracy and development. Feature stories and opinion pieces are the major articles in the newspapers that educate readers on different issues. This is because a feature story, for example, is a 'longer piece of writing than a news story…' and therefore 'will often cover an issue in greater depth than news story would do; or it might look at the ongoing story from a different angle' (BBC, 2018).

In devolution in Kenya, media is expected to dedicate the editorial opinions and features, among others in educating its audience on the functions of county governments so that the misunderstanding does not exist. In order for good governance to prevail, citizens need to gain proper knowledge on the roles a government plays to them.

This can only be achieved faster and better through the media than personal contact (Preeti, 2014). According to Dewey (In Preeti, 2014), media is one of such potent force in the social environment that help offer education. In many countries all-over the world, media has been used severally to aid in educating the audience on matters governance, politics and issues affecting the society.

For example, print media has been instrumental in educating people about different roles of government structures, as was witnessed in India. After the India's Independence, a Five Year Plan was developed by the government. Media was utilized to educate the people about the plans and the roles the government would play in building the nation. It was the print media (the newspapers) which, by framing stories, gave great importance to development themes and on various government development programmes and how the people could make use of those programmes (Patil, 2011).

In South Africa, media played a big role in educating black South Africans about good governance and was also used to challenge or perpetuate a discriminatory regime through ideological structures (Smith, 2005).

The media in Kenya have contributed to the opening up of the political space and political transition alongside other non-state actors within the civil society by educating the people. Immediately after Independence, media in Kenya played a huge role in educating the public about democratic movements that were to bring the multiparty democracy. It is through the media that political activists fought hard to ensure devolution was achieved through referendum to enhance democracy, service delivery and resource sharing in Kenya (Ochilo & Wanyande, 2011).

Therefore, it is still important for relevant authorities to offer civic education through the media to the people so that they understand what this new kind of governance entails, including the functions of the county governments.

Lack of media education on functions of county governments leads to lack of knowledge on the tenets of devolution in Kenya. This makes it difficult for the people to know policy reforms and implementations on matters devolution; meaning the citizens will now know what functions are devolved, which ones are left to the national government and ones shared by the two levels of government (Patil, 2011).

A country that denies media opportunity to educate its people is likely to fail in promoting democracy, justice and in provision of services to the people (Cissel, 2012). Many scholars have argued that Kenyans have not been adequately educated about the distinct functions of the county governments (Olang', 2014).

This is risky to the development of country since the citizenry cannot hold the leadership accountable for any wrong doing by the government in place. When people don't have knowledge about the roles of county governments; what these governments should play in service delivery, it becomes difficult for them to hold the leadership responsible for poor service delivery, corruption, among other injustices (Olang', 2014).

Therefore, this study sought to find out how media has educated people about the functions of the county governments so that its results are used to promote more understanding about the functions of the county governments and also used to strengthen governance in the county governments.

Research Methodology

The study reviewed the media coverage of the functions of county governments by *The Standard* and *The Nation* newspapers weekend editions. This study used sequential mixed method research design. In the sequential mixed methods design that this study used, the data were first collected using quantitative method where questionnaires were administered to 399 respondents of Embakasi East Sub County in Nairobi City County that has the highest literacy level in Kenya (Geopoll Blog Survey, 2015). This was followed by qualitative method where content analysis of the 208 weekend newspapers of *The Standard* and *The Nation* was done on Water, Health, Transport, Education and Lands. In this study, the researcher started with quantitative before going to qualitative.

The researcher used the purposive sampling method for newspaper sampling to select 208 weekend newspapers of *The Standard* and *The Nation.* The two papers were used instead of all papers in Kenya because they are the ones with the highest number of readers (Geopoll Blog Survey, 2015). The weekend editions have been used in this study because they have more detailed contents including columns and features that provide a wider range for content analysis (BBC, 2014). The newspapers were published in 104 days between April 2013 and April 2014; this was the first year of devolution in Kenya and people expected more information and education from the media about the new kind of governance.

The contents of the 208 papers were looked at where feature stories, supplements and opinion pieces were categorized as more educative, and the news stories (hard news) left as more informational articles (BBC, 2018). Systematic random sampling was used to pick the 399 households for this study which was arrived at after using Yamane's formula (1967). This was a representative sample that gave this research validity for the general target population. The

researcher employed a random route walk where he used a road junction as the starting point in a given administrative location.

The sample size for this study was 399 households and 208 weekend *Standard* and *Nation* newspapers selected in a period of 12 months from March 6, 2013 to April 30, 2014, giving a total of 103 days. However, the research was done per ward and therefore, household population for the five wards were considered and calculated as indicated in the **table** below:

Table 1: The Sample Size

Category of Respondents	Ward	Ward Household Population (WP)	Sample Size Household Population (n)
Literate Adults (Aged 18 years and above)	Upper Savanna	11, 342	92
Literate Adults (Aged 18 years and above)	Lower Savanna	11, 342	92
Literate Adults (Aged 18 years and above)	Embakasi Airport	9, 720	79
Literate Adults (Aged 18 years and above)	Utawala	9,720	79
Literate Adults (Aged 18 years and above)	Mihango	6, 856	57

TOTALS: Household population in all wards=48, 983; Sample size in all wards=399

Findings and Discussions

Reliance on Newspaper for Educational Purpose on County Government Roles

The study established the level of reliance on newspaper for educational purposes by the residents of Embakasi East Sub County.

Table 2: Reliance on newspaper for educational purpose

Response	Frequency	Percentage
Yes	247	69.77
No	88	24.86
Don't Know	19	5.37
Total	**354**	**100**

Most (69.77%) of the respondents rely on newspaper for educational purpose on the functions of county governments. However, 24.86% do not rely on newspaper for educational purpose while 5.37% do not know.

Preference of Newspaper for Educational Purpose on county governance on themes; Land, Water, Education, Health and Roads

Table 3: Preference of Newspaper for educational purposes (*Source: Field Survey, 2019)*

Newspapers	Frequency	Percentage
The Standard on Sunday (n=247)	37	24.8
The Nation on Saturday (n=247)	16	16.6
The Sunday Nation (n=247)	24	19.8
The Standard on Saturday (n=247)	49	38.8

As shown in table above, most (38.8%) of the respondents who rely on newspaper for educational purpose preferred *The Standard on Saturday;* followed by *The Standard on Sunday* (24.8%). Others are: *The Nation on Saturday* at 16.6% and *The Sunday Nation* at 19.8%.

Newspapers contents on educational role of media on functions of county governments

The study looked at the contents of the 208 weekend newspapers; 104 copies of *Saturday* and *Sunday Nation*, and 104 copies of *Saturday* and *Sunday Standard* for a period of 12 months, from April, 2013 to April, 2014.

Table 5: *Educational articles per theme in the Standard weekend papers*

Themes	Total Frequency 200 articles	Standard on Saturday	Sunday Standard
Lands	40 articles (20%)	10 articles (25%)	30 articles (75%)
Transport	34 articles (17%)	14 articles (41.1%)	20 articles (58.8%)
Education	43 articles (21.5%)	20 articles (46.5%)	23 articles (53.5%)
Health	45 articles (22.5%)	35 articles (77.8%)	10 articles (22.2%)
Water	38 articles (19%)	18 articles (47.4%)	20 articles (52.6%)
TOTAL ARTICLES	**200 articles** (100%)	97 articles (48.5%)	103 articles (51.5%)

From the above table; for *The Standard* newspapers, there were 200 articles; with Lands 40 articles (20%), Transport 34 (17%), Education 43 (21.5%), Health 45 (22.5%) and Water 38 (19%). *The Standard on Sunday* recorded more articles at 103 (51.5%); than *Standard on Saturday* at 97 articles (48.5%).

Table 6: *Educational articles per theme in the Nation weekend papers*

Themes	Total Frequency (211 articles)	Saturday Nation	Sunday Nation
Lands	42 articles (19.9%)	20 articles (47.6%)	22 articles (52.4%)
Transport	38 articles (18.0%)	19 articles (50%)	19 articles (50%)
Education	45 articles (21.3%)	27 articles (60%)	18 articles (40%)
Health	47 articles (22.3%)	27 articles (57%)	20 articles (42.55%)
Water	39 articles (18.5%)	19 articles (48.4%)	20 articles (51.28%)
TOTAL STORIES	**211 (100%)**	**112 articles (53.1%)**	**99 articles (46.9%)**

From the above table, Transport had the least number of articles at 38 (18.0 %), followed by Water at 39 (18.5%), Lands 42 (19.9%), Education 45 (21.3%) and Health 47 (22.3%). Again it

is clear that *Saturday Nation* carried more stories on the five thematic areas at 112 articles (53.1%) while *Sunday Nation* had 99 articles (46.9%).

Discussions and Analysis

It is clear from the study that majority of the newspaper readers (69.77%) rely on the weekend papers for education on the functions of the county governments while 24.86% do not. Most preferred paper for this purpose in regards to all the five themes of Water, Health, Lands, Transport and Education is *Standard on Saturday* (38.8%), followed by *Standard on Sunday* (24.8%), then *Sunday Nation* (19.8%) and finally *Nation on Saturday* at 16.6%. In the newspapers' content, where the 208 weekend papers were studied and 411 articles looked at, Lands had 25% in *Saturday Standard*, 75% for *Sunday Standard*, while *Saturday Nation* recorded 19.9% and *Sunday Nation* had 52.4%. Therefore, *Sunday Standard* had the highest number of articles about Lands that were educative and touched on the county governments while *Saturday Nation* had the least number of such articles.

Some of the articles analysed discussed matters land policies, issues of title deeds, land management, among others. From the stories, the reader would make meaning about what role the county governments are expected to play on matters Lands and which ones have been left to the national government.

On matters Transport, *Standard on Saturday* recorded 41.2%, *Sunday Standard* (58.8%), *Saturday Nation* 50% and *Sunday Nation* posted 50% in the content. The papers discussed the role the county governments should play in improving transport system in the counties and roads that should be developed by the national government.

In an opinion piece published on Sunday, August 11, 2013 *"Governors Dilemma Over Roles Transfer"* the paper argues that Kshs27 billion had been surrendered to the counties for the construction of roads. Again, the same piece asserts that there are functions that were undertaken by the Rural Electrification Authority that can be comfortably handled by county governments should be immediately transferred.

On content analysis for Education, 60% articles of *Saturday Nation* were on education while 40% were in the *Sunday Nation*. *Standard on Saturday* recorded 46.5% while *Sunday Standard* posted 53.5%. For example in a feature article: *Government Launches Sh6 Billion Uwezo Fund for Youth and Women*, published in *The Sunday Standard* on September 8, 2013 the paper outlines the national government's agenda in expanding education and its fruits by empowering girl child in order to give them an opportunity to contribute in nation building.

Although Uwezo Fund is a national government's initiative, the government partnered with the county governments through the wards administrators to identify the needy pupils who would benefit from the sponsorship (page 16). This is one of the educative articles that as it outlines role of the national government on Uwezo Fund initiative, it also educates the readers that indeed not every element of education is devolved, and it also educates that even though education is not fully devolved, both national and county governments are allowed to work together to promote education.

Health remains a delicate sector that every person is keen on. For this reason, the media entities have dedicated weeklies such as Health & Lifestyle and Life & Style by *The Standard* and *The Nation* respectively; a move aimed at keeping the public aware and educated on various health issues as well as staying at par with the latest developments in medicine.

In content analysis of the 208 weekend newspapers, *Saturday Standard* recorded 77.8% of the articles, 22.2% for the *Sunday Standard,* 57.45% for *Saturday Nation* while *Sunday Nation* posted 42.55% on matters health. The articles that were studied had contents about the roles the national and county governments play in promoting health, roles in policy implementation and health facilities' managements.

For example, in a feature story, *Public-Private Partnerships Good for Devolved Healthcare*, published in the newspaper of April 13th, 2014, county governments have been urged to embrace public-partnerships in the devolution of healthcare services, according to Mission for Essential Drugs and Supplies (MEDS) Managing Director, Paschal Manyuru.

According to this study, Kenya's print media offers educative articles on matters water as a devolved function of the county governments. Water is at the core of sustainable development and is critical for socio-economic development and improved health. In response to questionnaires, respondents agreed that weekend newspapers in Kenya play a role in educating them about water as a devolved function of county governments.

This mirrors what is in the content analysis of the 208 weekend papers that give 48.72% for *Saturday Nation*, 51.28% for *Sunday Nation. Standard on Saturday* posted 47.4% and 52.6% for the *Sunday Standard.*

Here many articles were concerned about the roles the county and national governments were supposed to be doing on extreme cases such as drought and floods. They talked about what role the counties should play in providing water to the drought-stricken areas to avoid cattle and human deaths. Some stories discussed what the national government should do in curbing floods in some counties across the country. This means that when it comes to disaster as a result of water, both governments are expected to work together.

From the above findings, the tenets of *Framing* theory are answered in this educational role of the media. The newspapers studied have framed their stories in a way that as audience are informed about events of devolution, they get educated on what is devolved fully to the counties, the elements that have remained with the national government and how the two levels of government can work together for the benefit of the citizens. The opinions, commentaries and features done are framed to discuss the five themes and therefore provide necessary education on the same.

The findings also answer the research objective of the educational role of media on the functions of the county governments as the articles make people aware on the roles the county governments play in the devolved sectors under the study, what elements are left to the national government and where the two levels of government share the responsibilities.

Conclusions

The main objective was to assess the extent to which *The Standard* and *The Nation* newspapers have educated Kenyans about the functions of county governments. In response, newspapers have constantly published educative columns, features and opinion pieces on the functions of county government to continually enlighten the public on the functions as well as expectations. Therefore, newspaper has significantly contributed to education of the public on the functions of county governments. Weekend newspapers that were looked at revealed that there was educational role which in turn provided knowledge to the people about functions of the county governments in regards to five major themes of Lands, Transport, water, education and Health, though Daily papers were most preferred.

Recommendations

In order to enhance the use of newspaper in devolved governance, the study has a number of recommendations:

On education of public on the functions of county government, the study recommends that all the weekend newspapers to slot more sections that will essentially highlight the functions of all the arms of government. In cases where such columns and sections already exist, it is essentially important to do evaluation aimed at establishing the key priority areas concerning county governance. Knowledge gap analysis will also help the newspapers generate educative features that are tailored on the existing knowledge gaps.

Lastly, in order to strengthen the content and frequency of reporting on county governance, the study recommends to the newspaper printers to start up or expand the interactive engagements with the public; either online or physically. This will help in coming up with innovative ideas on how to increase reliance newspapers for education on the roles and functions of county government. Moreover, it will also help the media companies reach the illiterate with education in a simple manner.

Suggestions for further Research

The study recommends a study to establish the knowledge, attitude and perception of the public towards digital newspaper in education on functions of county governments.

Reference

Agesa, R. U. (2009). *One family, two households: Rural to urban migration in Kenya.* Review of Economics of the Household, 2(2), 161-178.

Amkeni Wakenya. (2010). *The Constitution of Kenya: Laws of Kenya 2010.* Nairobi. Kenya

Amy, M., Kristen, P., Lee, R., Rosentiel, T. (2011). *How People Learn About their Local Communities: The Role of Newspaper.*

Aubel, F. (Unknown). *Media and the Memory in Wales: The Devolution Referendums 1979 & 1997*

AudienceScapes National Survey of Kenya. (2009). Nairobi

Ayoti, A. L. (2015). *Free Newspaper and Reading Culture: A Case Study of The People Daily.* Nairobi. Kenya

BBC News (December 2, 2014). *Kenya Profile: Media.* Nairobi.

BBC News (2018). Kenyan Media Action

Becket, C. (2006). *Development, Governance and the Media: The Role of Media in Building African Society.* APOLIS Report. www.lse.ac.u./polis

Blumler, J., Gurevitch, M. &Katz, E. (1974). *Utilization of mass communication by the individual.* In J. G Blumler & E. Katz, E. (Eds.), the uses of mass communication: current perspectives on gratifications research (pp. 61-72). Beverly Hills, CA: Sage.

Brinkerhoff, D.W., Brinkerhoff, J.M., & Mcnulty, S., (2007). '*Decentralization and*

Participatory Local Governance: A Decision Space Analysis and Decision Space

Analysis and Application in Peru". Benton Institution, New York USA.

Cheema, G.S., (2007). '*Devolution with Accountability: Learning from Good Practices'.* Washington: Brookings Institution Press

Cisse, M. (2012). *Media Framing: Comparative Content Analysis on Mainstream and Alternative News Coverage of Occupy Wall Street.* Elon University

Constitution of Kenya. 2010

Daudi, K. A. (2016). *College Of Humanity and Social Sciences Faculty of Arts Department of Sociology and Social Work* (Doctoral Dissertation, University Of Nairobi).

Dickovick, T. & Riedl, R. (2010). *Comparative Assessment of Decentralisation in Africa: Final Report and Summary of Findings.* Unknown Publisher

East African Community Paper, 2017

Geventa, J. (1998). *Citizen Knowledge, Citizen Competence and Democracy Building.* Pen State Press

Geopoll Blog Survey (2015). *Kenya's Media Ratings From April-June 2015.* Nairobi

Ghai, Y. 2007: *What is Democracy? What is it for?* The Star. March 13, 2017. Nairobi. Kenya

Gregory, B. (1972). Steps to an Ecology of Mind. Retrieved from www.edtechpost.ca/.../...

Hauss, C. (2006). *Devolutionary Government and Politics. https://www.britannica.com*

Herbert, J. (2000). *Journalism in the Digital Age: Theory & Practice for Broadcast, Print and On-line Media.* Reed Educational and Professional Publishing Ltd

Honti, M., Schuwirth, N., Rieckermann, J., & Stamm, C. (2017). *Can integrative catchment management mitigate future water quality issues caused by climate change and socio-economic development?* Hydrology and Earth System Sciences, 21(3), 1593.

Iberi, D. (2014). *Print Media Coverage of County Government in Kenya: A Content Analysis of the Daily Nation and The Standard Newspapers*. Nairobi. Kenya

IGI Media Policy Group: Survey Report of 2011

The smart phone Revolution Has Arrived in Classroom! What Are my Options?

Obondo Gaudence

Department of Curriculum, Instruction and Educational Media, Moi University,

P.O Box 3900, Eldoret, Kenya.

Tel.: +254-720-550-507. Email: gaudenceobondo@yahoo.com

Prof. Jackson K. Too

Senior Lecturer Moi University, Department of Curriculum, Instruction and Educational Media
P.O. Box 3900, Eldoret, Kenya

Tel: +254-722-672-758. Email: jkiprop2002@yahoo.com

Dr. Violet K. Nabwire

Senior Lecturer Moi University, Department of Curriculum, Instruction and Educational Media

P.O Box 3900, Eldoret, Kenya.

Tel.: +254-722-292-656. Email: vknabwire@gmail.com

Sub Theme: Mobile learning (mlearning)

Abstract

Smartphones can enhance universal access to education, equity, quality and efficiency in education. ICT can also play a major role in improving education management, governance and administration. While the introduction of Personal Computers into the school system and the building of school networks are happening all over Africa, use of digital learning content in schools and colleges is rapidly increasing world over. Smartphones continues to evolve as ICT inspired tools and teaching approaches offered the possibilities of transforming students learning experiences by heightening their motivation and a sense of autonomy. The smartphone revolution from retail into corporate market is now getting into our classrooms. It has become an ordinary resource for teachers to use to enhance instruction. To maximize its effectiveness in the classroom, the teacher needs to have positive attitude and technological skills. The objectives of the study are to; examine the benefits of using tablets in the classroom, options available for using m-learning and challenges faced by both teachers and learners in use of the smart phone This study is informed by the Technology Adoption Model (TAM) which is an information system theory that models how users' come to accept and use a technology. I shall use the mentioned objectives for argument to probe the research and to provide a path to understanding how tablets in education transform the pedagogy. In an effort to ensure smartphone integration in teaching

and learning in schools, the Government has over the years invested heavily in establishment of the requisite ICT infrastructure.

Keywords: Smart phone Revolution, Classroom, Options.

Introduction

With the growing portability and functional convergence of technologies, as well as with cost reduction of products and services, mobile devices are increasingly present in everyday life. According to the 2013 UNESCO Report, mobile technologies are commonly found nowadays even in areas where schools, books, and computers are scarce. Due to the fall in prices of these technologies, mobile phones in particular, even in impoverished areas, many people can afford and know how to use mobile devices (UNESCO, 2013). Therefore, the presence and relevance of such devices in everyday life have motivated research in the educational field (Pachler et al., 2010). Mobile learning (m-learning) is the field of study that analyzes how mobile devices can contribute to learning (Batista, 2011). M-learning involves the use of mobile technologies, either solely or combined with other communication and information technologies to allow learning anywhere, at any time (UNESCO, 2013).

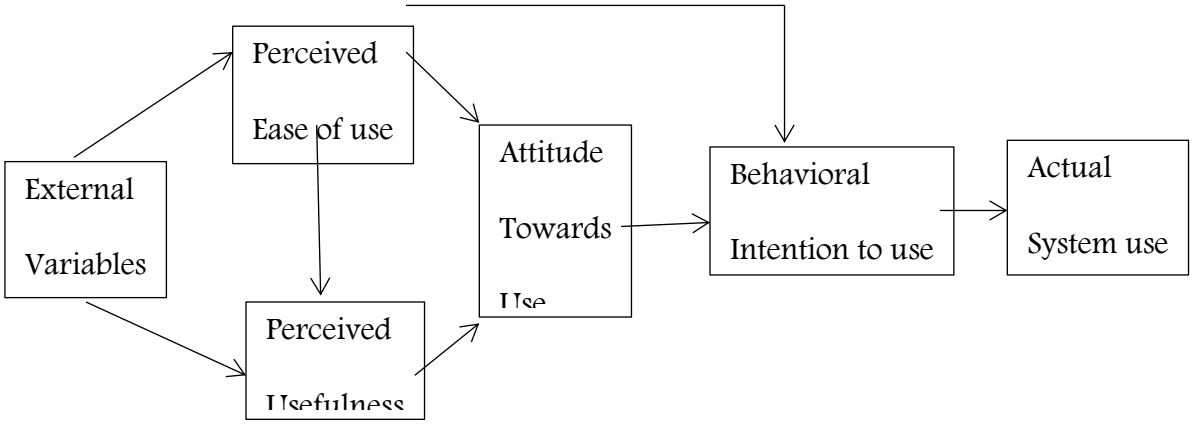
Cellphone have come a long way since two-pound Motorola dyna Tac 8000x was introduced in 1984. Subsequent generation of mobile phones continue to evolve and become more affordable. According to Nelson research, smartphones sales in 2012 have increased. The smartphones owner population is growing. Multi- functionality and connectivity are opening doors for learning. Students connect to internet improving their academics as teachers use them for audio and recording and taking digital image to enhance their instruction. However, mobile devices, especially mobile phones, are criticized by teachers in view of the problems they bring – distraction, for instance. Regarding mobile phones specifically, Machado (2012) argues that it is necessary to establish restrictions to the use of such devices in schools in order to have a better development of the pedagogical actions, and also to "slow down" students from the hectic pace of contemporary life. However, the author also considers feasible to incorporate this equipment into the various educational projects. Gibson et al. (2012) also say that, even though many teachers consider mobile phones a distraction in the classroom, others believe they are beneficial. The first, most successful smartphone was blackberry. Smartphone have become part of contemporary culture because it has an operating system which manages the gadgets hardware and software.

What Are Smartphones?

Smart phones are high end mobile phones which combine the features of personal digital assistants (PDAs) and mobile phones creating a powerful, portable communication tool. They carry a variety of features within a small, often light weight frame. They however vary in size, colour, style and features as many manufacturers seek to remain at par with and even surpass the technology of their competitors. It is believed that it can empower teachers and learners by facilitating communication and interaction, offering new models of delivery and generally transforming teaching and learning processes. The penetration rate of mobile phone in classroom is rising rapidly. In Kenya penetration rate has doubled within a short time.

The Technology Adoption Model

This paper is informed by the Technology Adoption Model (TAM) which informs an information system theory that models how users come to accept and use technology. The model suggests that when users are presented with a new technology, a number of factors influence their decision about how and when to use it. TAM was developed by Fred Davis et al., 1989; Richard Bagozzi et al., 1992. The TAM proposes two specific beliefs- perceived ease of use and perceived usefulness determines one's behavioral intention to use technology as shown in fig 1.



Source: Bagozzi et al (1992)

Use of Smartphones in Classroom

Smart phones are used to access internet, schedule homework and send email to teachers and fellow students regarding assignment. The phones allow students to conduct web searches. It encourages students score and improvement is noticed in the subjects. For example students at a high school in Taiwan were given tablets and smart phones to use in classroom, teachers conceded a few drawbacks to the new technology but contend the learning opportunities outweighed the disadvantages.

Use of Smartphones per Subject

Mathematics data analysis, geometry measurement, numbers, operations, algebra and angles. Use video clip on Pythagorean Theorem. These can be sent to students' phone then used in classroom to support students understanding. Use calculator to perform mathematical operations such as subtraction, addition and multiplications. Integrate everyday situation in teaching, identifying geometrical figures. Sorting and grouping; sort and group objects, according one attribute, ordering; arrange objects in ascending and descending order, draw small and big objects using ICT devices. Numbers; arrange numbers in sequence from 1-9, play video games on counting, find the missing numbers in given sets of numbers, symbolic representation of numbers; type number symbolic from 1-9, complete number puzzles.

Languages write poems, create captions for picture images to inspire a story. Learners can record clips of their own activities and view them in class. The activities may include learners singing, telling stories, reciting poems and rhymes. In teaching language activities in kindergarten, it could be used to enhance listening skills for example learners could listen and watch clips of people greeting and bidding farewell recorded in m-device and practice

responding to greetings and bidding farewell. It also used for reading speaking (self-expression), learners can watch video clips depicting various emotions and feeling and talk about them. Passing information; watch video clips or animation to help them connect words with meaning. Articulation of letter sounds; listen to sound clips and manipulate other interactive programs that enhance letter sound articulation.

Arts record the story in image and sound or tell story through film. Drawing and photographing images, adding speech/ music to a photo series.

History guest speaker, audio presentation, clear, correct and accentual speech. Learners could be encouraged to enjoy listening by using animated stories and recorded short stories from resource person about things about immediate environment for example trees, animals, people and encourage them to ask questions or retell parts of the story

Geography economic- read geodata images, geographic positions, debate the concept of total transparency.

Theatre &music listen to wide range of music available for example pop and rap music on phones gives students access to classical jazz, big band. Students can have the opportunity to compare and discuss the differences in these styles. From smartphone, listen and respond to music, perform simple music, coordinate parts of the body as they play music.

Sciences stopwatch can be used to time experiments. In teaching kindergarten environmental activities for example health practices watch videos on different feeding habits, cleaning foods (fruits and vegetables).

CRE show video clips of children reading the holy bible, watch birth of Jesus, listen and watch audio visual materials on events that take place on Christmas festival, display different places of worship.

Smartphones in Classroom Potentials

In classrooms, smartphone are slowly shifting out of the toy and liability- to-attention category and into the tool-and- engaging students' category that is being embraced by teachers who believe in a non- standardized approach to education. Smartphone enhance teaching and learning process. It is used to engage learners in meaningful learning that translates into improved student performance. Effective integration should focus on pedagogy design which takes into account the fact that teachers need to 'learn about technology in the context of their subject matter and pedagogy' (Hughes 2004, p. 347). Additionally, Smartphone can support various types of interactions in the learning environment: learner-content, learner-learner, learner-teacher, and learner-interface.

It is evidenced that the popularization and technological development of mobile phones have given prominence to these devices in m-learning (Xie et al., 2011; Gibson et al., 2012; Buck et al., 2013; Burton et al., 2013). Due to their popularity, mobile phones can contribute to increase access to digital educational content. As portable equipment, they can promote learning both inside and beyond the physical space of educational institutions (UNESCO, 2012). Use of such devices can also contribute to more attractive teaching and learning processes, thus with their applications catering to different learning styles (Buck et al., 2013). Therefore, mobile phones

have the potential to make learning more accessible, collaborative and relevant (UNESCO, 2012).

Batista (2011) lists positive aspects found students' ability to use the keypad, practicability and students' receptiveness regarding the educational use of mobile phone. Research conducted by Tangney et al., (2010); Ndafenongo (2011); Kalloo & Mohan (2012) have shown the possibilities and contributions of mobile phones. Tangney et al. (2010) argue that, given their inherent capacity to motivate collaboration and contextualized learning, mobile technologies have the potential to contribute to pedagogy. The authors provide strategies to develop resources for smartphones aimed at the teaching and learning as well as support teachers in using them. When using these tools and apps, the teacher is free to create learning and to learners, the tool easy to handle, engaging, enjoy working collaboratively. Use of video clips in mobile phones contributed to improve student participation and concentration, to accelerate content development, to stimulate peer collaboration and interaction, and to promote student autonomy.

Options Available

Technological advancements have allowed smart phones to perform various functions with increasingly better performance. However, the use of these devices in educational contexts divides opinions, especially when used in the classroom. Smart phones can support different pedagogical tasks, but may also be responsible for problems such as distractions during classes. Therefore, such use is still facing resistance in formal education.

Interesting ways to use Smartphones in Classroom

Q.R codes- can be used in a classroom to present information such as assignment and get feedback to learners by generating Q-R codes that can be read by their smartphones.

Homework Diaries- for many learners' homework diaries get lost or become tattered, phones can replace them i.e setting work and reminders are easy ways for students to engage with learning.

Quick research- phone is an innovative way to undertake research tasks provided boundaries are set, and then it can prove a great success.

Take picture- take photos of posters or other things that can't be glued inside a book.

Photo rally- use camera to record evidence of items.

Video- when demonstrating a technical sequence for example landform process.

Voice recorder- use a voice recorder as a means of collecting audio evidence/ feedback on work, interview, keywords for revision.

Stopwatch- science teachers can use it during experiments for example for measuring pulse rate in a medicine class.

Captain's log- students can use voice or video at their own time and pace.

Calling expert- teachers can use special apps to make a video or voice with an expert in order to achieve certain objectives.

A fun way of learning language- for example translation with text or picture, spelling by use of flashcards, games or crosswards. Listening to podcasts stories, reading article from pdf reader e-books, google. Writing text messages, projects for example podcasting, visualize lists of vocabulary.

Calculator- this is used for maths and physics

Camera phone- take picture of any text, diagram or interesting scene/ thing.

Digital story telling- this is done through video, webcasting, audio/ video recording, photo sharing among others.

E- reader or text option- students can access full text websites.

Dictionary or word play- students can google to define a word.

Sending message reminders- the subject teacher may send sms reminders for example asking learners to bring particular material, don't forget the homework. The teacher can also receive message (sms) from students thus help teachers to stay in touch with learners who may have particular queries and provide a fast response.

Calendar- teachers may use it for teaching geography for example revolution leap year.

Use study boost to review/study- students and teachers can create a set of study or review questions on this site. The questions are then sent by text to the students so that they can review using their phones.

Use google sms or chacha- student can text questions to google 466458 or chacha 242242.

Create a mobile group- teachers can create a group using services such as remind 101, celly or broad text to send text to students. This is an easy way to send assignment, the sms is sent once and it goes out to everyone.

Class video project- invites students to prepare video, record drama. The whole class can watch the video using projector.

Benefits of Using Smartphones in Classroom

Smart phones improve access to education. M-learning increases access for those who can't physically attend learning institutions. It presents an important venue by which to reduce the gap between the haves and the have nots in contemporary society where to access to knowledge and information is increasingly important (Vanwest, 2005).

M-learning provides a potential way forward for expansion of education programs to larger segments of the population, they do not need to fix phone infrastructure for installation of mobile phone networks (Motlik, 2008), and many people are already familiar with the mobile phone

application. M-learning exerts impact on educational outcomes by increasing access, it represents a continuation and improvement of distance learning through increased utility and application. Literature suggests, broadens the availability of quality education materials through decreased cost and increased flexibility while enhancing the efficiency and effectiveness of education administration and policy.

Promotion of New Learning

It presents more than a mere extension of traditional forms of education, facilitates alternative learning process and instructional methods that the theories of new learning identify as effective learning. According to proponents of new learning, mobiles facilitate designs for personalized learning in a responsive difference and diversity in the way learning occurs. They facilitate authentic learning, lifelong learning, learning that occurs spontaneously in impromptu settings outside the classroom. They make learner-centered possible by enabling students to customized the transfer of and access to information in order to build on their skills and knowledge and to meet their own educational goals (Sharples et al.,2007)

Powerful Participation Tool

Helpful to encourage participation in class by students texting their questions to teachers. It also brings real things to life by taking students and taking photos for example in physical Geography, vegetation. It can be used for note taking, dictation or typing Student may use a voice over recording apps. It is fairly quick and easy to search for information using smartphone thus access library. Free apps will allow them to share their notes and continue collaborating when class is over.

Effective ways of Using Smartphones in Classroom

Pose question and ask students to search for answers. Use an app like poll-everywhere to encourage participation and engagement around the ideas and issues you are presenting in class. **Instant answers;** access to the internet provides for instant answers for example in Botany Biology if they want to know why leaves change colour they only "search away from learning. It also gives students the ability to get an answer to a question they may feel uncomfortable asking in class. If a teacher uses a term they do not understand, they can find the answer without in tempting the class.

Wide Access to Information; Learners can be exposed to a word to create ideas outside their bubble. They can learn another language or teach themselves how to draw, knit or play chess i.e may gain endless array of options available and skills they might not otherwise have access to.

Access to Video; Enhance learning experience by providing instant video access for example man's first step on moon is easier to digest in form of instant video available.

Social Learning; It is a great way for students to share information thought and ideas on a subject. Students who are shy in classroom may blossom in a social learning situation.

Use to Coordinate; They can use it to create dictionary and thesaurus apps thus double checking lyrics on internet to create sound track that applies to current studies.

To Communicate; Establish wasp, twitter and e-mail accounts to share class assignments and reminders, students can read from their smartphones during silent reading.

Create a "scavenger hunt" design activity that focuses on a real-world challenge related to topic, and then have students report their findings.

Smart phone has the ability to browse full websites with large amount of data and it will appear the same way as it is in the desktop browser. Also has QWERTY keyboard which is similar to the computer keyboard. The key board can be hardware (physical keys that you type) or it can be software (on a touch screen like you will find on an IPhones). Smart phones have got application that can help you create and edit Microsoft office documents. Smart phone also has a GPS which can be used to locate place that are new to you. When traveling to unknown places it is a good idea to have a GPS to help you find the place you're looking for. Smart phones will help make your tour navigable. When it comes to messaging a smart phone will send messages and also email messages. A smart phone can synchronize your personal and most likely your professional email account. Some smart phone can support multiple accounts depending on the make and model.

Reasons to Use Smartphones in the Classroom

Students learn in a way they are comfortable. There is a widespread use of smartphones by younger children. More and more students know how to use them and they are becoming the most used 'tool' by children. Students are able to get answers quickly. Smartphones provide the ability to get answers questions quickly. A student may not ask for clarification to a question he or she has in an open classroom hence the use of a smartphone in a classroom setting can provide those answers. The audio and video capabilities of smartphones can bring learning to live within the classroom. This can be done through video images, music and voice. In addition, students can even be allowed to connect with other students from around the world, hence expanding their learning world. The use of the smartphones allows for social learning. Smartphones can allow students to work in groups on projects, sharing information and discoveries. Therefore, the students can move toward a common goal, in a format they are comfortable using. With the widespread use of smartphones by younger and younger students, what are the practical reasons for allowing smartphones as a learning tool in the classroom? Consider these points: Students learn in a way they are comfortable. Smartphones are young-person intuitive. More and more students know how to use them, and they are becoming the most used "tool" by teens. Students can get answers quickly. Smartphones provide the ability to get answers quickly.

In some situations, a student may not ask for clarification to a question he or she has in an open classroom. Use of a smartphone in a classroom setting can provide those answers. Audio and video can bring learning to live. Audio and video capabilities of smartphones can put a voice to John F. Kennedy, a dramatic video image to the Hindenburg disaster, and allow students to hear the music of Chopin or Al Jolson. They can even connect with other students from around the globe and expand their learning world. Smart phones are high end mobile phones which combine the features of personal digital assistants (PDAs) and mobile phones creating a powerful, portable communication tool. They increase students' performance; students can sms text messages to send out vocabulary items at spaced intervals, thus increase students' retention. Text messaging can be used to encourage interactive learning. It also reinforces vocabulary learning by creating flashcards. Voice memo recorder can also be used to collect samples from TV or radio or guest speaker, interview or conversation outside classroom.

Mobile phones are relatively cheap and increasingly powerful (Chinney, 2006). Students enjoy using their phones because of easy access to materials and ability to practice anytime and anywhere in addition some students like the screen size limitations, which make the amount of content more manageable than that of other teaching materials (Chen et al., 2008).

Smartphones have several pedagogical considerations. Most importantly phones are social tools that facilitate authentic and relevant communication and collaboration among learners.

Challenges of Using Smartphones in Teaching/ Learning

Naturally, there is controversy, and quite a few naysayers would rather see their kids find other ways to learn. A school and teachers are beginning to realize that smartphone and tablets are here to stay some are even adapting policies of BYOT (Bring Your Own Technology). Safety and security, skills, competency, availability and finance are current and future interventions will inject the much needed infrastructure, skills and attitude necessary to spur ICT integration for teaching and learning in our schools. It is important that teachers deliberately seek to acquire basic ICT skills as well as enhance their capacity in ICT integration. This will greatly improve their capacity in curriculum implementation. However, despite the potential of mobile phones for educational purposes, schools in general do not make use of them; choosing, quite often, to prohibit their use in the classroom (Seabra, 2013). It is recognized that mobile phones can be responsible for distractions. Machado (2012) discusses ringtones in the classroom, with their variety of musical genres and styles (often amusing) may significantly disturb pedagogical activities as planned by the teacher.

Though a silent practice, texting can also draw attention away from the lesson, as well as be used to send answers of tests or exams. In addition, games, music, videos, photos and access to the internet may compromise student performance in class (Machado, 2012). Therefore, the author understands that, in general, use of mobile phones should be restricted in schools, but that, on the other hand, this equipment can contribute to pedagogical actions as a tool for research and production of answers in tests and exams in more efficient ways than traditional ones. Batista (2011) also identifies these negative points; variety of models and resources in the phones, size of the screen and cost of internet access, smart phone not durable especially when not taken good care of. For example it can malfunction easily when they come into contact with water. It is very expensive to buy compared to other phones. It becomes more complex when it comes to operating because of the many applications which need to be mastered to avoid confusion when operating it. It can only work efficiently where there is accessible internet connection when it comes to browsing. Smart phone cannot be used to store large amount of data due to their storage memory. You cannot depend on smart phone for all your work, you will all need a computer to do some tasks.

Kress & Pachler (2007) use of mobile phones in education is a complex theme which presents positive aspects and difficulties that must be taken into consideration, for example;

Harmful Effects of Digital Device; Much exposure for students who have video screens in front of their faces and headphones on their ears are viewed as harmful.

Inappropriate Materials; Students may access materials which are not relevant for example pornographic.

Child Predators and Cyber bulling; Creates much exposure to and potential danger for the students.

Provide Disconnect; a disconnect of students from face to face social activities, family communication and nature.

Therefore the choice of apps requires special attention, since many are specific to certain operating systems (Batista, 2011). It is also essential to consider that even in other sectors mobile phones can cause trouble. Distraction related to the use of these devices can, for instance, affect work, personal relations, and leisure. Hence, this is a matter that demands pondering even in contexts other than educational. However if used in the proper way, these devices can make great contributions to educational actions According to Richardson (2008) "our students must be nomadic, flexible and mobile learners. They carry a variety of features within a small, often light weight frame.

Conclusions

All the ideas discussed offer increased opportunities for learning by taking advantage of the tool that students are intimately familiar with and carry around all the times. Dealing with challenges of using smartphones may seem difficult but teachers who have used them have found it to be a worthwhile pedagogical investment

Reference

Batista, S. C. F. (2011). M-LearnMat: Modelo Pedagógico para Atividades de M-learning em Matemática. Tese, Doutorado em Informática na Educação, Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre, RS, Brazil

Boriachon, J., & Dagouat, C. (2007). Internet Evolution: From web 1.0 to web 3.0. London: ECE-AAU.

Buck, J. L., McInnis, E., & Randolph, C. (2013). The new frontier of education: the impact of smartphone technology in the classroom. Proceedings of the ASEE Southeast Section Conference, Atlanta, GA, United States, 120, 11p.

Burton, L., Cobb Jr., R., Kateeb, I. A., Tsay, Li-S., Seay, C., Graham, T. E., & BouSaba, C. (2013, June). Mobile teaching: merging smart phones, cloud, and desktop to achieve content-specific instruction in a generic environment. Proceedings of the ASEE Annual Conference and Exposition, Atlanta, GA, United States, 120, 12 p.

Chen, N. S., S. W. Hsieh, and Kinshuk. 2008. Effects of short-term memory and content

Chinnery, G. 2006. Going to the MALL: Mobile assisted language learning. Language Learning and Technology 10 (1): 9–16.

Cochrane, T., & Bateman, R. (2010). Smartphones give you wings: Pedagogical affordances of mobile Web 2.0. Australasian Journal of Educational Technology, 26(1), 1-14. Retrieved from http://www.ascilite.org.au/ajet/ajet26/cochrane.pdf

Davidson, L. K. (2011). A 3-Year experience implementing blended TBL: Active instructional methods can shift student attitudes to learning. Medical Teacher, 33, 75-753.

Gibson, J., Taylor, T., Seymour, Z., Smith, D. T., & Fries, T. P. (2012). Educational aspects of undergraduate research on smartphone application development. Proceedings of the World Multi-Conference on Systemics, Cybernetics and Informatics (WMSCI 2012), Orlando, FL, USA , 16, 211-216.

GIL, A. C. (2008). Como elaborar projetos de pesquisa. São Paulo: Atlas.

http://cmais.com.br/educacao/celular-na-escola-o-que-faze

Kalloo, V., & Mohan, P. (2012, April). MobileMath: an innovative solution to the problem of poor Mathematics performance in the Caribbean. Caribbean Teaching Scholar, 2, 1, 5-18.

Kress, G., & Pachler, N. (2007). Thinking about the 'm' in m-learning. In N. Pachler (Ed.), Mobile learning: towards a research agenda (pp 7-32). London, UK: WLE Centre/Elanders Hindson Ltd.

Machado, J. L. A. (2012). Celular na escola: o que fazer?. Retrieved October 03, 2013, from

Ndafenongo, G. (2011). An investigation into how cell phones can be used in the teaching of Mathematics using Vitalmaths video clips: a case study of 2 schools in Grahamstown, South Africa. Thesis, degree of Master of Education, Rhodes University (Faculty of Education), Grahamstown, South Africa.

October). MobiMaths: An approach to utilising smartphones in teaching mathematics. Proceedings of the World Conference on Mobile and Contextual Learning (mLearn2010), Valletta, Malta, 9, 9-16.

Pachler, N., Bachmair, B., & Cook, J. (2010). Mobile Learning: Structures, Agency, Practices. New York, USA: Springer.

representation type on mobile language learning. Language Learning and Technology 12 (3): 93–113.

Scrimshaw, P. (2001). Computers and the teacher's role. In C. Paechter, M. Preedy, D. Scott, & J. Soler (Eds.), Knowledge, power and learning, pp. 140-147. London: Sage.

Seabra, C. (2013). O celular na sala de aula. Retrieved October 01, 2013, from ://cseabra.wordpress.com/2013/03/03/o-celular-na-sala-de-aula/

Tangney, B., Weber, S., O'Hanlon, P., Knowles, D., Munnelly, J., Salkham, A., Watson, R., Jennings, K. (2010,

UNESCO (2012). Turning on Mobile Learning in Latin America: Illustrative Initiatives and Policy Implications. [Working Paper Series on Mobile Learning]. Paris, France. Retrieved October 05, 2013, from http://unesdoc.unesco.org/images/0021/002160/216080e.pdf

UNESCO (2013). Policy guidelines for mobile learning [Guidelines]. Paris, France. Retrieved October 04, 2013, from http://unesdoc.unesco.org/images/0021/002196/219641e.pdf

Xie, A.; Zhu, Q., & Xia, H. (2011, July). Investigating College Major Differences in the Need of Mobile Phone Learning. Proceedings of the International Conference on Multimedia Technology (ICMT), Hangzhou, China, 399-402.

Assessing Skills Supply and Youth Employability in Kenya: secondary school education graduates training (miss-) match with Mumias Sugar Company labour market needs

Stephen O. Odeber& Simala IK Associate Professor of Education Planning, Masinde Muliro University of Science and Technology,
Kenya.email:sodebero@mmust.ac.ke,sodebero@yahoo.co.uk,mobile:+254722995895

Abstract

In recent years concerns have arisen about growing disparities between education and labour market needs with new focus on the roles of both quantity and quality of human capital in the development process. This study assesses skills supply and youth employment at Mumias Sugar Company in Kenya, identifying skills gap as one of the major challenges that face labour market growth in the country. This study is guided by Labour Market Analysis Approach (LMA). LMA refers to measures of education and training requirements that are used to translate occupational classifications into skills requirements. LMA identifies and continually adjusts to current short-term needs.

The study adopted demand and supply theories as espoused by Livingstone who believes that supply-demand theories provide better explanations of education-employment relations and uses them to argue that underutilization of knowledge and underemployment will be most common among those with the least power, including younger people. These theories also hold that demand – the number and types of jobs available – is influenced by "competition, technological innovation, and conflicts between employers and employees over working conditions, benefits and knowledge requirements" (Livingstone, 2002) and that the supply of labour is altered by changes in population, household needs and legislation. At the same time, the demand for education increases as people seek the knowledge, skills and credentials needed in a changing society. To understand labour market needs at Mumias Sugar Company, data was collected on openings, placements and un/employment rates so as to provide information which was analyzed for insights into shortages and/or surpluses. Shortages were reflected in high levels of un/employment and salary scales. The data also contained concrete information about the skills and qualifications that the sugar company is looking for in certain positions which contribute to occupational profiles. Particularly, profiles of employees who are secondary school graduates were studied so as to understand the skills they possess and were triangulated against skills required by the company. Interviews were held with secondary schools graduates working at Mumias Sugar Company in various positions to know a great deal about the scarcity or abundance of both soft and hard skills and hiring practices. Findings indicate that specific skills prioritised by MSC for employment include fabrication of bolts, and other machines that could be used at the plant. This is especially in the factory where breakdowns are common and some of the parts that breakdown may not be accessible easily yet they need urgent repair and maintenance. Direct and intense interaction between the workers and machines is emphasised in order to fully understand the behaviour of the machines and fellow workers. The study concludes that whereas the hard skills such as literacy and numeracy which are emphasised in secondary school curriculum are desirable in Mumias Sugar Company, they cannot guarantee

one any formal employment. This is because such skills were found important only for further tailor made training.

Key words: employer, supply, Mumias Sugar Company (MSC), skills, employment, training, market needs.

Background

Today Kenya faces youth employment challenges which, if not addressed, threaten economic development and social stability. Youth employment has become a major policy issue in the country with the focus on labour market needs and youth employment skills especially for secondary school graduates and higher unemployment rates in both urban and rural areas. In recent years concerns have arisen about growing disparities between education and labour market needs with new focus on the roles of both quantity and quality of human capital in the development process (see ILO,1995&1999; Vision 2030). It is within this context that this study assesses skills supply and youth employment at Mumias Sugar Company in Kenya, identifying skills gap as one of the major challenges that face labour market growth in the country. The study looks at policy options necessary to improve employment opportunities for secondary school graduates.

A fast changing labour market country context that takes account of the impact of technological revolution and increasing young population requires a reshaping and mobilisation of labour market programmes and services to meet current and future needs of enterprises and individuals. Currently, main challenges facing Kenya include the need to: raise skills levels of the labour force (both employed and unemployed) to improve employability and secure and maintain employment in line with objectives of Vision 2030; avoid potential skills mismatch by ensuring that secondary school students receive training in skills relevant to the needs of enterprises of existing job opportunities or those that will arise from replacement needs, start ups and expansions; and facilitate improved access to training, education and employment service provision for young Kenyans in schools

This study acknowledges the importance of skills to the economic and employment reform agenda in Kenya in terms of matching skills profiles to labour market needs, raising investment in human capital at secondary school level and adapting secondary education and training system to meet emerging challenges. It calls for a renewed endeavour to build employment pathways to young people and reduce youth unemployment and also stresses the importance of improving the matching of labour market needs and adapting secondary education and training systems in response to new competence requirements. By proposing an initiative which aims at providing a more coordinated approach, it is hoped that the findings will make key contributions to the identification of labour market trends and skills shortages at both sector and national levels, and within both short- and long-term perspectives and also contribute to the increase of employment and the reduction of both frictional and structural unemployment for young people.

Research Problem

Kenya faces labour market demand and supply problems. The most important characteristic of employment in the country is that a high percentage of the job-seeking population are secondary school graduates who have little chance of gaining formal sector employment. Yet, skills development is a critical element in achieving the economic goals which the country has set for

herself (see Kivuva, 2002; Republic of Kenya,1988, 2005a,b,c; 2007). Although the Government is aware of this fact, it has not fully succeeded in taking advantage of emerging opportunities by matching the demand for labour with new skills and by creating an adaptable young workforce that can adjust to changing labour market conditions and needs. A major public policy concern that has emerged in recent years is whether there is a good match between the skills and knowledge that are supplied to the labour market and the skills and knowledge employers require (Abagi & Owino, 2000; Ferej, 2000). From the perspective of school leavers entering the labour market, the issue is the extent to which they are able to find employment that uses their skills. From the employer perspective, the concern is whether they are able to find suitably skilled staff from among secondary school graduates. This research uses the Mumias Sugar Company to analyse the relationship between the two.

The study focuses on demand-supply issue at Mumias Sugar Company (MSC) as a youth labour market, and if and how well the knowledge and skills that secondary school graduates gain are utilized on the job. The findings will raise concerns about labour market needs and about whether the skills and knowledge gained by young secondary school leavers are fully used in the jobs they find. There appears to be a mismatch between what secondary school graduates are being trained for and the requirements in the job market. While recognizing the variety of challenges facing Kenya, the common problem in the country is that investments in education and training are not yet resulting in satisfactory levels of productive employment.

Purpose for the Study

The goal of this study was to assess skills supply and youth employability in Kenya in general, but with a narrower focus on secondary school education and training in meeting labour market needs. The aim of the study was to critically examine secondary education graduates training (mis-) match with Mumias Sugar Company labour market needs. More specifically, the research undertook to:

Identify employment skills needed by Mumias Sugar Company;

Identify the core skills possessed by secondary school graduates;

Rationale for the Research

Kenya has a high educated secondary school graduate population (Amutabi, 2003; Makau, 2000). Debate among policy and decision makers over how to tackle youth employment challenges in the country has been characterised by significant frustration. Secondary school education and training do not seem to result in the creation of more jobs nor materialise into anticipated employment benefits (Ikiara & Ndung'u, 1997). It is not certain that young people are able to fully contribute their skills and abilities to growth and development through gainful and meaningful employment. Much of existing research in Kenya deals largely with the training side of the labour market (see Haji, 2007; Manda, Mwabu & Kimenyi, 2002). A majority of studies have examined issues related to providing young people with skills and knowledge for their future careers (GoK, 2002; Manda, 2004).The increasing demographics, effects of climate change on the economy, impact of information technology and communication, and global transformations in general, have made labour markets and the adaptation to socio-economic changes even more imperative.

However, there is opportunity for the country's future skills supply and labour market needs to be transformed. Thus, this study focused on the relationship between supply and demand needs in the youth labour market in Kenya with a focus on Mumias Sugar Company. The company was chosen because it is representative of the formal employment sector and owing to the role it plays in economic development of the country. Moreover, the company has now resorted to retraining secondary school graduates in its employment in an expensive apprenticeship programme that is affecting its profit base. Thus, the research is interested in assessing the match between skills and labour market needs as one of the main factors for youth unemployment in the country and how to ensure that secondary school education and training improve their capacity to generate more and better skills attuned to present and future labour market needs. The study will make recommendations for improving the connections between the demand and supply sides of youth labour market in Kenya, including greater support for vocational options in secondary school; developing better bridges between secondary school educational paths; and strengthening partnerships between secondary schools and employers in the design and delivery of programs and career information.

Methodological Approach

This study was guided by Labour Market Analysis Approach (LMA). LMA refers to measures of education and training requirements that are used to translate occupational classifications into skills requirements. LMA identifies and continually adjusts to current short-term needs (Canadian Council on Learning, 2007). Labour market analysis can take four different forms: Public Employment Services/Job Advertisements; Key Informant Interviews; Employer Surveys/Household Surveys; and Enrolment Data and Tracer Studies (Psacharopoulos, 1991). All the four forms were used as a supplement to increase the accuracy of projection techniques, as well as their applicability to national and sectoral projections.

Data on secondary school training and skills development and labour market needs at Mumias Sugar Company used in this report was sought from various sources. The Workplace and Employee Survey (WES) was designed to explore a broad range of issues relating to Mumias Sugar Company as an employer and her employees. The survey was aimed at shedding light on the relationships among competitiveness, innovation, technology use, and human resource management on the company side and skills, technology use, training, job stability, and earnings on the employee side. The survey frame of the workplace component of the WES was created from the information available from MSC.

To understand labour market needs at Mumias Sugar Company, data was collected on openings, placements and un/employment rates so as to provide information which was analyzed for insights into shortages and/or surpluses. Shortages were reflected in high levels of un/employment and salary scales. The data also contained concrete information about the skills and qualifications that the sugar company is looking for in certain positions which contribute to occupational profiles. Particularly, profiles of employees who are secondary school graduates were studied so as to understand the skills they possess and were triangulated against skills required by the company.

Interviews were held with secondary schools graduates working at Mumias Sugar Company in various positions to know a great deal about the scarcity or abundance of both soft and hard skills and hiring practices. Because the sugar company makes hiring decisions, it provided information on skills needs, and the types of jobs that are expanding and contracting. In-depth information was gathered from Mumias Sugar Company and her employees by way of surveys

and interviews. This information provided details that are necessary to supplement data already gathered.

Theoretical framework

The relationship between learning outcomes and labour market needs have been analyzed by among other scholars Livingstone (2002) who identifies three groups of theories: supply-side, demand-side, or a combination of the two. Supply-side theories, such as "human capital" theories, suggest that more education gives workers the "intellectual capital" needed for a more productive economy. That is, as the level of education rises the demand for those skills rises and contributes to economic development.

Supply-demand theories emphasize relationships among education, employers and state agencies. Employers and some employee groups may raise entry criteria when there is an oversupply of employees, and thus use formal education to screen admission to jobs. This leads to the idea of a "credential society" in which job entry can be controlled by groups with the power to increase qualifications. These theories would also argue that both an undersupply of qualified applicants and greater productivity could lead to changes in job performance requirements.

Demand-side theories hold that employees and employers react to trends, rather than influence them, and the theories might be either optimistic or pessimistic. Optimistically, demand-side theories argue that the educational system needs to produce workers with the complex analytical skills needed by a "knowledge-based economy." Pessimistically, the theories argue that underemployment and unemployment will result as modern production systems lead to deskilling of job requirements or automation.

Livingstone believes supply-demand theories provide better explanations of education-employment relations and uses them to argue that *underutilization* of knowledge and *underemployment* will be most common among those with the least power, including younger people. These theories also hold that demand – the number and types of jobs available – is influenced by "competition, technological innovation, and conflicts between employers and employees over working conditions, benefits and knowledge requirements" (Livingstone, 2002) and that the supply of labour is altered by changes in population, household needs and legislation. At the same time, the demand for education increases as people seek the knowledge, skills and credentials needed in a changing society. Thus, in Livingstone's analysis, there are always "mismatches" between employers' requirements and the supply and qualifications of job seekers. The use of education as a screen or filter applies most obviously and appropriately to specialized occupations, whether they are trades or professions. However, employers use education as a filter for non-specialized occupations as well. In any case, the aims of education are broader than a specific occupation and broader than imparting basic knowledge and skills to youth.

Referring specifically to the mobility involved in finding a match between worker and employer, Sofer (2000: 11) observed that there is no unanimously accepted single theory of that mobility. She goes on to note that alternative theories to explain supply and demand have developed largely because of the lack of relevant information on training and the characteristics that lead to a good match.

This study observes the linkage between secondary school education skills supply and the needs of Mumias Sugar Company and seeks to identify key policy issues that need to be addressed for education to contribute to positive labour market outcomes. It argues that educational outcome at secondary school level such as knowledge, skills and certificates, determine employability at the company. A general versus technical or vocational educational track has strong repercussions on labour market needs. Certificates attained and grades completed after secondary education often remain among the key determinants of labour market outcomes because school graduates who have an adequate skills and knowledge have more chances of ending up employed at Mumias Sugar Company. The mix between skills supply and employability is conceptualised diagrammatically as follows:

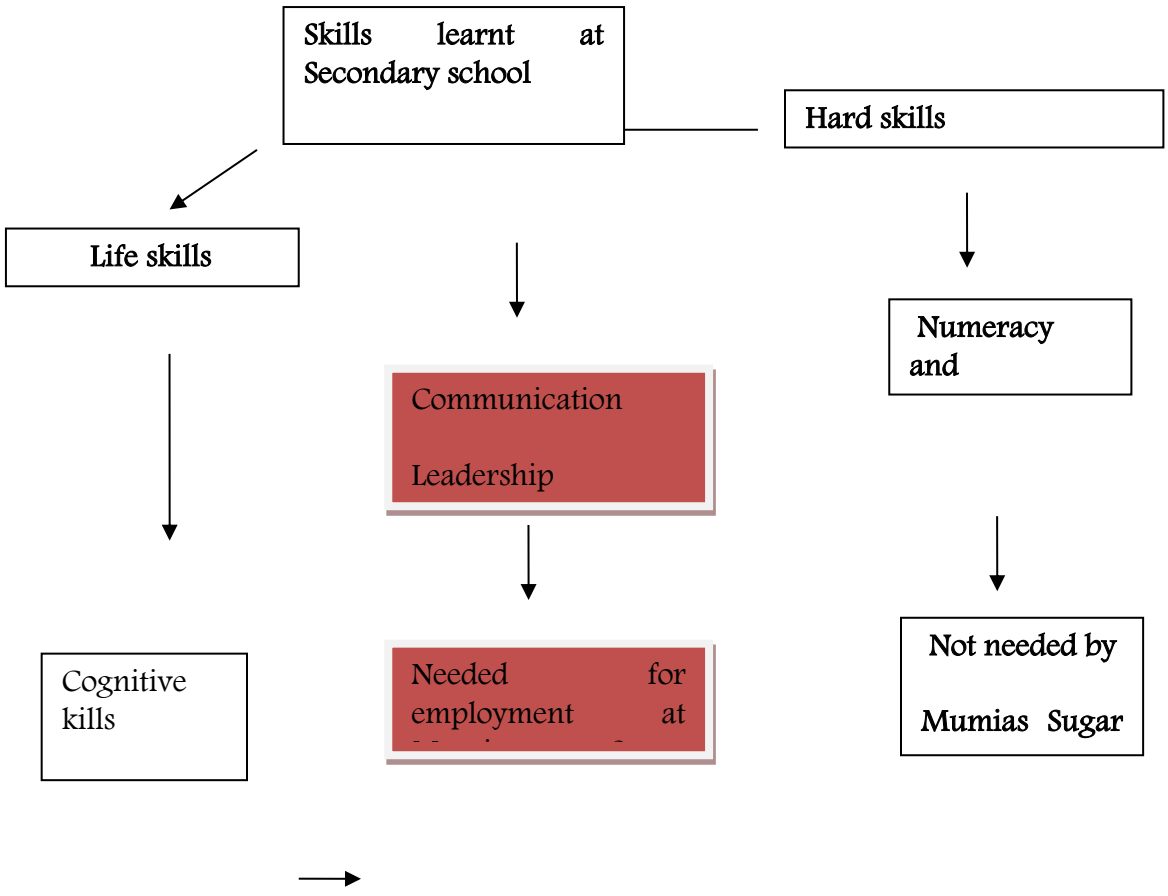


Figure 1:

Figure 1: Organogram of skills supply and employability at MSC

Figure 1 outlines three various perspectives that are used to explain relationships between skills learnt at secondary school and labour market needs at Mumias Sugar Company.

Significance of the Study

The current unemployment situation of young people in Kenya is worrisome. Yet the young people are the future of the country. The country faces major challenges in generating sufficient employment to meet the aspirations of its rapidly growing population. Failure to tackle these now will entail substantial social and economic costs in the future. However, there are several practical ways to address the challenges.

Generally, this research is about making it easier for secondary school graduates to get the right skills and competences and to be able to use them in the appropriate jobs. By bringing the worlds of education, training and work closer together, this study focuses on effective skill development and effective skill utilisation. Enhancing relationship between skills provision and employment will ensure the responsiveness of education and training systems to the needs of the labour market.

This study is premised in the fact that employers have the potential to play an important role in the school-to-work transition, by helping students make more informed choices about their learning and career pathways. Employers can contribute in many ways about career opportunities, and by mentoring young people. Education policies and employer practices could help more young people in Kenya make an informed choice about learning pathways leading to a career and improve the level of utilization of skills in the labour market. As Kenya's demographic situation changes and more young people enter the labour market, the rate of growth of the labour force will increase. Sound human capital development policies for Kenya's youth will become increasingly important so that the country does not waste the youth's potential.

Specifically, the study argues that secondary school education policies need to be seen within a broader macroeconomic context if it is to contribute to national economic growth. The *World Development Report 2007* suggests that although curricula and teaching methods have remained largely unchanged in developing countries over the years, employers are increasingly demanding strong thinking, communication, and entrepreneurial skills—demands which are largely un-met by educational systems in developing economies including Kenya. Both general and core competencies and skills have become increasingly valuable in labour markets that are characterized by change and in which there is a constant need to adapt to new developments in technology and working methods.

Research Findings

Employment skills needed by Mumias Sugar Company

Specific skills prioritised by MSC for employment include fabrication of bolts, and other machines that could be used at the plant. This is especially in the factory where breakdowns are common and some of the parts that breakdown may not be accessible easily yet they need urgent repair and maintenance. Direct and intense interaction between the workers and machines is emphasised in order to fully understand the behaviour of the machines and fellow workers. The interaction also helps the worker to detect the common faults and understand trouble shooting machines, appliances, and the logical but urgent solutions. Machine operations in many instances require concentration and quick decisions that can stem huge losses. This is only possible when the worker has experience with the running of the machines, servicing and

detection of trouble shooting, malfunctions detection in the sugar plant and power generation points. As one of the respondents succinctly observed:

However well you are trained, without interaction with the machines and power generation, you can take an extremely long time trying to detect malfunctions within the factory. This can occasion the factory huge losses. On the contrary, an experienced person may simply take minutes to detect the fault and will save the company from incurring huge losses. In essence interaction with machines helps one to identify strategic points. [Lf 1]

This view was supported by another respondent who is one of the senior managers of the company and who entered the company through apprenticeship. He viewed secondary school curriculum as being rich in theory. He observed that the school curriculum builds the basics which are important for further training. However, he noted that such basics only, cannot earn the graduates a job in their company. He comments:

In apprenticeship, you reach a level where the sound only can wake

you up from your sleep because you can detect that something is

wrong. Meanwhile, for lay persons, they will think you are crazy

seeing you agonize over a perfectly running and productive plant.

(sic) [Lf2]

Asked about critical skills required for employment, the respondents noted that premium is placed on practical skills in mechanical engineering, electrical skills, fabrications, and production engineering. However, knowledge of such skills is not a guarantee for employment; rather, a surety to employment is intense interaction with the plant and other workers to the level of becoming part of the system. Such interaction is the source of smooth succession in retirement, resignation, interdiction, dismissals, leave of absence, deaths, promotions, and other forms of attrition.

Conclusions and recommendations

From the findings of the interviews, it does emerge that whereas the hard skills such as literacy and numeracy which are emphasised in secondary school curriculum are desirable in Mumias Sugar Company, they cannot guarantee one any formal employment. This is because such skills were found important for further tailor made training. On the contrary, life skills such as cognitive thinking, innovation and decision making were found critical to the company's existence and therefore important for employment. However, from the respondents' perspective, the life skills were gained only through intense interaction with the machines and other workers within the company. In essence then, it means that schools only play a complimentary role to the employers by providing hard skills in numeracy and literacy which the company relied on to train their staff for employment at Mumias Sugar Company.

Interviews [coded in the text]

Lf1. Interview with one of the employees with MSC, June 30th 2012 [12.30-1.00 pm]

Lf2. Interview with a senior manager at MSC, July 1st 2012 [9.30-10am]

References

Abagi, O., Owino, W. *et al.*, 2000 'Implementing the report of commission of inquiry into the education system in Kenya (Koech Report): Realities, challenges and prospects', Nairobi: Institute of Policy Analysis and Research.

Amutabi, M.N. 2003 The 8-4-4 system of education. *International Journal of Educational Development.* 23 pp.127-144.

Bartel, Ann P., and Nachum Sicherman. 1998. "Technological Change and the Skill Acquisition of Young Workers." in the *Journal of Labour Economics*, Vol. 16, No.4: 718-755.

Canadian Council on Learning (2007). Is it Possible to Accurately Forecast Labour Market Needs? Ministry of Advanced Education, January, 10, 2007.

Dede, C., and M. Lewis. 1995. *Assessment of Emerging Educational Technologies That Might Assist and Enhance School-to-Work Transitions*. Washington, DC: National Technical Information Service.

Ferej, A. K 2000 The integration of youth into the informal sector: the Kenyan experience. *In the Transition of Youth from School to Work: Issues and Policies, Edt David Atchoarena.* IIEP, Paris.

Government of Kenya,2002. *National Youth Policy*. Ministry of HomeAffairs, Heritage and Sports.

Government of Kenya 2001. *Economic Survey*, Nairobi: Government Printer.

Government of Kenya 2000. *Interim poverty reduction strategy paper 2000-2003.* Nairobi: Government Printer.

Government of Kenya (1996). *Sessional paper number 2 of 1996 on industrial transformation to the year 2020.* Nairobi: Government Printer.

Haji, Semboja Haji Hatibu 2007, 'The Youth Employment in East Africa: An Integrated Labour Market Perspective', in *African Integration Review Volume 1, No. 2*

Handel, Michael J. 2003. "Skills Mis-match in the Labour Market." *Annual Review of*

Sociology Vol. l, No. 29: 135-165.

Ikiara G.K and N.S. Ndung'u 1997. "Employment and labour market during adjustment: the case of Kenya". Geneva: ILO.

Kivuva, L.A. 2002. *Secondary education reform in Kenya: The quest for quality, relevance and equity* (web edition Ed.), www.ginite.org/cstudies/africa/cs-africa.htm, The World Bank.

Manda, Damiano Kulundu 2004, 'Globalisation and the Labour Market in Kenya' Kenya Institute for Public Policy Research and Analysis *KIPPRA Discussion Paper No. 31*

Manda D.K., G. Mwabu and M. Kimenyi 2002, "Human Capital and Returns to Education in Kenya", Discussion paper No 13, KIPPRA, Nairobi.

Psacharopoulos, G. (1991). From manpower planning to labour market analysis. *International Labour Review, 130*(4), 459-70.

Republic of Kenya 1988 *Sessional Paper No. 6 of 1988 on Education and Manpower Training for the next Decade and Beyond.* Nairobi: Government printer.

Republic of Kenya 2005a. Ministry of Labour and Human Resource Development (MLHRD) Strategic Plan. Nairobi: Government Printer.

Republic of Kenya 2005b. *Kenya Education Sector Support programme 2005-2010: Delivering quality education and training to all Kenyans.*

Republic of Kenya, 2005c. *Sessional Paper No. 1 of 2005 on a Policy Framework for Education, Training and Research: Meeting the Challenges of Education, Training and Research in Kenya in the 21st Century.* Nairobi: Government Printer.

Republic of Kenya 2007. *Kenya Vision 2030: A Competitive and Prosperous Kenya.* Nairobi: Government Printer.

Makau, Peter Muia 2000 'Issues in Labor Resource Management in Kenya', Paper Presented at Centre for Economic Studies in Africa, School of Business Montclair State University Upper Montclair, New Jersey

Analysis of Human And Social Capitals And Community Participation In Development Initiatives Among The Rural Households In Coastal Region Of Kenya

[1]Ong'ayo, A H. and Hassan, F. A.

Pwani University, P.O. Box 195 - 80108,Kilifi, Kenya

e-mail: aong_ayo@hotmail.com cell-phone: +254-0722617028

Abstract

Community participation in development initiatives as beneficiaries of the intended outcomes is important to the Government and development partners as implementing agencies. Community capitals which include cultural, human, social and built capitals play a crucial role in determining the extent communities participate in projects and programmes implemented by development agencies. The present study sought to establish the human and social capitals that determine community participation in projects and programmes implemented by the Kenya government and development partners among the rural households within the coastal region of Kenya. The research was carried out in the three counties of the coastal region. Multi-stage sampling techniques namely purposive, proportionate random and simple random sampling was used to select the study area and the study sample. Data were collected using semi-structured questionnaire Focus Group Discussion and observation schedules. The data analysis was done using descriptive statistics and regression analysis with the help of the Statistical Package for Social Sciences Version 22. The findings revealed that households heads with human capital namely Primary and Secondary education, training, and occupation have a higher likelihood of participating in development initiatives. While households with the social capital namely membership to groups engaged in economic activities and have linkages with development agencies, have a likelihood of participating in development initiatives. Key policy recommendations for county government and development partners includes: encourage the community members to enrol in adult education, provide support for vocational and technical training, register as members in existing groups or form groups based on common interest and engage in economic activities. The county government to enhance advisory services to ensure close contact with professional who will facilitate training, meetings and interactions with groups consequently members' empowerment.

Keyword: Household, Participation, Human capital, Social capital, Development initiatives

Corresponding author: Ong'ayo, A H.

Introduction

Community participation has been recognised by many international development agencies as a vital component for sustainable development (Cornwall, 2009). The concept of community participation originated about 40 years ago from the community development movement of the

late colonial era in parts of Africa and Asia. The concept has been recognized as an important element since the early 1990s as a means of improving local welfare, training people in local administration and extending government control through local self-help activities ((Ayman, 2011; McCommon, 1993).Today, community participation has developed as one of the major models of development gaining acceptance across the spectrum of development actors as a means of improving development practice related to grassroots community development initiatives and viewed as a basis for project success (Cornwall, 2009). In recognition of its vitality to community development, community participation has been referred to as the heart that pumps the community life blood (Reid, 2000).

The concept of participation came to be popularised and institutionalised in the 1990s as a novel, common-sense way of addressing development discourses and practices of many mainstream development organizations. It has earned its status as an orthodoxy with promises of giving 'the poor' a voice and a choice in development and an essential ingredient in getting development interventions and policies right (Cornwall, 2006). Participation is commonly understood as the collective involvement of local people in assessing their needs and organizing strategies to meet these needs in partnership with the national government, county government, local organizations and external development partners. (Zaku and Lysack, 1998 cited in Cuthill, 2010).

Community participation in development initiatives is associated with attainment of benefits. The accrued benefits include: a) enhancement of the relevance of programmes to ensure that they are all suited for the needs and circumstances of the beneficiaries (Kironde & Kihirimbanyi,2002 cited in Cuthill, 2010); b) ensures that the views of many stakeholder groups are represented in the development process (Cullen, Coryan & Rugh, 2011); c) expectations that the programmes decisions that feed on the insights of many stakeholders are not just relevant to the beneficiaries, they are generally smarter (Weaver & Cousin, 2004, Cullen et al., 2011); d) greater programme outcomes such as greater access to social services (Bedelu, Ford, Hilderbrand & Reuter, 2007), consumption and demand for services (Kilpatrick et al., 2009); e) programme sustainability due to greater sense of ownership and responsibility for programmes activities by stakeholders by willing, able to mobilize and commit local resources to continue some or all of the programmes proceeds after external support is withdrawn or reduced (Oakley, 1992).

In an attempt to understand effective community participation in development initiatives implemented by government and development partners either on their own or in partnership to attain the benefits associated with it, it is important to examine the factors that influence their participation. Research on community participation in development has focused on demographic and socio-economic factors among other s as factors that influence community participation. For instance, Bauma et al., (2000) argues that the level of participation in social and civic community life is significantly influenced by individual socio-economic status and other demographic characteristics. Supporting this line of thought, Plummer (2002) describes factors such as skills and knowledge, employment, cultural beliefs, gender, education and literacy social and political marginalization to be key in affecting community participation. Recent research on community participation in development has broadened focus and included community capitals namely: human, social and institutional factors and the interaction among these components of the community (Cote, 2001, cited in Cuthill, 2010). A theoretical analysis of community participation by Nkwake, Trandafili, & Hughey (2013) revealed that Communities have seven types of capital which influence community or individual participation in development initiatives. Community capitals include cultural capital, social capital, human capital, built capital, natural capital and political capital. Assessing levels of community capital

is an effective way of measuring a community capacity to participate in development initiatives for change (Flora & Flora, 2008). It is important to examines the extent the community capitals influence community participation in development initiatives among households.

Human capital is defined as a key factor of individuals' Cadile et al. Human capital includes characteristics of individuals that strengthen one's ability to earn a living and provide for one's community, family and self-improvement. It consists of one's personal assets such as health of individual, formal education, skills, intelligence, leadership and talents (Flora & Flora. 2008). While human capital consists of a variety of personal assets, Becker (2002) states that human capital which includes, schooling, on-the-job training, health information and research, is the most important form of capital in economies of success of individuals and the whole economies which depend on how extensively and effectively people invest in themselves. Becker (2002) asserts that human capital stimulates technological innovations and high tech sector and identifies education and training as the most essential forms of human capital which are associated with individual occupation. In the theoretical analysis of the scientific literature, Ciutiene and Railaite (2014), concludes that human capital includes a wide range of different components, such as knowledge, experience, competency, health among others which are necessary for achieving development.

While there are many definitions of social capital, Fine (2001) defines social capital as the development of networks in which community residents can identify problems, share information, and implement strategies designed to solve problems for the benefit of all. Putnam (1993) defines social capital as features of social organizations such as networks, norms and trust that improve performance of a society by facilitating coordination actions for mutual benefits. Social capital is manifested in the relations among people (Coleman, 1988). According to Coleman, social capital resides in people's minds and influences their relationships with each other or plan to interact and may produce potential benefits, advantage and preferential treatment from another person of group beyond that expected in an exchanged relationship. Narayan and Pritchett (1997, cited in Lindon et al., 2002) and Heller (1996) argue that increased social capital leads to increased community cooperative action and solves local community property problems and economic development, strengthens linkages among the individuals that speed the diffusion of innovations, quantity and quality of information, reduces transaction costs, pools risks and allows households to pursue more risky and higher return activities. Social capital is within two context of economic development policy. The one that is bottom-up development depends on intra-community ties which is referred to as integration and extra-community networks referred to as linkages. The other is top-down development which involves state-society relations referred to synergy and institutional coherence, competence and capacity which are called organizational integrity (Woolcock, 1998). In other words, social capital is inherent in individuals and interaction with others.

In Kenya today, participation of the community is mostly done through structures such as groups namely: Community Based Organizations (CBOs), Common Interest Groups (CIGs), and Faith Based Groups (FBGs) which according to Putnam (1993, cited in Cuthill, 2010) are social capital specifically formed for the purposes of achieving common good projects (Hassan et al., 2018; Ong'ayo et al., 2017) and which are among the growing mechanism for channelling development assistance (Khwaja, 2004). The groups have served as instruments for consultation with supposed beneficiaries about planning and implementation of community projects (Hassan et al., 2018; Ong'ayo et al., 2017). The groups are formed on the basis of interest and for the purpose of sharing of technologies and information on new innovations, networking, forming linkages with other likeminded individuals, groups and professional the viability of the groups

is determined by the both acquired and inherent in the individual (Ong'ayo et al., 2017) The participation is strengthened by both inherent and acquired individual ability and anticipated gains which include literacy levels, gender, skills, knowledge, and training (Flora & Flora, 2008).

The Kenya government both at national and county level and development agencies have implemented various development initiatives at the coastal region with the goal of alleviating poverty among the rural households. About 69.7% percent of the coastal population live below the poverty line, with some areas such as Ganze in Kilifi scoring an alarming 84 percent making it the second poorest region of Kenya's eight regions after North Eastern with 73.9 percent (Government of Kenya, 2008). Many development initiatives have been implemented with a focus on ensuring community participation for empowerment. The projects include Kenya Coastal Development Project (KCDP), Hazina Ya Maendeleo ya Pwani sub-component of KCDP, Health Service Project (HSP) funded by Danish Development Agency (Danida), Agricultural Sector Projects (ASP) funded by Kenya Government in collaboration with development partners, Regional Water Development Projects, United Nation Development Programmes (UNDP) among others (Danida Ministry of Foreign affairs, 2004).

The Objective of the Study

The study was guided by the following specific objectives: To identify the human and social capitals of the households, and to establish the extent the two forms of capitals determine rural households' participation in development initiatives implemented among them by the government and development partners and organizations.

Methodology

The study was carried out in three counties of the coastal region of Kenya namley namely: Tana River, Kwale and Kilifi. The climate of the region varies with distance from the coast and it becomes drier towards the inland from the ocean and from south to north (Nicholson et al., 1999).Covering an area of approximately 83,000km^2, the coast region has a population of approximately 3.3 million people with a birth rate of 3% (Government of Kenya, 2009). About 69.7% percent of the coastal population lives below the poverty line, with some areas such as Ganze in Kilifi scoring an alarming 84% making it the second poorest region of Kenya's eight regions after North Eastern with 73.9% (Government of Kenya, 2013).

The target study population was an estimated 3.3 million people of the communities living in coastal region currently (GoK, 2009). The accessible population was the 2,160 community members drawn from the groups that participated in different development initiatives implemented in the region by the government either on its own or in partnership with development partners.

The study used a combination of simple random sampling, proportionate random sampling, purposive sampling and techniques. First simple random sampling was used to select three Counties since participatory approaches have been used for implementation of development initiatives in all the six counties. Purposive sampling was used to select the three sub-counties. Proportionate random sampling was used to select households. Two hundred and twenty six households were sampled. According to Kathuri and Pals (1993), a sample of 100 respondents or more is appropriate for a survey study. This is large enough for data collection. With a large

sample, the researcher is confident that if another sample of the same size were to be drawn, findings from the two samples would be similar to a high degree (Bordens & Abbort, 2008). Sampling Frame for households from the selected sub-counties was obtained and arrangements made on when to visit the field and administer the questionnaire to the selected household heads.

For successful data collection in the field, one set of semi-structured questionnaire, Focus Group Discussion schedule were used. The questionnaire was administered to households to collect personal profile of the respondents which included demographic data, individual characteristics which included: socio economic diversification, frequency of interaction with development professionals and to obtain suggestions from households on the way forward on development initiatives implemented in the field by the government and development partners, NGOs and CBOs. Observation schedule was used to collect data on the performance of socio economic activities for various categories of respondents and Focus Group Discussion was used to elicit more information from groups of households converged by the researcher. Data collected were analysed using descriptive statistics namely percentages and frequencies and inferential statistics regression with the help of the SPSS version 20.0. Regression analysis was used to determine the influence of human and social capitals on household participation in development initiatives.

In this study, human capital is captured in terms of the education level, training, and occupation and years of work experience. The data analysis was done using the following regression function predictor equation

$$CP = ß_0 + ß_1Ag + ß_2Ms + ß_3Ed + ß_4Sa + ß_5Occ + ß_6Exp + Ɛ \quad (1a)$$

CP is not observable but what is observable is defined by

$$CP = \begin{cases} 1 \text{ if } HP > 0 \\ 0 \text{ if } HP \leq 0 \end{cases} \quad (1b)$$

Where
Ag = 1 if the household member 26 years, 0 if otherwise.
Ms = 1 if married, 0 if otherwise.
Educational level
Ed = A vector of dummy variables indicating household member's level of education
These are:
Primary = If household member has primary level of education
Secondary = If household member has secondary level of education
Tertiary = If household member has tertiary level of education
(Base category: no schooling)
Training
Trn = A vector of dummy variables indicating household member's type of training
These are:
Vocational = If household member attended vocational training
On-job training = If household member attended on-job training
(Base category: no training)
Occ = 1 if the household member is engaged in socio-economic activities, 0 if otherwise.
Exp = 1 if the household member is has 2 years of experience, 0 if otherwise.
$ß_s$ are the coefficients to be estimated from equation (1b), while Ɛ is the error term with the assumption CP (Ɛ) = 0.

Equation (1b) can be estimated using a Probit model because the dependent variable is binary.

The characteristics of the household such as education, age and gender of the individual may have either positive or negative relationships with PC. Households with basic or higher levels of education may influence positively the degree with which they participate in development because it enhances ones chances of participating in training such as workshops and seminars and other development initiatives. Individual marital status may also influence the participation training and access to funds for economic activities due to lack of collaterals.

Social capital is captured in terms of the membership to groups, interaction with other groups and linkages with development agencies. The data analysis was done using the following regression function:

$$CP = ß_0 + ß_1Mg + ß_2Ig + ß_3Lda + Ɛ \qquad (1a)$$

CP is not observable but what is observable is defined by

$$CP = \begin{cases} 1 \text{ if } SP > 0 \\ 0 \text{ if } SP \leq 0 \end{cases} \qquad (1b)$$

Where

Mg = 1 if the household member to a group, 0 if otherwise.

Ig = 1 if interacts with other groups, 0 if otherwise.

Lda = 1 if interacts with development agencies, 0 if otherwise.

$ß_s$ are the coefficients to be estimated from equation (1b), while Ɛ is the error term with the assumption CP (Ɛ) = 0

Results and Discussion

The bio data of the respondents are shown in Table 1.

Table 1:Bio data of the respondents

Variables	Frequency (n)	Percentage (%)
Age:		
<25 Years	3	0
26 - 30 Years	20	7
31 - 50 Years	151	53
>50 Years	111	40
Gender:		
Male	124	44
Female	161	56
Marital status:		
Married	135	47.2
Single	70	24.6
Widow/widower	80	28.2
Membership to Group	160	55.9
Interaction with other groups	146	51.1
Linkages with Devt agencies	170	58.5
Household size		
1 – 5 Persons	122	42.8
6 - 10 Persons	118	41.4
11 – 15 Persons	24	8.4
16 Persons and above	21	7.4
Level of education:		
None	89	31.2
Primary school	96	33.7
Secondary School	70	24.6
College	22	7.7
University	8	2.8
Training		
Vocational training	90	24.6
Informal training	129	45.0
None	67	23.4
Socio-economic activities		
Farming	183	64.2
Fishing	02	0.7
Trading	54	18.9
Formal employment	23	8.1
Others	23	8.1

Field survey data, 2018

Majority (53%; n =151) of the respondents fell within the age group of 31 - 50 years, whereas an additional 40% (n = 111) were above 50 years of age and only 3 respondents were below 20 years (Table 3). More than half (56%, n = 161) of the respondents were females, while 46% (n = 133) were males. More than half (56%, n = 161) of the respondents were single, widows and widowers. In terms of household sizes, slightly more (42.8%, n = 122) of the respondents had small households of 1 - 5 persons while 41.4% (n = 118) had household size of 6 – 10 persons. Very few respondents (7.4%, n = 214) had household sizes of 11 - 15persons. The educational attainments of respondents were relatively low. Only 7.7% (n = 22) and 2.8% (n = 8) had college and university education. More than 70% (24.6% & 45%) had undergone training. Interaction with other groups was over 50% of the households while 51% had linkages with development agencies. About 64% (n = 183) of the respondents engaged in farming as their main source of livelihood. Very few respondents engaged in fishing (0.7%, n=2). Given the fact that the region is endowed with marine and specifically fishery resources this finding is of great concern. Versleijen and Hoorweg (2008) confirm that challenges such as reduced catches, more competition from fellow artisanal fishermen as well as foreign fishermen, tourism and human settlement have made many fishermen to resort to other income-generating

Households Participation in Development Initiatives in relation to Human and social capitals

Table 2 and 3 presents human and social capitals attributed to community participation in development initiatives in three counties of the coastal region of Kenya. The table shows the results of the Probit estimations.

Community Participation by Human Capitals

Using a Probit regression, the study assessed the influence of bio data comprising age, marital status, level of education, training, type of economic activity and experience attained by the household member on community participation in development initiatives (Table 2). In this model the reference category was "those who did not participate". Table 2 and 3 show the output from the Probit model and the z-statistics.

Table 2: Human Capital influencing Household Participated in Development Initiatives

Variables	Probit dF/dx.	z-stat
If aged above 26 years	-0.16*	-1.67
Education level:		
Primary school	-0.16**	4.57
Secondary School	-0.14*	1.60
Tertiary	0.13	-1.44
Training (base no training):		
If attended Vocational training	0.35***	-0.18
If attended on-job training	0.23***	0.29
If engaged in Socio-economic activities:	0.53***	4.95
F-stat (wald chi^2)	97.40***	
R^2 (Pseudo-R^2	0.529	
Number of observation	286	

The coefficients on dummy variables indicate changes in probability for each outcome category when the value of the dummy variables changes from zero to one. The second column reports the z-statistics based on robust standard error.

*, **, and *** denotes significant at 10%, 5% and 1% significant levels respectively.

According to the results, tertiary level of education does not predict the likelihood of household head's participation in development initiatives. Household heads who are younger (25 years or below) are more likely to participate in development initiatives. The probability of participating is 16 percent each. Although these results are weakly significant at 10 percent level, the results for age are consistent with those in table 1. The household head's with primary education, have attended vocational and on-job training, and are engaged in socio economic activities have the probability of 35 percent, 23 percent and 53 percent respectively have a higher likelihood of participating in development initiatives. In overall, the results show that household heads who have attained primary education and have undergone vocational or on-job training and are engaged in economic activities predict with higher probabilities the chance of participating in development initiatives. This therefore means that basic education is a determinant of community participation in development projects.

Table 3: Social Capital influencing Household Participated in Development Initiatives

Variables	Probit dF/dx.	z-stat
If member of a group	0.51**	2.21
Interaction with other groups	0.23*	0.29
Linkages with Devt agencies	0.44**	1.95
F-stat (wald chi^2)	92.40**	
R^2 (Pseudo-R^2	0.519	
Number of observation	286	

The coefficients on dummy variables indicate changes in probability for each outcome category when the value of the dummy variables changes from zero to one. The second column reports the z-statistics based on robust standard error.

*, **, and *** denotes significant at 10%, 5% and 1% significant levels respectively.

The Probit results show that households who are members to groups and have linkages with government and development agencies that include private, NGOs and CBOs have higher likelihood of 51 percent and 44 percent of participating in development initiatives. The interaction with other groups has a lesser likelihood of the individual participating in development projects and programmes. Groups as a social capital provides ground for developing sense of belong and empowerment of individuals. This is achieved when the groups hold meetings and it is at these meetings that learning skills takes place either through interaction or from invited professionals.

Discussions

Although on-job training which include workshops and seminars are used by many organizations a avenues for gaining knowledge, skills and competency in performing various activities, the results show that training has a less probability than the workshops and seminars. This could be attributed to the methods used in the dissemination of knowledge and information. The beneficiaries who participate in projects are adults whose level of education is majorly basic education. The category of participants requires more interactive and dialectic process of knowledge acquisition. The interaction allows for sharing of knowledge, information, creation of awareness of new ideas and manipulation. The three aspects have a long lasting impact on the knowledge and skills the development initiatives intend to involve the community. Kwon (2009) argues that human capital is based on the knowledge and skills that are received during the learning process. The knowledge, skills and competency are among the important human capitals acquired during the learning that takes place during the training and workshops. Human capitals are inherent in an individual and active participation in any development process or activities gives the individual the chance opportunity to acquire them.

Human capitals are inherent in an individual and active participation in any development process or activities gives the individual the chance opportunity to acquire them. The knowledge, skills and competency are among the important human capitals acquired during the learning that takes place during the training. The type of activity undertaken by an individual or household during the training influences to a great extent the development of human capital and as such it may imply that the income level was a factor determining individual participation.

Kwon (2009) argues that human capital is based on the knowledge and skills that are received during the learning process. Tanner et al. (2002) states that vocational training are an effective means of producing changes in practice especially in relation to acquisition of individual human skills. The lack of predictability of the likelihood of development of human capital by the participation of stakeholders in evaluation of projects is could be due of professions or extension workers lack of facilitation skills. According to Nweke et al. (2013), lack of the likelihood of community participating in evaluation of projects is alluded more to the professionals development workers playing a leading role even if the aim is to build the capacity of communities or empowering them. High education level can also be a hindering factor in community participation as explained by Dorsner (2004) in which she indicates that educated members of the communities at times are not available for their community even if they have interest as they tend to have other business commitments.

The study findings contradict with those of Aworty (2012) who asserts that education as a human capital is in itself is not entirely a determining variable in community participation. He asserts that many uneducated households scored even better than those with secondary school education in variables such as: membership of community organization, attendance at meetings and participation in planning while those with good education level speak more in meetings than those without education do.

According to Seferiadis et al. (2015), Membership to groups strengthens the social fabric. It's a network that enables individuals to access resources and information and achievement of common goals. Social capitals provide an avenue for collective action. through different mechanisms, development projects are able to strengthen social capital for positive development outcomes which includes human competency and acquisition of skills and access to information. One way this is achieved is through group meetings often organized when development

initiatives are set up. At these meetings, learning of skills takes place. Brodie et al. (2009) found out that the socio economic group a person belongs to has an impact on his/her level of participation as people from lower socio economic groups often have less access to resources and practical support making their participation in community development initiatives rather difficult.

Conclusion

The study has shown that individual participation in development initiatives requires a set of human and social capital. Social and human capitals are intertwined. Human capital is associated with active and interactive engagement of the individual in development activities such as workshops, training and other practical activities. The interactive process inherent in group activities increases individual members' ability to acquire knowledge and skills which are essential for decision making on the use of new ideas introduced to them for longer period and improved welfare. Although education as a human capital is necessary especially in acquisition of technical knowledge, one does not require tertiary education to participate in development initiatives implemented in the community.

Policy recommendation

The Government, County governments and development partners, should:

Emphasis on ensuring the community members enrol in learning institutions to acquire basic education; encourage group formation grounded on strong foundation of trust. This will allow the individual members in the communities to engage in productive economic activities.

Acknowledgement

Acknowledgement goes to Pwani University for funding this Research work.

Reference

Cadil, J., Petkovova, L., & Blatna, D. (2014). Human Capital, Economic Structure and Growth. Procedia Economics and Finance, 12, 85–92.

Ciutiene, R. & Railaite, R. (2015).A Development of Human Capital in the Context of an Aging Population. 20th International Scientific Conference Economics and Management. Journal of science direct, Procedia - Social and Behavioral Sciences Elsevier 213 -75

Cornwall, A. (2006*) Historical Perspectives on Participation in Development*. Accessed from: 3/ 01 2019].

Cuthill, M. (2003) *The contribution of human and social capital to building community well-being: a research agenda relating to citizen participation in local governance in Australia*. Accessed On line publication 2010

Danida Ministry of foreign affairs (2004).Evaluation Projects in Makueni andTaita Taveta Districts, Kenya. TC UK / East Africa / Crystal(Part of the ETC International Group)

Day, C., & Dowrick, S. (2004). Ageing economics: human capital, productivity and fertility. Agenda, 11, 3–20.

Government of Kenya. (2009). *Kenya National Census*. Government Printer, Nairobi

Hassan, F., Ong'ayo, H., Osore, M (2018) Measuring the Level of Community Participation in a Demand Driven Development Project: Case of HazinaYaMaendeleoYaPwani Approach in Coastal Kenya. Yet to be published

Kwon, D. B. (2009). Human capital and its measurement. In The 3rd OECD World Forum on 'Statistics, Knowledge and Policy'Charting Progress, Building Visions, Improving Life Busan, OECD World Forum, Korea, October. In October ,1–15.

Lindon, J., Robison, Schmid, A & Marcelo, E. S. (2002). Is Social Capital Really Capital? Review of Social Economy Vol 9 (1). Michigan State University. Routledge Taylor and Francis Group. ISSN 0034 6764 print, 14701164 on line

Mc Sween-Cadieux, E., Dagenais, C., André Somé, P. & Ridde, V. (2017).Research dissemination workshops: observations and implications based on an experience in Burkina Faso. Health Research Policy and Systems201715:43. https://doi.org/10.1186/s12961-017-0205-9

Nkwake, A.M.,Trandafili, H. and Hughey, J.(2013). Examining the relationship between community participation and programme outcomes in metaevaluation. Journal of multidisciplinary evaluation. Vol 9 (20). World vision

Seferiadis, A. A., Cummings, S., Zweekhorst, M. B.M. & Bunders, J. F.G. (2015).Producing social capital as a development strategy: Implications at the micro-level *Progress in Development Studies* 15, 2 (2015) pp. 170–185. Sage Publications

Tanner, J. Hale, C. A. (2002). The workshop as an effective method of dissemination: The importance of the needs of the individual. Journal of Nursing Management 10(1):47-54. DOI: 10.1046/j.0966-0429.2001.00303.x. PubMed

USAID. (2019). Agriculture and Food Security. USAID. U.S

Versleijen N. &Hoorweg, J (2008). From Farming to Fishing: Marine Resource Conservation and a New Generation of Fishermen. *Western Indian Ocean Journal of Marine Science,7,* (1) 1-14

The Craze for Students' Numbers In Kenya's Public And Private Universities And The Optimal Operation Of Masinde Muliro University Of Science And Technology: Towards A COST RECOVERY STRATEGY

Stephen O. Odebero, Associate Professor of Education Planning, Masinde Muliro University of Science and Technology,
Kenya.email:sodebero@mmust.ac.ke,sodebero@yahoo.co.uk,mobile:+254722995895

Abstract

The Research Issue

From 2003 when the university came into being as a constituent college of Moi University up to 2013, Masinde Muliro University of Science and Technology (MMUST) had experienced unprecedented growth. Student population had grown tremendously. As of 2012/2013 academic year, student enrolment stood at 10,100 majority of who were enrolled in the Privately Sponsored programme (PSSP). The University had also witnessed growth in new programmes, departments, schools and faculties. Quite a reasonable number of infrastructural facilities had also been developed such as the library, science complex building and hostels (CHE,2011). The university had also expanded its wings in study centers and campuses. These included, Bungoma Campus, Sangalo campus, Webuye, Kaimosi, Kobujoi, Ebunangwe, Nambale, Budalangi, Busia, and Nairobi campuses among others. Despite these expansions, the University had faced myriad challenges. More serious challenges were reported between 2010/2011 to 2013/2014 FYs. The major challenges were:

Fluid financial situation leading to inability of the university to meet its pecuniary obligations to staff and other service providers to pay salaries on time, inability to pay service providers for the PSSP programmes, inability to send SACCO capitation on time and delayed remittance of statutory deductions to banks, KRA and other stakeholders.

Inadequate staff support facilities and equipment.

Inadequate health care support facilities and equipment

Inadequate provision of tuition facilities and infrastructure

Inadequate student accommodation and welfare services

Inadequate infrastructure to support research and innovation

Several attempts were made to remedy the situation through change of guard by University Council (UC) and Top University Management (TUM) including numerous austerity measures in 2012/2013 FY. However, it was believed that such changes alone would not steer the University to financial stability without proper identification of the problem from an empirical perspective. It is against this background that this study was proposed with a view of establishing the optimum level of operation of the University. The rationale behind this was to provide a foundation on which job rationalization, resource allocation, and University's target out puts can be measured through efficient utilization of the minimum resources available. Thus the purpose of this study was to establish the optimal level of operation of Masinde Muliro University of Science and Technology. This included identification of change in long-run average cost based on the concept of economies of scale and diseconomies of scale. The study argues that the university would enjoy economies of scale in a situation where average cost was equal to the marginal cost. By contrast, the university suffers from diseconomies of scale in a situation where marginal cost would be higher than the average cost of operation. The extent of diseconomies of scale can affect efficient operation of the University.

Objectives of the study

The following specific objectives guided this study.

To determine the optimal level of operation of Masinde Muliro University of Science and Technology

To analyse the unit costs, the total costs and the marginal costs of operation of the university

Central Research Question

The study was guided by the following main question.

What is the optimal level of operation of Masinde Muliro University of Science and Technology?

Subsidiary Research Question

In order to address the main question, the study developed the following subsidiary research question stated as follows:

What are the unit costs, the total costs and the marginal costs of operation of the university?

Significance of the study

Prudent financial and physical management of any institution is of prime significance. In the recent past many higher education institutions in Kenya have been accused of inefficiency in human capital and resources management. The significance of this study lies in the fact that it will:

Aid the university's top management organs such as the Chief Executive officer and the Vice Chancellor, University Council, the deputy Vice Chancellors including Registrars, Heads of Departments, Deans and Directors, to identify areas of inefficiency in financial and human resource management of the University.

It is also hoped that this study might form the basis for future policy decisions in the University that will enhance prudent financial management, accountability among staff and cost recovery mechanism

1.5 Concepts

According to Gerring (1999), concept formation lies at the heart of all social science research. The significance of concept formation lies in its ability to aid proper conceptualization of the topic of study since every author makes lexical and semantic choices as they write. In this study, the terrain of concepts was developed in an organogram as shown in Figure 1 below.

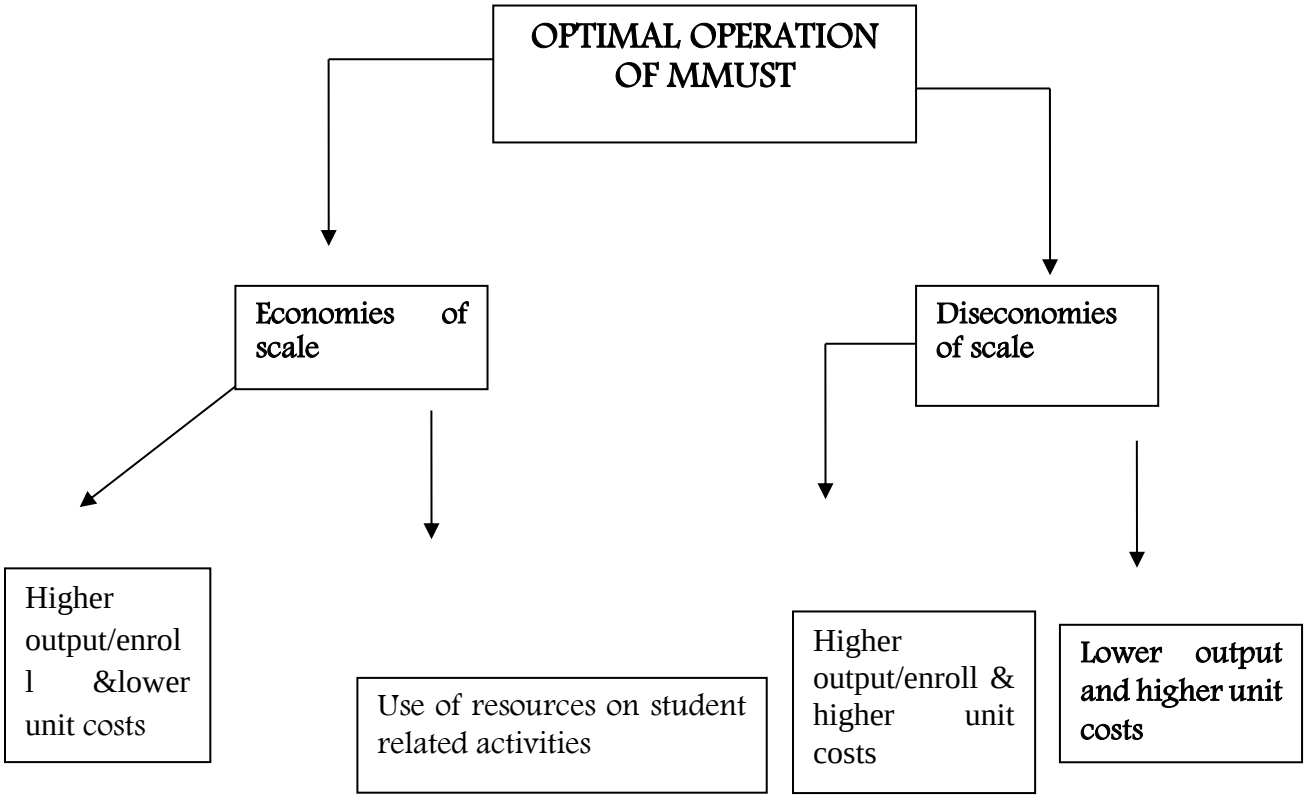


Figure 1: Organogram of the Main Concepts of the Study

Source: Own Conception.

Subsequently, the main concepts of the study were operationslised as follows:

Optimal operation of MMUST: As used in this study, this refers to a situation where average/unit costs equals to marginal costs

Marginal costs: This is the extra costs that an institution will incur by admitting one additional student. It is $\frac{\text{Change in total costs}}{\text{Change in number of students}}$

They are cost that change with number of students being admitted in the university for example the more the number of students being admitted in the university, the more the costs of food, water, electricity, hired lecture space, hired accommodation space, stationary and chairs. The University must get interested in marginal costs and average costs in its operation. This is because, when the marginal costs are increasing by a big margin, you cannot keep on admitting more students. However, when the marginal cost is equal to average cost, the institution is operating optimally. The University should aim at maintaining this.

Unit cost: It is the total costs divided by the number of students in the university. At the moment, the university should be concerned with lowering unit cost in its operation. The aim is to ensure the university operate optimally and therefore avoid wastage of scarce resources. Unit costs are also referred to as average costs or operating costs. All these terms will be used interchangeably.

Total costs: It is the additional fixed costs and variables costs. It includes all the costs that the university will incur in order to function or operate.

The Causal Path

Causality has been defined as a theoretical concept independent of the data used to learn about it.

(King, Keohane and Verba, n.d:76). In this study the outcome variable denoted by Y (dependent variable) is the optimal operation of the university that encompasses low unit cost. At this point, the marginal cost is equal to the unit cost. However, the causal variable denoted by X (independent variable) is efficiency in financial expenditure. This explained by proper utilization of HC in the, teaching and non teaching staff. This will be shown by planned growth rates in staff employment and student numbers. The causal path assumes that funds will be utilized on student related activities. However, there could be intervening variables such as corruption, political pressure, court action, etc. Such factors are denoted by Z. This is shown in Figure 2.

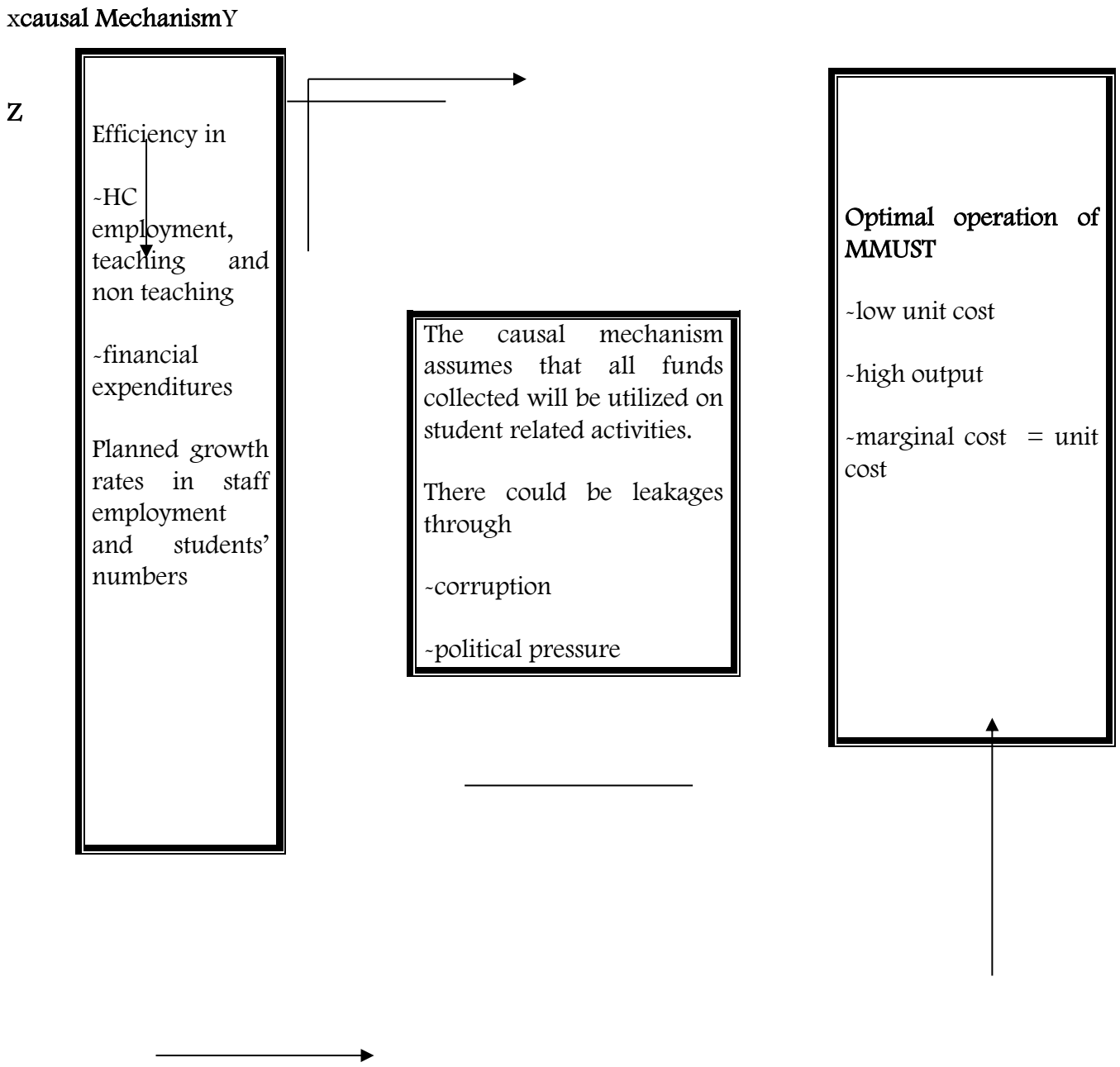

xcausal MechanismY
Z
Efficiency in
-HC employment, teaching and non teaching
-financial expenditures
Planned growth rates in staff employment and students' numbers
The causal mechanism assumes that all funds collected will be utilized on student related activities.
There could be leakages through
-corruption
-political pressure
Optimal operation of MMUST
-low unit cost
-high output
-marginal cost = unit cost

Figure 2: the causal path

Source: *adopted from Odebero, 2012*

Theoretical framework

Educational Cost Function Analysis

The survey was based on the theory of Cost function analysis of educational investment. Cost function analysis models the relationship between firm costs, firm output, and input prices (Very and Layard, 1975; Grogberge, Jansen, Taylor and Booker, 2005). As such, an educational cost function uses statistical techniques to measure the systematic relationship between actual expenditures and educational output and outcomes given input prices and technological factors (Grogberge, Jansen, Taylor and Booker, 2005).

Economically, output (Q) has a direct relationship with the total cost since an increase in the output leads to a rise in the total cost and vice versa. Be that as it may, an improvement in the state of technology usually provides the producer with cost saving techniques of producing the output. Technology therefore has an indirect relationship with the total cost. Rises in the prices of the factors of production directly lead to increases in the total cost of production, hence, a direct relationship.

Graphically, the other factors of the total cost function apart from the output (Q), act as shift factors as changes in any or all of them shift the cost curve outwards or inwards, depending on the direction of change. The relationship between total cost and output can be plotted on a two-dimensional diagram allowing for movements along the cost curve, holding all other factors constant. This implies that the cost function may be written as

$$C = f(Q)$$

The short-run total cost function is given as

$$C = f(Q, T, P_f, K)$$

and the long-run function is

$$C = f(Q, T, P_f)$$

where C = total cost

Q = output

T = technology

Pf = prices of factors of production

K = fixed factors of production

In the area of higher education, any analysis of costs must acknowledge and explicitly take into account in the estimation technique the multi-product nature of production. Universities by their very nature are engaged in production and dissemination of knowledge (Cohn and Cooper, 2004). As such, the final outcomes are in the form of the knowledge generated through research and its subsequent dissemination by way of teaching.

Application of Cost Function Approach to the Optimal Operation of MMUST

The cost function approach has a number of desirable technical properties. It is reasonable to expect that education systems will be evaluated with respect to multiple outcomes, and the cost function framework accommodates this requirement handily. Some other statistical approaches, such as estimation of an education production function, are not as readily adapted to a multiple outcome situation. Second, the cost function approach is applicable as long as firms are minimizing costs. Public education systems may attempt to provide education services at minimum cost, but they are certainly not profit maximizing as must be presumed in some other methodologies. Hence a cost function approach has often been employed in studies of nonprofit institutions, both in the public sector and in the private sector.

Finally, a cost function-based approach encourages or even forces researchers and policy analysts to be explicit about what outcomes are being studied and what inputs are being considered, as well as what assumptions are being made regarding behavior of decision makers at the school or any other level under analysis.

Criticisms of the Cost Function Analysis in Education

The cost function approach has been criticized because its technical complexity makes it difficult to communicate to the policy-making community. A number of judgments and assumptions must be made by a researcher attempting to estimate an education cost model. The basis for and importance of these choices may, indeed, be less than transparent to the policy audience (Psacharopoulos and Woodhall, 1985). In our view, a singular focus upon transparency is a

poor policy lens. The primary objective should be to use the approach which can provide the most accurate policy information.

Simplicity, bought at a price of significant inaccuracy, is a poor bargain. Another related criticism of the cost function approach is that the cost function does not directly inform how education systems should spend their money. This is a relevant observation about the cost approach, but we don't see it as a fatal criticism. The cost function approach provides a predicted available technology, and given a target level of efficiency.

Cost Behaviour in Public Universities

Cost behavior is the general term describing how a cost will change when the level of output changes. Normally as the level of activity rises or falls, a particular cost may rise, fall or even remain constant. It is therefore against this background that a manager should be in a position to predict how a certain cost will behave in response to a change in an activity. Understanding these dynamics is critical for the purpose of planning and decision making. As such, hypothetical set of data can be used to illustrate this relationship as presented in Table 1 and Figure 3.

Table 1: Variation in educational costs against enrollment/output

Enrollment	Total Cost	Average Cost	Marginal Cost
0	5		
1	9	9	4
2	12	6	3
3	15	5	3
4	20	5	5
5	30	6	10
6	42	7	12

Table 1 uses hypothetical data to demonstrate how average costs and marginal costs vary with changes in the level of output or enrollment. Accordingly, the average cost is initially higher than the marginal costs. However, as the student enrollment continues to increase, the marginal costs start increasing until they surpass the average costs. The point where average costs are equal to marginal costs signifies the stage of optimal enrollment. This information is further expressed graphically as shown in Figure 3.

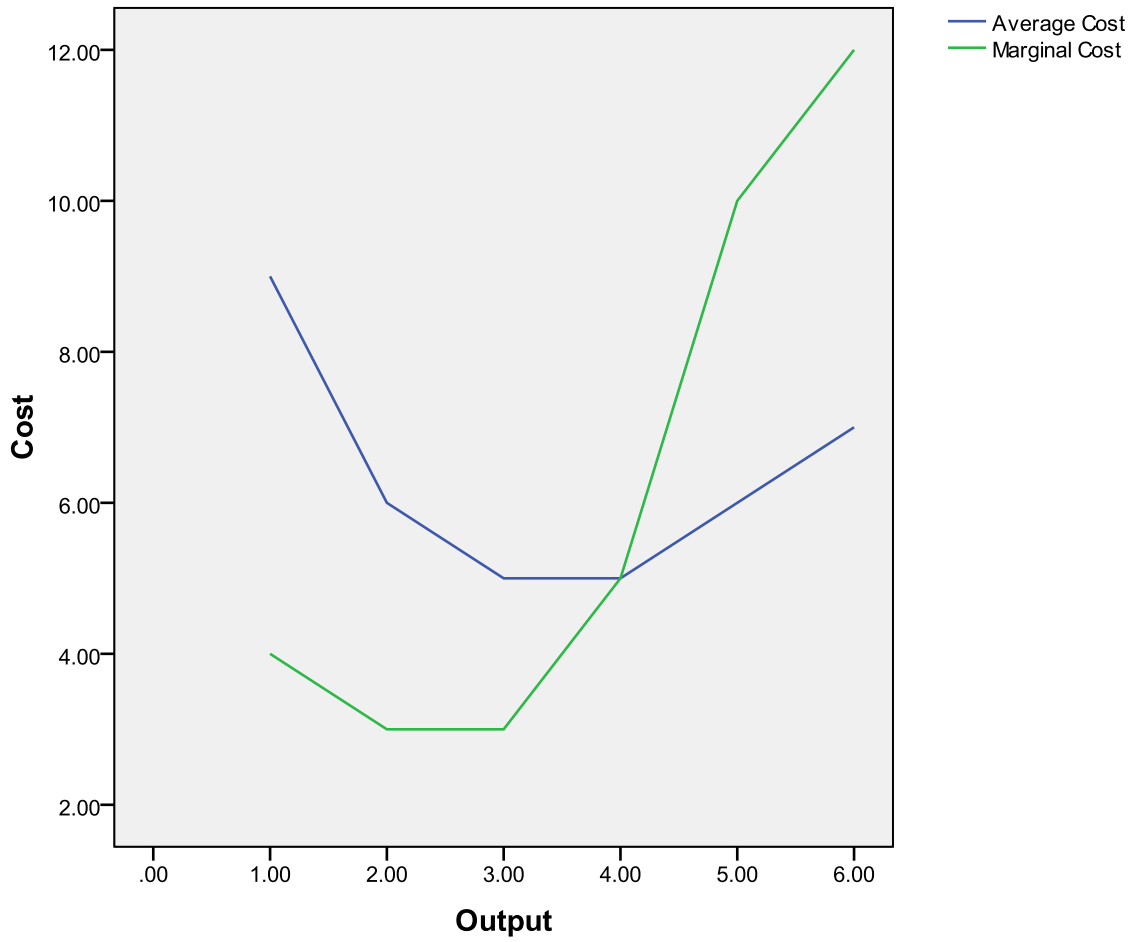


Figure 3: Cost against Output

From Figure3, three relationships between average costs and marginal costs can be deduced.

i) When the average cost is falling, the marginal cost is less than the average cost.

ii) When the average cost is at the minimum, marginal cost is equal to

average cost. This is a point of optimal operation/ optimal enrollment

iii) When the average is rising, marginal cost is greater than average cost

In addition to the above relationships, it is important to note that the stage, at which the marginal cost is lower than the average cost, represents the economies of scale. When the economies of scale are in existence, it is possible to increase production or enrollment without incurring substantial expenditure. In educational institutions, unit costs decline as the student/pupil enrollment increases, until the point where economies of scale are exhausted. Once economies of scale have been exhausted diseconomies of size set in. For example, if there is spare capacity

in a university, it is possible to increase enrollments without incurring substantial expenditure. However, once this capacity is exhausted, diseconomies of scale will set in and the marginal cost will exceed the average cost. This is because continuing to enroll students in the university where facilities are exhausted will necessitate the construction of new buildings, purchase of more books and equipment among others. It is the acquisition of these new facilities/items that causes the marginal cost to exceed the average cost, thus ushering in the diseconomies of scale.

Typology of optimal operation at MMUST

Unit cost	
H L Inefficient operation High Unit Cost Low output	H H Diseconomies of scale High unit cost High output
LL Below optimal Low unit cost Low output	LH Optimal level Low unit cost High output

Output

Figure 4: source: *derived from Odebero, 2012*

The typology explains that low unit cost and low output would lead to an undesirable type of operation called *below optimal*. This means that the institution would still require to enroll more students to maximize the use of existing facilities and resources. The reverse of it is when the institution has low unit cost but high output. This would result in a desirable type of operation called *optimal operation*. Any institution would want to maintain this level of enrolment to keep the costs low and manageable.

In the event of the institution increasing enrollment, this would result in even higher unit cost and the result would be a *diseconomies of scale*.

Methodology

The study was done as a descriptive survey to carry out a survey of the existing status with regard to optimal operation of the university. This involved personal interview with senior managers of the university who were purposively sampled in order to establish the status of the phenomenon.

In addition, questionnaires were administered to a random sample of students, teaching staff, non-teaching staff, and University community members such as suppliers, the business community and parents. The main object of this was to establish the level of efficiency in institutional operation. The information got from questionnaire was cross validated by in-depth interviews from key informants such as senior officers in university management.

Process tracing of employment policies for staff, financing policies from exchequer, and policies governing income generating units was done. Specifically, document analysis was used to establish trends in university financing through government capitation and PSSP collections and students enrolment. The major documents used included but were not limited to, audited annual reports and accounts, budget proposals and senate reports.

Sample and sampling techniques

Table 2: Target Population, sample population and Response rate

Item	Target	Sample	Response rate
Teaching staff	285	30	17
Non-teaching staff	700	80	84
Students	9000	100	88
Community		40	22
coordinators	10	05	03
Deans	5	1	1
Finance Officer	1	1	1
Registrars	3	1	1
DVCs	3	3	1
Grand Total			**218**

Findings

Optimal Level of Operation of Masinde Muliro University of Science and Technology

The main objective of this study sought to establish unit costs, total costs, marginal costs and optimal level of operation of the university. The findings are discussed as follows.

STUDENTS COSTS

Students' costs were divided into two components: average (or unit) costs and marginal costs. The calculation of these costs makes two underlying assumptions: first, that all expenditures in the university are incurred to further the objectives for which a student is enrolled, and that there are no disparities in students fees payments that may arise from differentiated program costs or inability to pay. Thus students pay equal amounts of money to get a carefully packaged set of services from the university.

Average (or unit) costs were determined by the following formula:

$C_{av} = \frac{C_j}{E_j}$ where C_{av} is the average cost, C_j is the total expenditure in the given year, and E_j is the total student enrolment in the given year.

Average cost therefore is the amount of money required to keep one students in the university for the given year.

Marginal costs were determined using the formula:

$C_m = \frac{C_j - C_i}{E_j - E_i}$ where C_m is the marginal cost, C_{av} is the average cost; C_j is the total expenditure in the given year; C_i is the total expenditure for the previous year; E_j is the total enrolment in the given year, and E_i is the total enrolment in the previous year.

Marginal cost is the expenditure that the university incurs to enroll an extra student. When marginal costs equal average costs, the institution is said to be operating at its optimal level. ***When average costs are higher than marginal costs, it means the institution is operating below capacity*** and there is need to enroll more fees paying students. ***When marginal cost is above average costs, the institution is said to be over established and diseconomies of scale set in.*** Difficulties associated with maintaining optimal levels of operation include the challenge of keeping strict fiscal discipline and managing incidental expenditure drivers such as unforeseen emergencies. Table 6 gives statistical data of the total costs, unit cost, unit cost growth rate and the corresponding marginal costs.

Table 7: Operational Costs at MMUST

Year	Total Cost Ksh.(Millions)	Unit Cost Ksh. (Thousands)	Marginal Cost Ksh. (Thousands)
2006/07	597.796	294.917	
2007/08	747.159	217.324	105.856
2008/09	967.822	181.240	116.016
2009/10	1214.953	181.255	181.314
2010/11	1519.713	184.252	197.256
2011/12	1802.003	192.316	251.595
2012/13	2154.731	213.340	483.189

The table shows that total costs have been rising steadily over the years as students enrolment grow. Starting with Ksh. 597.796 million in 2006/7 academic year, total costs reached Ksh. 2.14 billion in 2012/13 academic year. An examination of unit costs however shows an initial decline from Ksh. 294,917 to reach the lowest level of Ksh. 184, 252 in the year 2010/2011 before rising again to reach the highest level of Ksh. 213,340 in the 2012/2013 academic year. Marginal costs on the other hand started off at the lowest level of Ksh. 105,856 to reach the highest level recorded at Ksh. 483,189.

Cost curve analysis was employed to help pin point the optimal operating point for the university, as illustrated in Figure. 4.

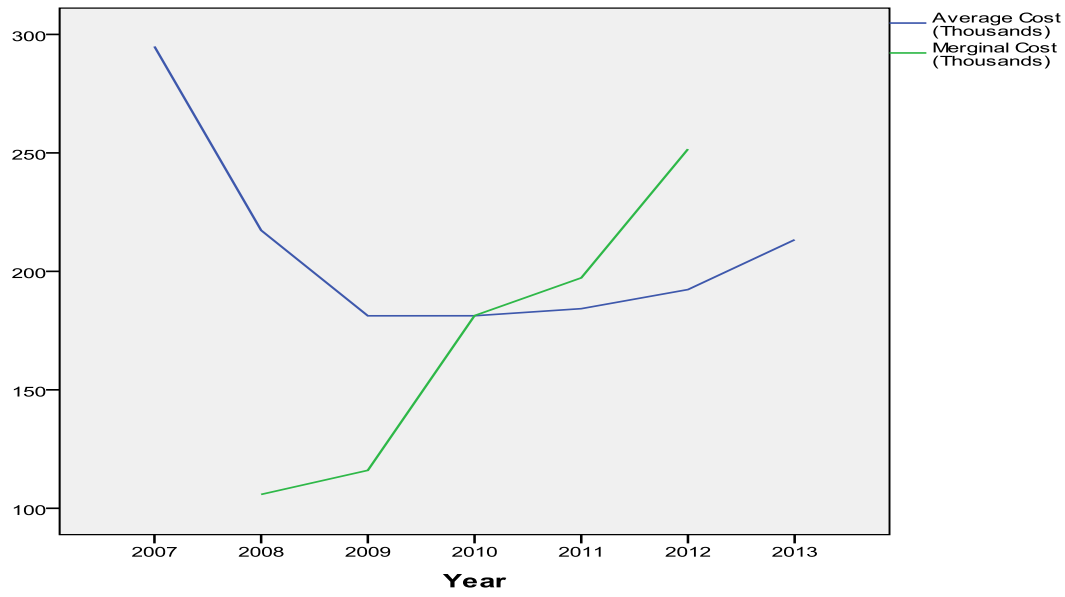


Figure. 4: Average costs, Marginal Costs and optimal operation of MMUST

Figure. 4 shows a comparative diagrammatic representation of students' average costs and marginal costs and optimal level of operation.

As seen earlier, marginal cost is the expenditure that the university incurs to enroll an extra student. While average cost is equivalent to unit cost. Between 2007 and 2009 the university experiences higher ***average costs than marginal costs and this implies that the institution is operating below capacity. At that point it was advisable for the university to enroll*** more fees paying students. This is because there were more facilities that were underutilized. More students would ensure that university facilities are exhaustively utilized to meet the set objectives. From the figure, the average costs were dropping from around kshs.300, 000 in 2007 to kshs.181,000 in 2009. The marginal costs on the other hand rose from kshs.116, 000 in 2007 to kshs.116,000 in 2008.

However, the university experienced optimal operation in the year 2010. This is the point of intersection or the point when marginal costs equaled average costs. Specifically, the average cost and the marginal cost were equal at kshs 181,000. It is advisable that the university should have tried to maintain this point because this was the cheapest it could get in its operation. At this point, the university would make surplus cash, the salaries would be paid on time and statutory deductions would be paid on time. However, it is important to note that the fees charges were lower than the average cost at the optimal level of kshs. 181,000. It is recommended that fees be raised to match the costs at the optimal level of operation.

From the year 2011, the marginal costs surpassed the average cost at kshs 251,500 for MC and ksh 192,000 for average cost respectively. This means that the university was spending more to maintain an extra new student than to maintain the already admitted old student. Because the ***marginal cost is above average costs, we conclude that MMUST has been over established from 2011 to date. By implication, the university is operating at diseconomies of scale. At the moment, the university spends a whooping ksh 483,000 to admit an extra student as opposed to ksh 213,000 in maintaining an old student.***

Some of the glaring indicators of over establishment include congested lecture halls where students to attend lesson outside classrooms. Numerous incidents of students catching voices of their lecturers through windows without visual contact with the lecturers have been observed. Indeed the possibility of a lecturer covering the entire course without coming in physical contact with some students is not farfetched possibility. The study discovered that there was one public address system in the University. This could partly explain the apathy lecturers have in enforcing the quality requirement of 80% lesson attendance for a student to sit examinations. Would such a lecturer therefore deploy the most appropriate teaching methodology to effectively deliver the content to student? And if the University is unable to provide sitting space for students, is it possible that it is facilitating effective teaching through provision of teaching aids that expose students to what the knowledge economy demands of them after school? The university has responded to this by hiring lecture halls, Office space and teaching spaces outside the university. This has only helped to increase costs of operation.

In the interest of education quality and institutional competiveness, management should lay out a clear time bound activity plan to ensure students do not learn in noisy environments, lecturers have office and preparation rooms from where students can consult on academic issues, administrative staff have adequate office space to attend to those seeking assistance of confidential nature. Such measure may help improve employee and student moral and promote responsible behavior. The exponential growth in academic units that are often unstructured has exacerbated the already sorry situation of infrastructure such as lecture space, staff offices, access to reliable internet and other ICT facilities, students' hostels and recreational facilities. Hiring of facilities that are spread out wide exhaust students as they run about to catch up with lectures while at the same time denying the university the required revenue for its critical operation. In addition, hiring lecture halls and students accommodation may be a conduit through which corruption related schemes are incubated and hutched.

It is advisable that the university must quickly stop further admission of new students since it's uneconomical. It is further advised that the university expands existing facilities such as lecture halls, office space, students' hostels, recreational facilities, etc before any new admissions can be done as opposed to hiring of lecture halls, teaching spaces and office spaces outside the university as this only leads to increased costs. The university could also start new campuses outside the main campus where the new students can be housed. In such a case careful planning and spontaneous investment in one campus to optimality could be more efficient than hurried but haphazard expansion. Increment in fees to mitigate the average costs may not be an option because other institutions charge much less especially private universities.

Difficulties associated with maintaining optimal levels of operation include the challenge of keeping strict fiscal discipline and managing incidental expenditure drivers such as unforeseen emergencies.

Table 6 gives statistical data of the total costs, unit cost, unit cost growth rate and the corresponding marginal costs.

Conclusions and recommendations

The main objective of this study sought to establish unit costs, total costs, marginal costs and optimal level of operation of the university.

Students' costs were divided into two components: average (or unit) costs and marginal costs.

Average cost was defined as the amount of money required to keep one students in the university for the given year.

Marginal cost was defined as the expenditure that the university incurs to enroll an extra student.

The institution was said to be operating at its optimal level when marginal costs equaled average costs. However, when average costs were higher than marginal costs, the institution was said to be operating below capacity. At this point there was need to enroll more fees paying students. On the other hand when marginal cost was above average costs, the institution was said to be over established and diseconomies of scale were seen to have set in.

The study shows that total costs had been rising steadily over the years as students enrolment grew. Starting with Ksh. 597.796 million in 2006/7 academic year, total costs reached Ksh. 2.14 billion in 2012/13 academic year.

The study also shows unit costs declining initially from Ksh. 294,917 to reach the lowest level of Ksh. 184, 252 in the year 2010/2011 before rising again to reach the highest level of Ksh. 213,340 in the 2012/2013 academic year.

Marginal costs on the other hand started off at the lowest level of Ksh. 105,856 pa to reach the highest level recorded at Ksh. 483,189.

Marginal cost was defined as the expenditure that the university incurs to enroll an extra student. The study shows that between 2007 and 2009 the university experienced higher *average costs than marginal costs and this implies that the institution was operating below capacity. At that point it was advisable for the university to enroll* more fees paying students. This is because there were more facilities that were underutilized. More students would ensure that university facilities are exhaustively utilized to meet the set objectives.

According to the study, the average costs were dropping from around kshs.300, 000 in 2007 to kshs.181,000 in 2009. The marginal costs on the other hand rose from kshs.116, 000 in 2007 to kshs.116,000 in 2008.

The study reveals that the university experienced *optimal operation* in the year 2010 ie the point of intersection or *the point when marginal costs equaled average costs.* Specifically, the average cost and the marginal cost were equal at kshs 181,000. It is recommended that the university should have tried to maintain this point because this was the cheapest it could get in its operation. At this point, the university would most likely make surplus cash because it was cheap to run its operations.

It is however noted that the fees charges were lower than the average cost at the optimal level of kshs. 181,000. This implies that the tuition fees charges were not based on any empirical study and can therefore not be relied upon to finance the university operations. It is recommended that fees be raised to match the costs at the optimal level of operation.

From the year 2011, the marginal costs surpassed the average cost at kshs 251,500 for MC and ksh 192,000 for average cost respectively. This means that the university was spending more to enroll and maintain an extra student than to maintain the already admitted old student. Because the marginal cost is above average costs, we conclude that MMUST has been over established from 2011 to date. By implication, the university is operating at diseconomies of scale. At the moment, the university spends a whooping ksh 483,000 to admit an extra student as opposed to ksh 213,000 in maintaining an old student.

It is advisable that the university must quickly stop further admission of new students since it's uneconomical. Our recommendations is that the university must cease further admissions and gradually lower the students numbers to the optimal level so as to be able to maximize its operations. However, in the interest of growth, it is advised that the university expands existing facilities such as lecture halls, office space, students' hostels, chairs, library facilities, recreational facilities and related facilities before surpassing the optimal numbers in admissions.

The study also observes that hiring of lecture halls, teaching spaces and office spaces outside the university only leads to increased costs. The university could also start new campuses outside the main campus where the new students can be housed. In such a case careful planning and

spontaneous investment in one campus to optimality could be more efficient than hurried but haphazard expansion. Increment in fees to mitigate the average costs may not be an option because other institutions charge much less especially private universities and this could only serve to make the university unpopular.

References

CHE (2011). *Student enrolment in public and private universities in Kenya.* Commission for Higher Education: Nairobi.

Gerring, J. (1999). What makes a concept good? A criterial framework for understanding concept formation in the social sciences. *Polity,* 31(3): 357-93. http://www.jstor.org/stable/3235246.

Kabeera, E. (2013). No end in sight on harmonization of tuition fees in EAC universities. *The New Times*.

King, G., Keohane, O. R.and Verba, S. (n.d.). *Designing social inquiry scientific inference in qualitative research.* Princeton University Press: New Jersey.

Mutai, B. (2010). Exodus of Kenyan students to uganda. *The Kenyan Watchdog*.

Odebero, O. S. (2011). *Educational inequalities and opportunities in East African region.* Society of International Development (SID): Nairobi.

Odebero, O. S. (2012). Situational analysis of education sector in Kenya, a consultancy report prepared for the TNS/RMS Safaricom foundation. unpublished.

Odebero, O. S., Bosire, N. J., Sang, A. K., Ngala, B. J.and Ngware, M. W. (2007). Equity in the Distribution of HELB Loans in Kenya in Relation to Students Characteristics: An empirical analysis. *Educational Research and Review,* 2(8): 209–19. http://www.academicjournals.org/ERR.

Otieno, J. and Francis, M. (2009). EAC common markets: Integration. *The East African Standard*.

Psacharopoulos, G. and Woodhall, M. (1985). *Education for Development: An analysis for investment choices.* 2nd edn: New York: Oxford University Press.

Republic of Kenya (1965). *African Socialism and Its Application to Planning in Kenya.* Government Printer: Nairobi.

Shultz, T. W. (1963). *The economic value of education.* Columbia University Press: New York.

Smith, B. (2014). Kenya, Rwanda, Uganda Sign local fees agreement. *The Pie News: News and business analysis for professionals in international education*: http://www.pn.news.co.ke.

Higher Education Curriculum Orientation and Performance of Universities in Kenya: Industry Linkage Strategies

Author(s): Dr. Orucho M. Ngala, School of Business and Economics, The Co-operative University of Kenya. P.O. Box 24814-00502, Karen-Nairobi. Tel:+254721670417. Email: oruchomiko@gmail.com

Affiliation (s) The Co-operative University of Kenya

Abstract

Quality education and training can only be achieved by orienting the academic curriculum in such a way that its content reflects industry demands. It must also be continuously reviewed after every cycle to capture the emerging issues in the dynamic economic environment. This study sought to contribute to knowledge by assessing the extent to which linking university curricula to the needs of the industry would influence performance of universities in Kenya. Resource based view was used as the main theory anchoring the study. Cross-Sectional survey was adopted as the research design. The population of the study consists of sixty five (65) public and private universities incorporated in Kenya. Out of this, a sample of forty seven (47) universities which had undergone at least one (1) graduation cycle was taken. Primary and secondary data was collected using semi-structured questionnaires and review of existing university documents and regulatory bodies websites respectively. Correlation and regression analyses were used to test hypotheses. ANOVA was used to determine the differences between group means. Balanced score card was appropriately used to represent financial and non-financial aspects that constitute performance indicators. It was established that positive and significant correlations existed between curriculum orientation and university performance. The findings offer insight to university authorities and policy makers by reinforcing the role of collaborative strategies when developing and reviewing academic curricula. University authorities need to enhance collaboration with the industry in order to substantially exploit the synergies resulting from enhanced symbiotic correlations between university and the industry. The main limitation of this study is that primary data was collected from only one respondent per university but common methods bias was mitigated through the use of additional secondary data to validate primary data. Thus, the limitation did not affect the credence of the results as presented and discussed.

Key words: Curriculum Orientation, Linkage Strategy, Industry, Performance, University

Introduction

There is a growing concern that the knowledge and skills acquired by students in most African Universities do not sufficiently meet the requirements of the industry and the wider economy. This mismatch, coupled with under-training in the critical skills of analytical thinking, communication and problem-solving is blamed for the emerging high graduate under-employment and unemployment in many parts of Africa. According to Pauw (2008), African Universities have been criticized as ivory towers that churn out graduates who are largely irrelevant to the needs of employers and the social, economic, and technical challenges facing African economies. There is a critical need for Universities to update and upgrade curriculum to

ensure that students graduate with relevant skills and competencies for job fit. Quality educational programmes can only be achieved by orienting University curricula in such a way that the industry demands are adequately fused in the developed or reviewed content. The curricula must also be continually reviewed after every complete cycle in order to capture the emerging issues in the dynamic industry environment. The curriculum must also be consistent with institution's mission and clearly defined outcomes intended to produce relevant graduates in the ever changing technological world. Clear policies must be formulated and implemented to guide curriculum development and review. The entire process must be highly inclusive in order to take care of all the needs of stakeholders involved at every stage (Martin, 2000). In Kenya for example, most Universities have inadequate resource capacity to adequately address the needs of courses in Technology and science related disciplines. They also have inadequately trained manpower to deliver the courses that they provide, thereby making the quality of some of their graduates questionable (Weidman, 1995). According to a report by Commission for University Education (2013), Universities are tasked with the pivotal role of helping Kenya achieve her development goals through education, research and innovation. Curriculum review ensures that degree programmes produce graduates with the required knowledge, skills and competencies for the emerging and dynamic industry issues relevant for workforce. The report further states that, very few Universities adequately involve stakeholders during curriculum development and review process and that just a few professional bodies work closely with the Universities. Proper curriculum orientation requires multi-sectoral approach, where all concerned stakeholders are involved and fully engaged in order to develop relevant curricula that reflect the interests of potential employers, community expectations, and that provide opportunities for self-employment. Ozsoy (2011) researched on 179 universities across Europe, Latin America and Sub-Saharan Africa. He established the proposition that the performance of a University will be positively associated with its intellectual capital and their capabilities, curriculum orientation, enhanced industrial attachment, teaching and learning facilities and collaborative research. This reinforces the need for linkage strategies with the industry. Studies exploring linkages between higher education and industry have shown that having a strong symbiotic relationship between the two would enable the synergies to be exploited. This implies that performance of a higher learning institution should be measured in terms of quality of collaboration it has with industry. According to Eshiwani (1999), a University can only remain relevant if it promptly responds to the changing technology and emerging industry demands, by formulating proper collaborative strategies. The industry cannot afford to operate in isolation and must foster linkages with universities. Universities on the other hand, cannot ignore the industry which is the consumer of its output and employer of its graduates. This study sought to establish the influence of curriculum orientation on University performance. Different organizations use varying measures of performance. These measures may be quantitative or qualitative. Kaplan and Norton (2008) introduced balance scorecard which considers financial and non-financial measures of performance such as internal business process, learning and growth and customer perspective. This study has appropriately used balanced score card to measure university performance.

Literature Review

Curriculum is the tool which guides teaching and learning process. According to Jita (2006), Curriculum can be defined as a web of interrelated and aligned activities working together to achieve certain learning outcomes. It is a plan for learning and teaching process. Curriculum development is a multi-step and cyclical process aimed at designing an effective learning content and resources required to achieve the stated objectives. The development of study contents, learning and teaching resources, work plans and assessment of students are all based on

curriculum (Hooghoff and Bron, 2008). Curriculum is viewed as the responsibility of learning institutions and all stakeholders in the society as a whole. There is critical need for stakeholder participation and experts or professional bodies engagement in all aspects of higher education in order to develop curricula that are relevant to industry needs. According to Jita (2006), the processes of stakeholder participation in the higher education quality assurance system have been rather limited and poorly conceptualized. Regular curriculum review is essential to ensuring quality in all academic programmes. The goal is to ensure that programs continue to offer relevant and emerging issues in the industry and to offer students learning experiences that are inspiring, intellectually challenging and transformational. According to Grant (2010), strategy is the link between the firm and its environment. It is broadly defined to include both goals and means of achieving them. Mintzberg (1987) proposed five definitions of strategy, namely; strategy as a plan, a ploy, a pattern, a position and a perspective. Johnson and Scholes (2006) defined strategy as the direction and scope of an organization over the long term. Strategy thus consists of the means an organization chooses to move from its present state to its future. It focuses on future performance as an organizational link with the external environment and considers internal resources in order to attain a competitive advantage. Theories of strategy embody specific explanations for why firms within and between industries differ in their performance. For example, the market positioning framework views differences between firms as resulting from the different characteristics of the markets they operate in. Resource based approach asserts that firm differences arise from situations where firms actively seek to differentiate themselves through their unique competencies and capabilities (Grant, 2010). The economic sector cannot afford to operate in isolation and must foster linkages with universities. This is because it requires qualified manpower to provide necessary services. Universities on the other hand, cannot ignore the economic sector which is the consumer of the knowledge and products generated. Strategies used to achieve quality University curricula should revolve around stakeholders' engagement, professional bodies' engagement and regular curriculum review. According to Koskei (2015), curriculum development is concerned with reviewing, planning, developing, implementing and maintaining curriculum while ensuring that the stakeholders engaged in this process have a high level of commitment to and ownership of the curriculum. In formulating policy, the challenge lies in the discourse on the form, content, aims and goals of curriculum, often referred to as curriculum orientation. According to Koskei (2015), effective curriculum development and review requires that proper industry analysis is first and foremost conducted in order to infuse market needs identified by all stakeholders and professionals into the content. Second, design and development should then be done in accordance with outcomes based on learning principles. He further states that the delivery of curriculum should be done using a wide variety of mechanisms appropriate to the modern learning market. This model proposes an integrated approach to curriculum development based on multi-stakeholder engagement whose end-result is a relevant and industry-driven curriculum.

Hypotheses of the Study

The following hypotheses were derived from the literature debate.

Hypothesis 1: There is a significant positive correlation between curriculum review and University performance.

Hypothesis 2: There is a significant positive correlation between stakeholders' engagement in curriculum development and University performance.

Hypothesis 3: There is a significant positive correlation between professional bodies' engagement in curriculum development and University performance.

Hypothesis 4: There is a significant joint effect of curriculum orientation on University performance.

Conceptual Framework

An integrated framework to respond to the knowledge gaps identified in the literature review in this study has been designed with two components. While curriculum orientation constitutes independent variable, organisational performance constitutes dependent variable. The study determined the direct relationship between curriculum orientation and university performance.

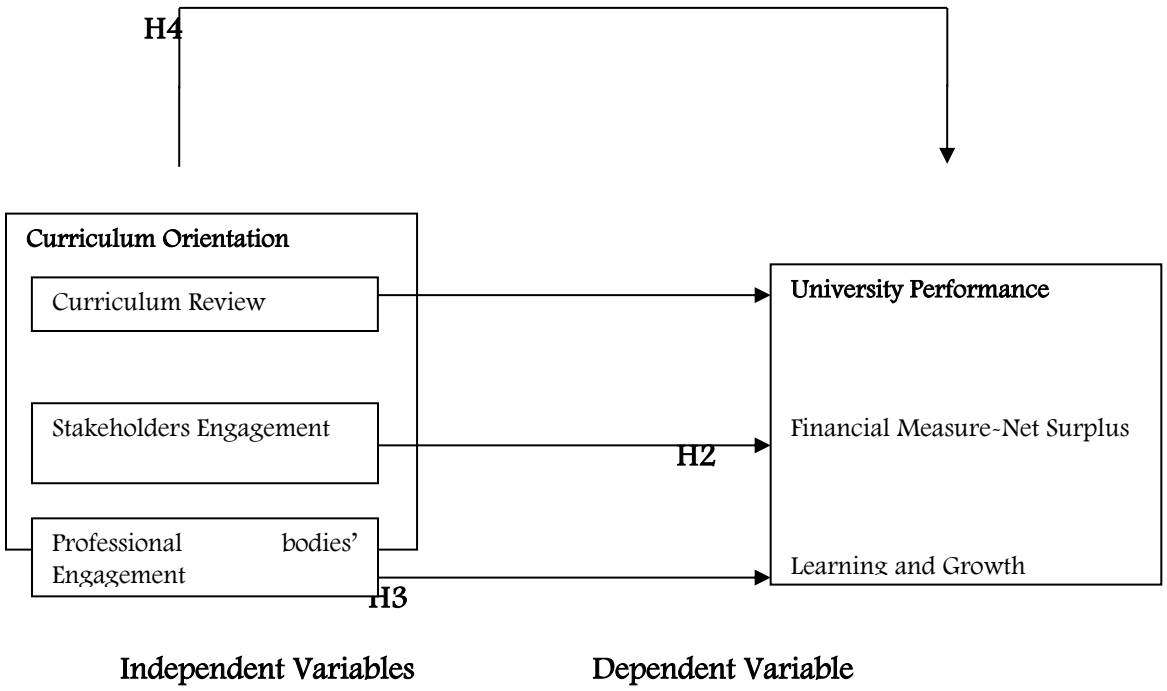


Figure1: Conceptual Model

Methods

The study adopted descriptive cross-sectional survey design. According to Irungu (2007), descriptive cross-sectional survey is appropriate where the overall objective is to establish whether significant associations among variables exist at some point in time. The cross-sectional approach involved collecting and comparing data from the phenomena as at the time of study. The combination of qualitative and quantitative data enabled adequate explanation of the variables and predictions in their behaviour without resorting into inquiries of the temporal effect. The design enhanced uniform data collection and comparison across respondents. In order to undertake comparative analysis between private and public universities, independent sample t-test, standard deviation, arithmetic mean and coefficient of variation (CV) were used.

C.V was used to measure variability and consistency in scores of different universities when arithmetic mean and standard deviation is compared. Correlation analysis was used to check the nature and direction of relationships between independent and dependent variables. Regression analysis was used to establish mathematical model relating the variables and to test the set hypotheses. As at the time of this study, there were a total of sixty five (65) universities operating in Kenya according to Commission for University Education report (2013). Thus, population of this study comprised 65 public and private universities incorporated in Kenya. From the 65, forty seven (47) universities which had undergone at least one (1) graduation cycle were sampled. Out of this, twenty two (22) were public and twenty five (25) were private universities. This sample size of 47 constitutes 72% of the population and it is way above the required 10% as a representative sample for a homogenous population. According to Kothari (2004), a population sample constituting 10% and above is appropriate if the researcher is dealing with a homogenous population. Reliability test was undertaken using Cronbach's Alpha whose value was established as 0.992, way above 0.7 as the rule of thumb for testing reliability of data collection instrument. Table 1.1 shows summary reliability scores for 27 questions which were constructed to investigate the study variables.

Cronbach's Alpha	N of Items
.992	27

Table 1.1: Total Statistics on Curriculum Orientation

variable	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Effectiveness and frequency of curriculum review	91.4651	956.255	.944	.991
Stakeholders engagement in curriculum development and review	91.6047	961.769	.970	.991
Professional bodies' engagement in curriculum development and review	91.1395	953.790	.891	.991

Table 1.2 shows reliability scores for 11 questions which were constructed to investigate University performance variables. Cronbach's Alpha was established as 0.975, which was also way above 0.7 as the rule of thumb for testing reliability of data collection instrument.

Reliability Statistics on University Performance

Cronbach's Alpha	N of Items
.975	11

Table 1.2 Total Statistics on University Performance

Variable	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Net surplus	34.9318	131.693	.909	.972
Total amount of scholarship awards or grants for students	34.9545	130.091	.921	.972
Total number of Students	35.1136	126.801	.955	.970
Teacher to Student ratio	34.9773	127.930	.957	.970
Supervisor to Student ratio	35.0682	128.205	.875	.973
University webometrics ranking in Kenya	35.5682	143.739	.429	.984
Total number of stakeholder conferences held	35.0682	129.600	.863	.973
Total number of collaborative activities with other institutions held	35.0455	128.230	.900	.972
Total number of industry visits made	34.9545	126.882	.939	.971
Total number of guest speakers hosted	34.8864	125.824	.942	.971
Performance of our university has greatly increased over the past five years	34.8864	130.940	.910	.972

Results

Structured questionnaires were administered in the selected forty seven (47) Universities to gather data on frequency of curriculum review and the extent of stakeholders and professional bodies' engagement in curriculum development and review process. Table 4.8 shows the descriptive statistics for each item.

Table 1.3: Descriptive Statistics on Curriculum Orientation

Variable	Frequency			Mean Score			Standard Deviation			Coefficient of Variation (CV)		
	Pu	Pr	Co	Pu	Pr	Co	Pu	Pr	Co	Pu	Pr	Co
Stakeholders engagement	21	23	44	3.0	3.4	3.3	1.4	1.2	1.3	44	36	40
Frequency of curriculum review	21	23	44	3.1	3.5	3.3	1.4	1.2	1.3	35	33	40
Professional Bodies' engagement	21	23	44	3.4	4.2	3.8	1.4	1.4	1.5	39	34	38
Average	21	23	44	3.2	3.6	3.5	1.5	1.3	1.4	41	35	40

Key: pu-public universities; pr-private universities; Co-combined (all universities)

Table 1.3 shows that Private Universities scored higher in frequency of curriculum review (3.5 and lesser variability of 33%) compared to a mean score of 3.1 and wider variability of 40% by public universities. Private Universities also obtained higher mean scores (3.4 and 4.2) in stakeholder and professional bodies' engagement in curriculum development and review process respectively. In overall, private universities recorded stronger curriculum orientation strategies (mean score of 3.6 and variability of 35%) compared to public universities (mean score of 3.2 and variability of 41%) in the area of curriculum orientation. In general, the combined mean score on curriculum orientation for all private and public universities is 3.5 out of 5 which approximates to 70% on a percentage scale.

Table 1.4 Independent Samples to Test for Equality of Means on Curriculum Orientation

	t-test for Equality of Means						
						95% Confidence Interval of the Difference	
Variable	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Effectiveness and frequency of curriculum review	-.97563	42	.33483	-.38716	.39684	-1.18801	.41368
Stakeholders engagement in curriculum development and review	-.97229	42	.33647	-.38302	.39394	-1.17802	.41198
Professional bodies' engagement in curriculum development and review	-1.94958	42	.05792	-.83644	.42904	-1.70227	.02939

The mean scores for the indicators of curriculum orientation were compared by computing independent sample t statistic for equality of means at 95% level of confidence and 42 degrees of freedom to test the significance of the difference between sample means of private and public universities. As shown in table 1.4 values of independent sample t-test are negative i.e. less than 2.5 and all p values are greater than 0.05. It is therefore concluded that there is significant difference between curriculum orientation mean scores when private and public Universities are compared.

Table 1.5: Descriptive Statistics on University Performance

Variable	Frequency			Mean Score			Standard Deviation			Coefficient of Variation (CV)		
	Pu	Pr	Co	Pu	Pr	Co	Pu	Pr	Co	Pu	Pr	Co
Net surplus	21	23	44	3.4	3.8	3.6	1.2	1.1	1.1	35.3	28.9	30.6
Total amount of scholarship awards or grants for students	21	23	44	3.6	3.6	3.6	1.3	1.2	1.2	36.1	33.3	33.3
Total number of Students	21	23	44	3.3	3.5	3.4	1.4	1.3	1.3	42.4	37.1	38.2
Teacher to Student ratio	21	23	44	3.5	3.7	3.6	1.4	1.2	1.3	40.0	32.4	36.1
Supervisor to Student ratio	21	23	44	3.1	3.8	3.5	1.3	1.4	1.4	41.9	36.8	40.0
University webometrics ranking in Kenya	21	23	44	2.7	3.3	3.0	1.1	1.2	1.2	40.7	36.4	37.1
Total number of stakeholder conferences held	21	23	44	3.4	3.6	3.5	1.3	1.3	1.3	38.2	36.1	37.1
Total number of collaborative activities with other institutions held	21	23	44	3.4	3.6	3.5	1.4	1.2	1.3	41.2	33.3	37.1
Total number of industry visits made	21	23	44	3.4	3.8	3.6	1.3	1.4	1.3	38.2	36.8	36.1
Total number of guest speakers hosted	21	23	44	3.5	3.8	3.7	1.4	1.4	1.4	40.0	36.8	37.8
Performance of our university has greatly increased over the past five years	21	23	44	3.4	3.9	3.7	1.2	1.1	1.2	35.3	28.2	32.4
Average	21	23	44	3.3	3.7	3.5	1.3	1.2	1.3	39.0	34.2	36.3

Key: pu-public universities; pr-private universities; Co-combined (all universities)

Table 1.5 shows that private universities performed better (mean score of 3.7 out of 5) compared to public universities (mean score of 3.3 out of 5). The overall mean score of university performance for both public and private universities is 3.5 out of 5 with the lowest score of 3.0 for webometrics ranking. Private universities have lesser variability in all performance indicators compared to those of public universities. This demonstrates that the responses on performance from private universities were more consistent and better than public universities. Among public universities, responses on net surplus were the most consistent with smallest variability of 35.3% and largest variability of 42.4% in total number of students. Among private universities, responses on net surplus were also the most consistent with smallest variability of 28.9% and largest variability of 37.1% in total number of students. When the universities are combined, responses on net surplus remained the most consistent with the smallest variability

of 30.6% and largest variability tied at 40% in supervisor to student ratio. The findings imply that net surplus is the most stable indicator of university performance.

Table 1.6: Independent Samples to Test for Equality of Means on University Performance

Variable	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
Net surplus	-1.025	42	.311	-.35404	.34557	-1.05142	.34334
Total amount of scholarship awards or grants for students	-.101	42	.920	-.03727	.36854	-.78102	.70648
Total number of Students	-.469	42	.642	-.18841	.40173	-.99912	.62231
Supervisor to Student ratio	-1.592	42	.119	-.63975	.40194	-1.45090	.17140
University webometrics ranking in Kenya	-1.751	42	.087	-.59420	.33938	-1.27909	.09069
Average	-0.823	42	0.472364	-0.31018	0.3835	-1.08412	0.463755

The mean scores for the indicators of University performance were compared by computing independent sample t statistic for equality of means at 95% level of confidence and 42 degrees of freedom to test the significance of the difference between sample means of private and public universities. As shown in table 1.6, values of independent sample t-test are negative i.e. less than 2.5 and all p values are greater than 0.05. It is therefore concluded that there is significant difference in performance between public and private Universities.

Correlation and Regression Analyses between Curriculum Orientation and University Performance

Correlation analysis was done after aggregating the variables as composite indices. When Pearson's product moment correlation coefficient (r) was computed, it was established that there exists high positive correlation between curriculum orientation and University performance since r= 0.895, which is greater than 0.7. The correlation is significant at p value (0.000) < 0.05 as shown in Table 1.7

Table 1.7: Correlations between Curriculum Orientation and University Performance

		University Performance
University Performance	Pearson Correlation	1
	Sig. (2-tailed)	
	N	44
Curriculum Orientation	Pearson Correlation	.895**
	Sig. (2-tailed)	.000
	N	44

***. Correlation is significant at the 0.05 level (2-tailed).*

Correlation coefficients between curriculum orientation indicators and University performance were further analysed as shown in table 1.8. Results show strong positive correlations between each indicator and University performance. Stakeholders' engagement and University performance demonstrates the strongest positive correlation among other variables, at r = 0.919 and p value less than 0.05.

Table 1.8: Correlations between Curriculum Orientation Indicators and University Performance

		University Performance
University Performance	Pearson Correlation	1
	Sig. (2-tailed)	
	N	44
Frequency of Curriculum Review	Pearson Correlation	.868**
	Sig. (2-tailed)	.000
	N	44
Stakeholders' Engagement	Pearson Correlation	.919**
	Sig. (2-tailed)	.000
	N	44
Professional Bodies Engagement	Pearson Correlation	. 864**
	Sig. (2-tailed)	.000
	N	44

***. Correlation is significant at the 0.05 level (2-tailed).*

When each of the indicators of curriculum orientation was regressed with University performance, stakeholders' engagement (S) was found the most significant predictor of University performance (Y) with p value =0.003< 0.05 followed by curriculum review (R) with p value =0.041, still less than 0.05. The last was Professional bodies' engagement (P) with p value 0.049< 0.05. From Table 1.9, the regression model relating each curriculum orientation and University performance can be expressed as Y=0.49 +0.3S +0.22R+ 0.13P. The model implies that a unit percentage increase in stakeholders' engagement (S) would cause 0.3% increase in University performance (Y), a unit percentage increase in curriculum review (R) would cause 0.22% increase in University performance (Y) and a unit percentage increase in

Professional bodies' engagement (P) would cause 0.13% increase in University performance (Y). ANOVA values show that F (4, 39) = 73.531 and p value (0.000) < 0.05, tolerance values>0 and most VIF values < 10, thus the regression model is a valid relationship between curriculum orientation and University performance.

Table 4.26: Regression Summary and ANOVA on Linkage Strategies-Performance

	Standardised Coefficients		Sig.	R	R Square	F	df	Sig.	Collinearity Statistics	
Regression				.940[a]	.883	73.531	4	.000[a]	Tolerance	VIF
	B	Beta								
Constant	.493		.000			Residual	39			
Frequency of Curriculum Review	.041	. 220	.041						0.078	10.12
Stakeholders' engagement	.121	.300	.003						0.144	6.92
Professional bodies' engagement	.125	.130	.049						0.181	5.51

Regression model is significant at the 0.05 level (2-tailed).

Consequently, all the four formulated hypotheses were accepted as follows:

Hypothesis 1: *There is a significant positive correlation between curriculum review and University performance.*

Hypothesis 2: *There is a significant positive correlation between stakeholders' engagement in curriculum development and University performance.*

Hypothesis 3: *There is a significant positive correlation between professional bodies' engagement in curriculum development and University performance.*

Hypothesis 4: *There is a significant joint effect of curriculum orientation on University performance.*

Discussion

Correlation analysis indicates that there exists high positive correlations between curriculum orientation and University performance. This demonstrates that strategic choices with strong industry linkage components yield superior organizational performance while strategic choices with weak industry linkage orientation lead to poor organizational performance. The study highlights the most significant components of curriculum orientation that impacts on University performance. Frequency of curriculum review, stakeholders 'engagement and professional bodies' engagement have been established as significant predictors of University performance. The University authorities must therefore strategically link these indicators to the industry needs by involving stakeholders and professional bodies in decision making process in order to realise superior performance. Organisational policies should take into consideration, the needs and

demands of the industry that it serves rather than focus on performance in isolation. Curriculum development and review policies, industrial attachment policies and all other linkage strategies and procedures must provide space for contributions from stakeholders. There is need for University authorities to develop policies that promote collaborative curricula development in Universities. The outcome would be curriculum that is relevant to industry needs in Kenya and other African countries. Results of this study show that curriculum review is not consistent in most Universities. This implies that there is inadequate government effort in coordinating the development of academic programmes offered in these institutions to make them respond to the country's development challenges. Universities need to adopt robust policy framework to monitor industry signals and determine appropriate value weightings on some academic programmes so as meet the economic sector shortages. It is clear from the findings that some Universities do not regularly review their curricula after every complete cycle. This has a definite impact on the quality of graduates as reflected in the performance of such universities. Robust policies and implementation strategies that address curriculum development and review focus are necessary to improve the quality of graduates from such curricula. Chatterton and Goddard (2001) Studied 35 universities in Britain to investigate the use of the resource based view and knowledge based view to improve the understanding of the process for the initiation and function of University and industry collaboration. Findings confirmed the persistent lack of an integrative framework for the management of collaborations and proposed a model for University and industry collaboration. These findings agree on the fact that curriculum orientation is paramount in determining University performance. Generally, private universities recorded stronger scores in most variables compared to public Universities as analysed in descriptive statistics. The coefficients of variation values are favourably lower among private Universities, thus indicating more consistency and stability in variable scores. It is clear from the findings that Universities can only remain relevant if they respond promptly to the changing technology and emerging industry demands, by formulating industry based curriculum development and review policies in order to counter competition challenges and strive to attain and maintain a competitive edge over the rivals in all areas of operation and more so offer quality education that is relevant to the needs of the industry.

Implication of the Study

The study findings have theoretical, practical and policy implications for future researchers, University authorities and all stakeholders. Resource-based view (RBV) as the main theory anchoring the study provides a favourable model for analysing the appropriate strategies that can provide effective curriculum orientation to industry needs. Although private Universities seem to have performed better than public ones, there is need to foster more collaborative approaches in curriculum development and review across all Universities in order to exploit the synergistic benefits. For practice, the study highlights the most significant components of curriculum orientation that impacts on University performance. Although Stakeholders' engagement came out as the strongest determinant of University performance, professional bodies and regular curriculum review are equally important in ensuring that the content meets the general expectations. The University authorities must therefore strategically link these indicators to the industry by involving stakeholders in strategy formulation and implementation process, in order to come up with effective industry based curriculum development and review policy. The Universities' decision makers should therefore reinforce stakeholders' engagement as a critical component of curriculum orientation. All-round curricula must be established in all disciplines to raise the quality of higher education, in particular, and of social life, in general. Universities must seek to acquire resources to support academic staff travel for participation in professional conferences and training programmes. It is important that there be

serious consideration of investment in curriculum development and review that will enhance the capacity of universities in the region in order to further national development. Organisational policies should take into consideration, the needs and demands of the industry that it serves rather than focus on performance in isolation. Curriculum development and review policies should be built around improving the fit between higher education and the world of work and making institutions more cost-effective. University curricula are often disconnected from industry needs. There is therefore, need to review the legal framework, protocol and conventions that set up these institutions to allow for more collaboration with the universities and industry players. There is need to establish a national policy on university-industry collaboration on curriculum development and promotion of innovative knowledge transfer mechanisms. This would involve development of policies for creating spin-off companies to utilize university patents and licenses and establishment of IPR management offices in each university and support the establishment of joint university-industry incubation centers. Future studies should be undertaken in Kenya and the East African region using relevant data from a variety of media sources and for longer periods of time. Particularly, it is recommended that regular surveys should be conducted by stakeholders including relevant government departments and universities to specifically seek opinions of prospective employers on what academic programmes and specific skills they consider critical for various jobs. Regular surveys need to be undertaken to obtain perceptions of University students on various jobs and industry. Such studies shall produce information that would inform curriculum development process among Universities so as to make higher education in Kenya more relevant to the country's current and future development needs.

References

Commission for University Education (2013). Status of Universities Operating in Kenya. Retrieved from http://www.che.or.ke/contactus.html.

Eshiwani, G.S. (1999). *Education in Kenya since Independence.*Nairobi. East African

Educational Publishers.

Grant, R. (2010). *Contemporary Strategy Analysis*: Text & Cases (7th Ed.). Chichester: John Wiley& Sons.

Hooghoff, H., & Bron, J. (2008). Core affairs: Scotland: Case studies basic education in Europe. Enschede, Netherlands: SLONetherlands Institute for Curriculum for Development.

Irungu, S.M. (2007). *The Effect of Top Management Teams on the Performance of Publicly Quoted Companies in Kenya.*Unpublished PhD Thesis, School of Business, University of Nairobi, Kenya.

Jita, L. C. 2006. Theorizing stakeholder participation within the higher education quality assurance system in South Africa. South African Journal of Higher Education 20 (6): 924–931.

Johnson, G. & Scholes, K. (2006). *Exploring Corporate Strategy*. England. Pearson Education Publishers.

Kaplan, R.S. & Norton, D.P. (2008). *The Balanced Score Card*. Harvard Business School press. Boston. MA.

Koskei, K. K. (2015). Assessment of Stakeholders' Influence on Curriculum Development Process in Secondary Schools in Kericho County. *IOSR Journal of Humanities and Social Science (IOSR-JHSS)*. 20 (3): 79-87.

Martin, M. (2000). *The Management of University-industry Relations: Five institutional Studies from Africa, Europe, Latin America and the Pacific region*. Paris: UNESCO.

Mintzberg, H. (1987). The strategy concept: Five P's for strategy. *California Management Review. 30.* 11-24.

Ozsoy, C. (2011). The Contribution of Higher learning to Economic Development. *University Journal*. 14. 5-9.

Pauw, K., Oosthuizen, M. & Westhuizen, C. (2008). Graduate Unemployment in the Face of Skills Shortages: A Labour Market Paradox. *South African Journal of Economics*.76. 45–57.

Weidman, J. (1995). Diversifying Finance of Higher Education Systems in the Third World: The Case of Kenya and Mongolia. Retrieved from http://epaa.asu.edu/epaa

Philosophical Foundations And Ethics: A Deconstruction And Reconstruction Of Kenyan Education System

Ruth M. Mwanzia[1], Njoki Wane[2] and George Muthaa[3]

Department of Education, Chuka University, P.O BOX 109-60400, Chuka Kenya

Corresponding author e-mail:*rmwanzia2011@gmail.com*

Abstract

One of the objectives of education is to promote ethical behaviour among learners. This is emphasized by various commissions and reports on education. Despite the enormous investment in education over the years and the high academic qualification, the level of impunity, corruption and intolerance among graduates and other leavers has become a major concern among educationists and stakeholders. Efforts through reforms and commissions have not yielded much in developing ethics among learners. This raises concern on the influence of contemporary philosophical foundations on ethics. The current study aimed at determining the influence of deconstruction and reconstruction of Kenyan philosophical foundations on ethics among learners in all levels of education. The study was carried out in Kenyan universities and communities. Descriptive survey and correlation research design were adopted for the study. A sample size of 384 respondents comprising of 324 students and 60 academic staff participated in the study. Data collection was done using questionnaires and interviews. Instrument validity was enhanced through expert judgement by supervisors. Reliability of instruments was estimated by use of Cronbach Alpha. Descriptive statistics and inferential statistics were used to analyze the data. Research hypothesis was tested using regression and correlation analysis at a significance level of $\alpha = 0.05$. The study found out that the contemporary philosophical foundations and reconstructed philosophical foundations contribute significantly towards ethics. The null hypothesis that there exists no significant influence on deconstruction and reconstruction of philosophical foundations on ethics is not supported in the current study. The study recommends the need to deconstruct and reconstruct the contemporary philosophical foundations in order to influence ethics among learners in all the levels of education.

Key words: Deconstruction, reconstruction, contemporary, philosophical foundations, ethics

1.0 Introduction

According to Singer (2001) ethics is the standard of good and bad distinguished by a certain community or social setting. Bewaji (2004) defines ethics as the character or attribute of an individual dealing with what is good and evil. In this study, ethics is defined as a set of guidelines that define acceptable behaviour and practices for a certain group of individuals or society. Ethics is important in the society because it is an essential part of the foundation on which a civilized society is built (White, 2016). Ethics safeguards the total way of life, which forms the culture of people. African traditional communities conceived ethics as an integrated whole (Kinoti, 2010). For instance, an honest person was described as one who could be relied upon because he or she was truthful, generous, courageous and had sense of justice.

In Kenya, the notion of ethics dates back to pre-independence period. Indigenous education emphasized on normative and expressive skills through instilling the accepted behavior and creation of unity respectively (Sifuna & Otiende, 2006). Indigenous education forms part of African heritage and therefore it is inseparable from African way of life. Indigenous knowledge is often perceived as primitive and historical comprised of ancient practices of the African

people. While that could have a meaning to those who propagate such views, to Angioni (2003); Dei (2002); Purcell (1998) and Turay (2002) the word indigenous refers to specific groups of people defined by ancestral territories, collective cultural configuration and historical locations. Owour (2007) observes that indigenous denotes that the knowledge is distinctive and belongs to people from specific places with common culture and societies.

From studies by researchers on African indigenous education, it is clear that indigenous education was grounded on specific aims of education which were realized through a well thought out philosophical foundations intended to guide social and moral behavior. But, like African philosophy itself, the ideas and beliefs of the African society that acknowledge ethics have not been given detailed investigation and clarification in the Kenyan education system and thus, stand in real need of insightful and extensive analysis, interpretation and implementation. Attempts have been made by contemporary African philosophers to give continuous reflective attention to African moral ideas however; this has not been fully achieved.

According to Owuor (2007) an examination of education reports, such as the Ominde Report of 1964, Gachathi commission of 1976, Kamunge commission of 1988 Constitution of Kenya 2010 and Basic education Act 2014 indicates that the government fully recognizes the importance of promoting ethics in the formal education system. While these reports seem to be inclined towards inclusion of indigenous discourses and perspectives in the education system, there have been obstacles at the implementation stage. There exists a glaring mismatch between the goals of education and the expected outcomes. The current study sought to determine the influence of deconstruction and reconstruction of philosophical foundations on ethics in the Kenyan education system.

1.2 Statement of the Problem

Education is critical in producing ethical people in the society. The African educational system inculcated ethics among members of society and produced ethical and morally upright individuals for generations. With the introduction of colonial education the responsibility of inculcating ethics to children was taken up by the new education system. Ethics has been a key focus for education policy in Kenya since independence. An examination of education reports including Ominde, Gachathi, Kamunge, constitution of Kenya 2010 and Basic education Act 2014 indicates that the government fully recognizes the importance of promoting ethics in the formal education system. Despite the enormous investment in education over the years and the high academic qualification among graduates, the level of impunity, corruption and intolerance manifested in theft of public resources, nepotism, ethnic hatred, religious intolerance, hate speech among others has become a major concern among educationists and stakeholders. Efforts through reforms and commissions have not yielded much in developing ethics among learners. The current study sought to determine the influence of deconstruction and reconstruction of Kenyan education system on ethics among

2.0 Literature Review

This chapter reviewed literature on the influence of deconstruction and reconstruction of philosophical foundations on ethics in the Kenyan education system. The chapter contains information about concept of contemporary and African indigenous philosophical foundations.

2.1 Contemporary Philosophical Foundations

The Kenya Education Commission Report (RoK, 1964) identified the eight national goals of education which formed the philosophical foundations of education. Ominde Report outlined six national goals of education which the educational system was expected to fulfill (ROK, 1964). These goals were later revised to become eight in number as follows: One to foster nationalism, patriotism and promote national unity; Two, education to promote the social, economic, technological and industrial needs for national development: Three, education to promote individual development and self-fulfillment; Four, education to promote sound moral and religious values; Five, education to promote social equality and responsibility; Six, education to promote respect for and development of Kenya's rich and varied cultures; Seven, education to promote international consciousness and foster positive attitudes towards other nations and Eight, education to promote positive attitudes towards good health and environmental protection.

2.2 African Indigenous Philosophical Foundations

African indigenous education as practiced by many communities simple or sophisticated rests on firm and sound philosophical foundations. This implies that this system of education used its own principles on which it was built. Sifuna, 2006, like Omona (1998) has outlined five pillars upon which African Indigenous Education rests. These are preparationalism, functionalism, perennialism and holisticism and communalism. The philosophy of communalism (Sifuna 2006, Mush, 2009 and Ocitti, 1973) attest that communalism or group cohesion, parents sought to bring up their children within a community in which each person saw his well-being in the welfare of the group. Sifuna, (2006), like Omona (1998) contends with Mush (2002), that preparationalism as a philosophical base for indigenous knowledge implied the role of teaching and learning to equip boys and girls with the skills appropriate to their gender in preparation for their distinctive roles in the society. Functionalism implied becoming useful to oneself as well as to one's family, community, clan or society to learn what was of relevance and utilitarian to both the individual and the society.

The principle of perennialism which is also considered same as conservatism explains most colonial societies were backward oriented much more than being future–oriented. African indigenous education did not allow the progressive influence of the mind of young people. Most traditional communities in Africa perceived education as a vehicle for maintaining or preserving the cultural heritage and status quo. This partly explains why traditional teachers discouraged pupils from experimenting with the unknown and imposed heavy sanctions on those who tried to do so. The principle of wholisticism as the name implies referred to multiple or integrated learning where a learner was required to acquire multiple skills. The holistic nature of customary education enabled young people to acquire a variety of skills that made them productive in many ways.

3.0 Methodology

The study was carried out in Kenya universities and communities. Descriptive survey and correlation research design were adopted for the study. The target population of the study was comprised of 537,211 subjects. A sample size of 384 respondents comprising of 324 students

and 60 academic staff participated in the study. Data collection was done using questionnaires and interviews. A research permit was obtained from the National Commission of Science, Technology and Innovation after which a pilot study was conducted in order to improve on the reliability of the research instruments. Reliability of instruments was estimated by use of Cronbach alpha method. A reliability coefficient of 0.789 for the academic staff questionnaire and 0.792 for the students' questionnaire were realized. Validity of research instruments was ascertained by university supervisors and other experts. Descriptive statistics and inferential statistics were used to analyze the data with the aid of Scientific Package for Social Sciences version 25.0. Research hypotheses were tested using regression and correlation analysis at a significance level of $\alpha = 0.05$.

4.0 Results and Discussions

The study sought to determine the influence of philosophical foundations on ethics in the Kenyan education system. Philosophical foundations are elements of philosophy that have a bearing in regard to the purposes and content of education. During analysis of data collected a Likert scale indicating Strongly Disagree (SD) $1 < SD < 1.8$; Disagree (D) $1.8 < D < 2.6$; Neutral (N) $2.6 < N < 3.4$; Agree (A) $3.4 < A < 4.2$; and Strongly Agree (SA) $4.2 < SA < 5.0$ was used. Descriptive statistics of the mean and standard error were used to analyze the results.

4.1 Contemporary Philosophical Foundations

The respondents were asked to indicate the extent to which they agree with several statements of contemporary philosophical foundations in influencing ethics in the Kenya education system. The results are shown in Table 1.

Descriptive Statistics on Contemporary Philosophical Foundations

Statement	N	Mean	Std. Error
Education system helps learners acquire a sense of national unity	383	3.99	0.055
Social responsibility is enhanced in the curriculum	384	3.80	0.053
Education promotes respect for culture	384	3.77	0.056
Individual development is achieved through education	384	3.89	0.055
The knowledge acquired in school helps in inculcating moral and religious values	384	3.83	0.053
Education helps learners to protect and conserve the environment	383	3.80	0.056
Education helps in character building	384	3.91	0.053
Education aims at preparing learners for various roles in the society	384	4.00	0.053
Education promote positive attitudes towards other nations	384	3.93	0.053
Overall Mean score		3.88	0.054

The results in Table 1 show that that the overall mean score of contemporary philosophical foundations was 3.88. Education aims at preparing learners for various roles in the society had the highest mean score of 4.00 and Std. error of 0.053. Education system helps learners acquire a sense of national unity was second highly rated with a mean of 3.99 and Std. error of 0.055. According to Ojiambo (2009) education underlines the importance of education in promoting national unity is a prerequisite component for national development. Through school

curriculum, education enables a country to achieve its needs and aspirations. National Cohesion and Integration Commission (NCIC) has emphasized the importance of education in the achievement of long term cohesion and integration among Kenyan communities. The Kenyan government promotes national cohesion and integration by ensuring political, social and economic stability. It is the responsibility of government to create a stable and predictable environment for citizens to pursue their life-long aspirations and endeavors. KICD (2013) emphasized the importance of education in the achievement of national cohesion among Kenyan communities.

NCIC in conjunction with KICD are involved in instilling among the young people the appreciation of diversity through education. Education promotes respect for culture was the lowest rated with a mean of 3.77 and Std. error of 0.056. Kinyanjui (2012) notes that all nations in the world possess a vast assortment of different people, customs, languages, traditions and lifestyles. This means that every nation is multi-ethnic and multi-lingual in its makeup and hence multiculturalism is destined to be one of the distinctive features of the world of the future. According to ROK (2012) every school whatever its intake and wherever it is located is responsible for educating individuals who will live and work in a country which is diverse in terms of culture, religion or beliefs, ethnicities and social backgrounds.

4.2 African Indigenous Philosophical Foundations

The respondents were asked to indicate the extent to which they agree with several statements of African indigenous philosophical foundations in influencing ethics in the Kenya education system. The pertinent results are shown in Table 2.

Table 2

Descriptive Statistics on African Indigenous Philosophical Foundations

	N	Mean	Std. Error
Emphasizing on an education system that promotes a spirit of communal cohesion	384	4.23	0.039
Preparing learners for various roles in the society	384	4.35	0.036
Emphasizing on holistic development of learners	384	4.25	0.043
Promoting moral and religious values in education	383	4.38	0.035
Emphasizing on an education that promotes continuity of desired societal values	384	4.30	0.038
Having an education that prepares learners for future responsibilities in society	384	4.51	0.033
Emphasizing on equal opportunities to all learners	384	4.35	0.042
Emphasizing on education that inculcates value of environment protection and conservation	384	4.30	0.037
Promoting positive attitudes of mutual respect	384	4.39	0.034
Providing learners with necessary skills and knowledge for national development	384	4.46	0.033
Overall Mean score	-	4.35	0.037

The results in Table 2 suggest that the respondents, on average indicated high agreement with integrating aspects of African indigenous philosophical foundations in the Kenyan education with an overall mean score of 4.35. Most notably, having an education that prepares learners for future responsibilities in society had the highest mean of 4.51 and a Std. error of 0.033. Emphasizing on an education system that promotes a spirit of communal cohesion had the lowest mean score of 4.23. According to Woolman (2001) the main purpose of education is to educate individuals within society, to prepare and qualify them for work in economy as well as to

integrate people into society and teach people values and morals of society. Role of education is a means of socializing individuals and to keep society smoothing and remain stable. Education in society prepares youngsters for adulthood so that they may form the next generation of leaders. One of the education essential tasks is to enable people to understand themselves. Students must be equipped with knowledge and skills which are needed to participate effectively as member of society and contribute towards the development of shared values and common identity.

4.3 Correlation Analysis Philosophical Foundations and Ethics

Pearson's Product Moment Correlation (r) was used for data analysis. Correlation is a value between -1 and +1. In the interpretation of results for the linear relationships in the study, for a weak correlation, "r" ranged from + 0.10 to + 0.29; in a fairly weak correlation, "r" ranged between + 0.30 and + 0.39; in a fairly strong correlation, "r" ranged from + 0.6 and + 0.79 while in a fairly strong correlation, "r" ranged from + 0.8 and + 0.99. The interpretation for the strength of the correlation by use of 'r' values was as indicated by Shirley et al. (2005). The values of "r" and "R2" were considered while interpreting results and a confidence level of at least 95% in the tests of hypotheses was required.

This objective of the study sought to determine the influence of deconstruction and reconstruction of philosophical foundations on ethics among learners in the Kenyan education system. In order to assess the relationships among the independent variable and the dependent variable, a correlation analysis was conducted. Results of the analysis are presented in Table 3.

Table 3

Correlation Analysis Philosophical Foundations and Ethics

		Ethics	Contemporary philosophical foundations	D & R philosophical foundations
Ethics	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	384		
Contemporary philosophical foundations	Pearson Correlation	.552**	1	
	Sig. (2-tailed)	0.000		
	N	384	384	
D & R philosophical foundations	Pearson Correlation	.445**	.853**	1
	Sig. (2-tailed)	0.000	0.000	
	N	384	384	384

The results of the Pearson's product moment correlation analysis as presented in Table 42 show varied degrees of interrelationships. The contemporary philosophical foundations are statistically significantly correlated with ethics (r=0.552; Sig. 2tailed (P-value) =0.000<0.01). Similarly the D & R philosophical foundations are statistically significantly correlated with ethics (r=0.445; Sig. 2tailed (P-value) =0.000<0.01). Ndofirepi and Ndofirepi (2012) state that any education system is developed under philosophical foundations that guide its processes. Education is influenced by philosophical, social, economic, political and cultural norms of the

society. Philosophical foundations must be capable of stabilizing social order, conserving culture in the society and acting as an instrument of social reconstruction. Okoro (2010). Education being a multipurpose process not only inculcates social, economic and cultural awareness in humanity but is also an important medium for grasping and promoting life enhancing values among human beings which form ethics. To enhance the whole education system there is need to address more fundamental issues of the social and moral consequences of the unregulated activities in education. Well stated philosophical foundations help in promoting ethics among lerarners.

4.4 Regression Analysis and Hypothesis Testing

The objective of the study was to determine the influence of deconstruction and reconstruction of philosophical foundations on ethics among learners in the Kenyan education system. Respondents were asked to rate the extent in which they agreed with several parameters of philosophical foundations in the Kenyan education system. The following hypothesis was tested.

Ho3: *There is no statistically significant influence on deconstruction and reconstruction of philosophical foundations on ethics among learners in the Kenyan education system.*

The results are presented in Table 4

The results in show that the contemporary philosophical foundations had influence on ethics. The coefficient of determination is 0.304. This suggests that 30.4% of variation in ethics is explained by contemporary philosophical foundations. Similarly the study found out that 19.8% of variation in ethics is explained by the D & R philosophical foundations. On the basis of these results, the study revealed that the contemporary philosophical foundations has marginal significance towards ethics.

F-statistic was used to assess the overall significance of the simple regression model. Results in Table 4 indicate that contemporary philosophical foundations significantly influence ethics with F-statistic of 167.207 and a p-value=0.000<0.05. This implies that the regression model is statistically significant at 5% level of significance. Similarly D & R philosophical foundations significantly influences ethics with F-statistic of 94.222 and a p-value=0.000<0.05.

T- test was used to determine the individual significance of the influence. The results in Table 43 show that the contemporary philosophical foundations was considered to be statistically significant with regression coefficient of 0.648 with a t-value=12.931 and p-value=0.000<0.05. This implies that for one unit change in the contemporary philosophical foundations, correspond to an increase in ethics by a factor of 0.648. Further the study revealed that the D & R philosophical foundations were considered to be statistically significant with regression coefficient of 0.855 with a t-value=9.707and p-value=0.000<0.05. This implies that for one unit change in D & R philosophical foundations, ethics increases by a factor of 0.855. Beta coefficients indicate that contemporary philosophical foundations had a stronger influence of 0.552 and D & R philosophical foundations with a Beta coefficient of 0.445.

Table 4

Regression Analysis of Philosophical Foundations and Ethics

The goodness of Fit

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
Contemporary philosophical foundations	.552[a]	0.304	0.303	0.77955
D & R philosophical foundations	.445[a]	0.198	0.196	0.83716

The Overall Significance of the Model

Model		Sum of Squares	df	Mean Square	F	Sig.
Contemporary philosophical foundations	Regression	101.612	1	101.612	167.207	.000[b]
	Residual	232.143	382	0.608		
	Total	333.756	383			
D & R philosophical foundations	Regression	66.035	1	66.035	94.222	.000[b]
	Residual	267.721	382	0.701		
	Total	333.756	383			

The individual Significance of the Model

Model		Unstandardized Coefficients B	Std. Error	Std Coefficients Beta	t	Sig.
Contemporary philosophical foundations	(Constant)	0.853	0.198		4.298	0.000
	Contemporary philosophical foundations	0.648	0.050	0.552	12.931	0.000
D & R philosophical foundations	(Constant)	-0.163	0.366		-0.445	0.656
	D & R philosophical foundations	0.855	0.088	0.445	9.707	0.000

Conclusively, the study revealed that the contemporary philosophical foundations and D & R philosophical foundations contribute significantly towards ethics. The null hypothesis that there exist no significant influence of philosophical foundations on ethics is not supported in the current study. The regression model for the prediction of ethics can be stated as follows:

$Y=0.853+0.648X_{31}$

$Y=3.084$

$Y=0.855X_{3}$

Where;

Y=Ethics

X_{31}=Contemporary philosophical foundations

X_3=D & R philosophical foundations

0.853 is an estimate of the expected value of Y where $X_{31}$is zero.

3.084 is an estimate of the expected value Y where X_3=0

0.648 is an estimate of the expected increase in Y for a unit increase in X_{31} where X_{31} is the contemporary philosophical foundations.

In that regard, 0.648 is the estimate of the expected increase in ethics of the contemporary philosophical foundations in response to a unit increase in parameters of philosophical foundations. The regression coefficient of -0.163 which is a constant, indicates the value of ethics when philosophical foundations is at zero while a unit increase in philosophical foundations would lead to an increase of 0.648 in contemporary philosophical. On the basis of these findings, the study concluded that philosophical foundations had statistically significantly influence to ethics.

The results in Table 43 show that philosophical foundations had a statistically significant influence on ethics. It explained 19.8% of its variation (R^2=0.198). T- test statistic was used to determine individual significance of the relationship. The regression coefficient value of the computed (composite index) scores of D & R philosophical foundations was 0.855 with a t-test of 9.707 and significance level of P-value=.000<0.05. This implies that for a unit increase in philosophical foundations, results in an increase in ethics by a factor of 0.855. Therefore, D & R of philosophical foundations influences ethics in the Kenyan education system.

The F-test was used to assess overall significance of the simple regression model. It was found that the regression equation was statistically significant at 5% significance level (F=94.222, P-value=0.000). The hypothesis that there is no statistical significant influence of philosophical foundations on ethics is not supported by the current study. The regression equation to estimate ethics in Kenyan education system was stated as:

$Y=-0.163+0.855X_3$

Where

Y= Ethics

X_3=D & R philosophical foundations

-0.163=constant

0.855= an estimate of the expected increase in Y for a unit increase in X_3 where X_3 is the D & R philosophical foundations.

Angioni (2003) notes that the philosophical foundations employed in the traditional African education are still relevant today. No serious educator in Africa can afford to ignore the principles draw from indigenous education. The assumption is that there is a certain degree, in which traditional education is still being promoted all over Africa in spite of the modifications which have come up as a result of adopting the western style of schooling. African traditional

education is focused on the attainment of quality education, with centres of excellence that are recognized and profoundly appreciated by the stakeholders of the educational systems. Adeyemi and Adeyinka (2002 indicate that African indigenous education had its foundation in the five principles of preparationism, functionalism, communalism, perennialism and wholisticism.

5.0 Conclusion

The study concluded that deconstruction and reconstruction of Kenyan philosophical foundations had a significant influence on ethics among learners. Having an education that prepares learners for future responsibilities in society had the highest influence compared to emphasizing on an education system that promotes a spirit of communal cohesion which had the lowest mean score in relation to all the other dimensions of the African indigenous philosophical foundations.

5.1 Recommendations

This study endeavored to determine the influence on deconstruction and reconstruction of Kenyan education system in the bid to influence ethics among learners. Following a reflection on the same, the researcher recommended that there is need to integrate African philosophical foundations into the contemporary Kenyan educations in order to influence ethics among learners in all the levels of education.

References

Adeyemi, M. & Adeyinka, A. (2003).The Principles and Content of African Traditional Education. *Educational Philosophy and Theory, 35(4), 425–440.*

Angioni, G. (2003). *Indigenous Knowledge: Subordination and Localism. In G. Sanga & G. Ortalli (Ed), Nature, Knowledge: Ethnoscience, Cognition and Utility*. New York: Oxford.

Bewaji, J. A. (2004). *Ethics and Morality in Yoruba Culture, in Kwasi Wiredu. A Companion to African Philosophy*. Oxford: Blackwell Publishing

Dei, S. G. J. (2002). *African Development: The Relevance and Implications of Indigenousness: Indigenous Knowledges in Global Contexts: Multiple Readings of Our World.* Toronto: University of Toronto Press.

KICD, (2013).*Secondary School Summative Evaluation*. Nairobi: KICD

Kinoti, H. W. (2010). *African Ethics: Gikuyu Traditional Morality*. Amsterdam and New York: Editions Rodopi

Kinyanjui, K. (2012). *The Role of Religion in National Cohesion and Integration.* Nairobi: Nairobi University Press.

Mushi, P. K. (2009). *History of Education in Tanzania.* Dar-es-Salaam: Dar-es-Salaam University Press

NCIC, (2013).*Strategic Plan.* Nairobi: NCIC.

Ndofirepi, A. P., & Ndofirepi, E. S. (2012). (E)ducation of (e)ducation in 392 Traditional African Societies? A Philosophical Insight . *Stud Tribes Tribals , 10 (1)*

Ojiambo, P. (2009). Quality of Education and its Role in National Development: A Case Study of Kenya's Educational Reforms. *In: Kenya Studies Review: 1, 1, 133-149*

Owour, J. A. (2007). Integrating *African Indigenous Knowledge in Kenya's Formal Education System: The Potential for Sustainable Development:* University of British Columbia Paideia Press.

Purcell, T. W. (1998). Indigenous Knowledge and Applied Anthropology: Questions of Definition and Direction. *Human Organization, 57 (3), 258-272*

RoK, (1964). *Kenya Education Commission Report*. Nairobi: Government Press.

RoK, (1965). *Kenya Education Commission Report*. Nairobi: Government Press.

RoK, (1976). *The National Committee on Educational Objectives and Policies.* Nairobi: Government Press.

RoK, (1988). *Education and Man Power Training for the Next Decade and Beyond*. Nairobi: Government Press.

RoK, (2010). *The Constitution of Kenya.* Nairobi: Government Printer

RoK, (2012). *Education Act.* Nairobi: Government Printer.

RoK, (2013). *The Education Act 2013.*Nairobi: Government Printer.

Sifuna, D. N. & Otiende, J. E. (2006). An *Introductory History of Education*. Nairobi: University of Nairobi Press.

Sifuna, D. N. (2008).Wither African Indigenous Knowledge?. The Case of Primary Education inAfrica: From Colonialism to Globalization, Africa and Europe: Historical and Cultural Dilemmas and Challenges for Nationhood and Development. *TRANS, (3) 24-32*

Singer, P. (2001). *A Companion to Ethics*. Malden: Blackwell Publishers

Turay, T. M. (2002). *Peace Research and African Development: An indigenous African Perspective. In G.J.S. Dei, B.L. Hall &D.G. Rosenberg (Ed), Indigenous knowledges in Global Contexts: Multiple Readings of our World*. Toronto: University of Toronto Press.

White, J. (2016). Moral Education and Education in Altruism: Two Replies to Michael Hand. *Journal of Philosophy of Education, 50 (3)*

Woolman, D. C. (2001). *Educational Reconstruction and Post- Colonial Curriculum Development: a Comparative Study of Four African Countries.* UK: Pergamon Publisher.

Indigenous Methods Of Education As Practised By The Kipsigis

Sammy kipkorir Bii

Department of Educational Foundations,

Mount Kenya University

E-mail sammykipkorirbii@gmail.com

Phone 0728516951

Abstract

This paper presents an overview of indigenous methods of education used by the kipsigis and its Relevance to modern education. The article is descriptive and relied heavily on published works.It shows that kipsigis instructed children through formal and informal methods. Informal methods of instructions included involving children in productive work and observation. The boys were engaged in looking after livestock while girls looked after younger brothers and sisters. Children also learnt how to observe. They also learned through play. Other forms of informal methods were myths, legends folklores, riddles and songs. Myths are regarded as tales imaginatively describing or accounting for natural phenomena. The kipsigis had songs for various occasions .Besides the numerous folksongs with which children were associated with as they grew up, there existed rich children's oral literature. Folktales among kipsgis were based on day to day happenings. Asking of riddles was a very special form of amusement. Some riddles seemed to be simple while others were complex. Proverbs were used wisely in ordinary conversation. Formal methods of instructions were initiation and apprenticeship. The period of circumcision was the most important time in the life of the kipsigis. It marked the passage from childhood to adulthood. Medicine was widely practiced in kipsigis pre-colonial times. When children were sick or ill, the mother was responsible for giving advice and first aid before the father's assistance was resorted to. Men and women learned this skill from their parents. There were individuals who were recognized as better herbalists. A person who wanted his child to learn the skills from a specialist would pay a fee and training took a period of time .The skill of iron work was transmitted from father to son .Weaving was done by women and was taught to girls .The art of pottery was learnt by the kipsigis women from luo and Abagusii.The paperconcludes that there were two methods of instructions used by the kipsigis to teach their children in pre-colonial times; these were formal and informal methods.

Key words: informal methods, formal methods, myths, legends, riddles, proverbs

INTRODUCTION

This paper presents an overview of indeginous methods of education. Informal education was a lifetime process and it involves acquisition of values, knowledge and skills relevant to the day-to – day affairs of the society. The process of training was done according to age and sex.

Training for social roles was accomplished through formal introduction given during initiation and apprenticeship training; initiation marked the passage from childhood to adulthood and tested a younger ability and formally concluded learning before admitting him or her to the adult community. The initiation of both sexes significant a distinct period of formal teaching and examining with specifically selected and experienced elders giving instruction and setting test. Apprenticeship training was applied in the arts of medicine, iron work weaving and pottery. Informal method as used in this study refers to a lifetime process which involved acquisition of values, knowledge and skills. Myths are regarded as tales imaginatively and describing or accounting for natural phenomena or tales about gods or things which were beyond the understanding of men's. Legend is regarded as a tale fabricated to account for real event that took place or was believed to have taken place in time immemorial. Proverbs were the condensed wisdom of the great ancestors.

Methodology

This paper is largely descriptive; it has used written text to examine method of instruction used by the kipsigis

The main objective of this paper is to illuminate our understanding of indigenous methods used by the kipsigis to instruct their children

Discussion

Informal method

Rono (2000) point out that the kipsigis instructed children through informal and formal methods. Informal education was a life time process and it involved acquisition of values, knowledge and skills relevant to the day- to –day affairs of the society. Informal method of instruction included involving children in productive work and observation.

A child was expected to learn by seeing and imitating, it could only be given formal teaching after it had made a mistake or when the outcome of its work was found unsatisfactory.

The process of training was done according to age and sex. Training for social roles was accomplished through informal instructions given by person already filling those roles. These were often members of one's own family or kin group. Other forms of informal education were myths, legends, talk cores, riddles and songs.

Sifuna & otiende (1994) content that myths are regarded as tales imaginatively describing or accounting for natural phenomena or tales about gods or things which which were beyond understanding of men.There were tales about imaginary events, tales which tried to explain the beginning of things. An example of the myths is about the seven brothers which are today known as seven groups of kalenjin.

The seven brothers

Long ago, there was a man who was very poor .He decided to leave his country in the North and look for better place. This place was called **Emetab burgei** because it was very hot. He travelled a long a big rivers until he came to a very big lake. While at the lake he prayed to the sun **Asis**

for help from his poverty. Suddenly he was given many cattle and also a wife. Soon after marrying this wife, the man gets seven sons.

Owing to his great wealth and blessings of children, the man became very arrogant and selfish. He even refused his sons to marry because of this selfishness.

Eventually, he lost all his wealth. His wife left him and married somewhere else who had cattle. The sons also left him and decided to start their own family.

The seven brothers travelled together looking for good land for their cattle. This way they scattered and settled in different places. Each married and had their own children. Only Nandi and Kipsigis were left as each other's companion. Nandi and kipsigis lived together for a long time. Eventually a time came when their land was too dry and they had to look for better land for their cattle. At this time they decided to separate so that each man and his family could get enough land. Nandi moved his people and settled in Aldai.Kipsigis moved southwards.

He passed a hill which he named Tulwop kipsigis (Hill of Kipsigis) Finally he settled in Kericho and his children and cattle increased in great numbers.

Today the seven brothers are known as the ancestors of the seven group of the kalenjin.(chesaina 1991)

Ocitti (1973) observed that legends were tales fabricated to account for real events that took place or were believed to have taken place in time in memorial. Like myths, legends sounded like fairly tales but were fragments of actual history. They were closer to real life than myth. An example of the legend is the origin of the cooking of ugali.

The origin of cooking ugali

Long ago the kipsigis did not know how to cook ugali. They ground grains mixed with a little water and left it to soak. A childless woman who was desperately anxious to have a child, undertook to look after a neighbor who was about to have a baby. When she was preparing food for the mother to be the childless woman thought to her: "If I put this food on the fire and then give it to her, it will probably make her so ill that she will die and then I shall keep her child". So she cooked the food after preparing it in the usual way and gave it to the woman who presently began to sweat. After looking at the sweating woman the child call one said to herself "she is ill already! I will go to the field so that when she is dead I can return and say I wonder how she died" When she reached the field she saw that the sun was very hot and the ground was very dry, she pulled out the bracken from the other woman's crop and use it to shed her own. When she returned home she found that her patient was still a live, so on the next day she boiled the food in same way and gave it to the expectant mother. Although boiled food was given to the patient every day she got fatter and fatter until all the neighbors remarked on it. First one tasted the boiled food and then another, until they agreed the food was good.(chesaina 1991)

Rono(2000) point that the kipsigis had songs for various occasions.

Besides the numerous folksongs with which children's were associated as they grew up there existed rich children's oral literature. There were many children's songs lullabies and tongue twisters. These were learnt, recited and sung by children during free time, enabling them partly

to gain mastery of their mother tongue. Apart from the fun derived from them. They also helped to promote the mental development of children.

Examples

Don't cry baby

Quiet my brother

Don't cry baby

So mother may be come back

From the farm with some grains

The grain of millet

Sleep, now our child

Our mother is on the way

Quiet my brother (chesaina 1991)

Fresh milk

Cheruto, please go to the market

Cheruto, please go to the market

Go and buy salt

How much salt?

For fifty cents

How much salt?

For seventy five cents

The cow bellowed, mboo

The cow bellowed, mboo

The child replied thank you

For giving me fresh milk

The goat bleated, mbee

The goat bleated, mbee

The child replied thank you

For giving me fresh milk. (Chesaina, 1991)

Rono (2000) claimed that forlk tales among the kipsigs were based primarily on day to day happenings .Most of these bore very close relationships to life. Much of the ethical teaching children received come from folktales, most of which had happy endings and involved triumph over difficulties. Virtues such as communal unity, handwork, honesty, courage and conformity were reflected in many of the folk tales. Children learnt a lot about human follies, faults and weaknesses. The usual time for narrating folk tales was evening by the fireside.

Examples

The man who never attended public gatherings

Long ago, men used to go raiding for cattle. Whenever the elders gathered in order to discuss these raids, there was one man who always absented himself. He would always ask "what am I going to do at the meeting? ``

One day the men met to discuss a dangerous raid. They decided to use a certain password on this particular raid. They said;' if we come across a monster each person should tell it: "wait for the person behind to carry you across "

On the appointed day, the warriors did as they had resolved. The man who never attended public gatherings brought the rear. The monster approached him to carry it across. The man who never attended public gatherings asked the monster "there were all men who passed through this road why did you not ask them to carry you across?" The monster replied: "they told me wait for the person behind" The man who never attended public meetings said ""climb on"

The monster climbed on the man who never attended public meetings, ate him up and finished him completely.

From that day every man made a point of attending all public gathering. (Chesaina 1991)

Sifuna & Otiende (1994) explained that the judicious use of proverbs was usually regarded as sign wit .Proverbs were the condensed wisdom of the great ancestors. In proverbs one or two moral ideas were contained in a simple sentence. Most of them referred to different aspects of the socio political life. Old people and the parents used them in their dealings with children to convey moral lessons, warning and advice, since they made greater impacts on the mind than ordinary words .Example of proverbs are:

Proverbs on fate

You cannot take away someone else luck. This means your future or good luck is yours nobody can take it away from you.

This proverbs remind people that youthfulness is experienced only once in a person life.

Nobody can graze for another

Once fate is his alone. Nobody can assume someone else destiny

Death and laughter are brothers .This proverbs remind people about inevitability and proximity of death.

Proverbs on initiative courage, determination and perseverance

While waiting to eat the head on the bull,

We continue eating the head of grasshoppers

Encouragement to those who are in problems not to despair.

Struggle right and left,

One should struggle in all ways it is not advisable to give up before one has tried off many available.

Water does not stay in the sky forever

Suffering is not everlasting therefore one should not despair.(chesaina 1991)

Cautionary proverbs

If you live with a thief you also become a thief. This is a warning against exposing oneself to a bad influence.

Do not show a borne to a hyena.

Avoid courting trouble. Once you court trouble, you have to face consequences.

Do not follow a person who is running away.

Avoid being to mislead.

Proverbs on communal life.

Bees cannot get finished from a beehive.

We cannot expect everybody in a community to be perfect; it is inevitable to undesirable elements.

It is best for us to be like a tall tree.

A great deal can be achieved through units.

Many hands can uproot a mountain.

Many hands make work lighter(Chesaina 1991)

Riddles.

That which says 'Kurkar' – mouse

As flexible as a wrist chain-snake

I put it upside down and it does not spill-cow's teat

I met my father carrying arrows-porcupine

That which stand the whole night-cow's horn

I have a child who washes herself all the time-fly

I went on a visit and slept on top of a tree-safari ant

It is coming slowly down hill-caterpillar

Pepper in the ceiling-cockroach (chesaina, 1991)

Formal methods of instruction

Bogonko (1992) stated that formal instructions were givenduring initiation and apprenticeship training.

Orchardson(1959)content that the period of initiation was the most important time in the life of the kipsigis both for the individual initiate and for the whole community. It marked the passage from childhood to adulthood and tested youngster's ability and formally concluded learning before admitting him or her to the adult community. The initiation for both sexes signified a distinct period of formal teaching and examining with specifically selected and experienced elders giving instructions and setting tests.

A few weeks or months before start of ceremony, a site was selected for the boy's seclusion hut 'Menjo' which was located away from the homestead. The building of the hut 'Menjo' was done by candidates for initiation with assistance and instructions of young men from the neighborhood. These practical tasks associated with circumcision and training of boys gave them foundation of building their own houses when they were adults. Candidates were sent to invite their close paternal and maternal relatives to the beer party to be held at their home at the start of initiation. Each of those invited give instruction and advice to the candidates pertaining to the endurance.

Persistency (1939) point of that, before actual rite took place, boys underwent severe test of their endurance. On day of circumcision were stung with thistles as a test of their courage. As initiation approaches, the teasing that had been occasioned throughout the boy's life become

frequent. As he went about his activities, men would stop him and inform him that he would be circumcised by fire and generally he would be reminded that the process was very difficult one. In the last days before initiation, the candidates in the evening at each other's homes to practice initiation songs to be sung the night before the operation. In these songs, boys were reminded to heed the advice and instructions given by their seniors.

Rono (2000) explain that on the day of ceremony, the candidates got up very early and gathered in on of the homes and many boys joined them. These large group then went off to collect sacred plants 'Korosek' and 'Sinendoik' to be used that evening .At night, songs full of advice about endurance and perseverance on the part of the initiation were sung .Later, the candidates would be taken to the central home where they were taught lessons about the importance of courage and other related social virtues. In this central place, candidates were lined up in the order in which they would go through each part of the ceremony. This was in the order of the age or age set of their fathers with son or daughters of the most senior coming first and being known as 'Kiboretiet' .The initiation of the second most man was placed last and was called 'Koyumgoi' (the one herds the other's home) . The other candidates were placed in line in descending order according their father's age set. Initiates were trained to attach great respect to seniority, particularly to their fathers.

Fish & G. Fish (1995) claim that, the next morning as soon as the sun got warm or about 7:00 am, the actual operation begun for the girl initiates but for the boys it took place a bit earlier, as early as five o'clock in the morning. Boys were circumcised in their individual 'Menjo' huts. Girls were circumcised in the central place; usually outside the house of a well-off person 'The actual circumcision was cutting off the boy's foreskin and cutting off clitoris for the girls. After the operation, caretakers took their charge in hand .The girls were led away to the various homesteads where they would be put in the seclusion. The movement also took a form of an emotional and dramatic event, culminating in the reunions by clans and close relatives on the way. This marked test of the initiate bravery. Any girl who failed the test was finally expected to be married by an old or sick ling man of the community. Sometimes, some clans excommunicate such members. After this, elders teach candidates rules of behaviors. They were taught to be obedient throughout the period, listen to instructions carefully and make no complaints even when mistreated.

Orchadson(1959) point at that the second ceremony was Labe tap eun (the dipping of the hands) which took place after a prolonged period of seclusion. Education for the two sexes differed in methodology and curriculum because they were trained to play different roles in society, for example boys were given instructions on military techniques and skills

This was an important task of boy's courage. Candidates were taken to stream by their instructors, dipped their hands in the water, washing off their un cleanliness, including their childhood activities. They were allowed to handle and given tools and weapons such as Machetes, knives, axes and arrows and spears. They were taught how use them both for domestic and external purpose. In the evening, the candidates were shown various constellations of stars and planets called **'Taboita'** which they were taught to recognize. This was a metaphor for blessings during procreation. For the boys, kinship knowledge was imparted by their father's .Sometimes; sponsors assumed their role .Boys' in initiates had to know their genealogy and their exact position in the clan. They were farther secluded in a state of limited mobility in which they practiced physical skills of manhood such as making bows and arrow, walking sticks and similar articles for shooting birds .Rono(2000) observe that the ceremony of **labet ap eun** for girls had some similarities to that of boys. The initiates were taught some basic songs to sing led by some

old women. Above all the importance of cattle to the community was emphasized at every stage in this process. Here, every morning and evening when cattle went in and out, the girls were instructed to sing praise to them .Usually girls were instructed by their mother for whom they had great respect. Following **labet ap eun** ceremony, the initiates were taught virtues of love, generosity, courage and responsibility .Formal teaching through songs **(tienjinet)** commenced at this stage The initiates sang every early morning before and after each meal and every evening .The songs were archaic in language .The songs had lessons in proper behavior in relation to elders, parents, peers, opposite sex and children. The men usually took turn testing the boy initiates with the latter having to answer the questions carefully and systematically and correctly.

Peristaiany (1939) state that boys were taught what they could and should do what they should not do in terms of controlling natural calamities such as rain. They were advised to love and defend their communities from external attacks. Boy initiates were also taught sense of oneness, character formation, loyalty to clan and age set and importance of individual place in the community. In addition, they were taught good behaviors and kindness and were forbidden to use bad language or quarrel as this would bring curse to him and to the society and would find difficult to obtain a wife. The girls during 'Tienjinet' were expected to kneel down and put a basket on her head while holding a stool in each hand with a stool placed on her back. She was instructed by her sponsors and elderly women to move four times round central wall of manure with touching the ceiling with her basket .She was prohibited to touch the floor with her stool. The stool was not allowed to fall off. This was a test on psychomotor skills of the girls, particularly on how to carry of many loads of possible in anticipation of domestic chores which could involve carrying heavy items from one place to another .it was also learning the skills of balancing. girls receive socialized knowledge on milking techniques ,sing, praise to their men- be husbands, clan and other community members also they were taught how to keep their houses tidy and clean gourd as well art of cloth making.

`Kayaet ceremony was the fourth stage and it took place at night for both sexes. The initiates were led by their instructors (motirenik) down to a stream. In both cases emphasis at this stage was a ritual purification.

The initiates were made to swear that whatever they saw during seclusion and whatever they had been taught at any other stage s of initiation would not be revealed to the young children or other an initiatively within community or outside. If they did, they taught that they would not prosper in future .at this stage, girls were allowed to do all domestic chores, particularly cleaning their houses and grinding grain, however, they were not allowed to cook. Their chief occupation was to sew their new dresses (sirek) which were hemmed with beads in readiness for their coming out (ngetunet).

The fifth and last stages were more ritualistic than the previous ones. It was called yatet ap oret(opening of the way).The emphasis placed was ritual protection against death for example those initiates who had lost at least three brothers older than them would squirrel or blue monkey skin. During this stage, the boy initiates mother formally recognized and anointed him as was the case during beginning stage of initiation .this implied that the young man was respected by the mother and had accepted him as any adult. The newly initiated man now took the title `**arap**` before his name.

Rono(2000 & peristiany 1939) observe that **ng'eetune**t (coming out) ceremony, girl initiates were taught how they should behave towards their husbands and how to interact with other members of the community as pertains to their social and moral conduct .Also girl initiates were

given instructions and advise on ways and means of looking after husband's property ,especially cattle .The initiates were trained to protect themselves against evils they would meet in the life ahead .Social conduct in the family and in other circles was emphasized. Girls were equipped with ritual powers to handle misfortunes .This stage constituted final break with childhood where clothes worn in the previous stage was removed and new ones put on. In addition, old hair was shaved off to mark the entry into new a new life.

By taking the child out of the home environment, the initiation rites emphasized that an individual must be responsible to the whole society and that the community and family had an interest in him

Apprenticeship training

Rono(2000) explained that medicine was widely practice in kipsigs in pre-colonial times. When children were sick or ill, the mother was responsible for giving advice and first aid before the father's assistance was resorted to. She fetched different types of curative leaves, roots and juices of particular trees .men and women learnt their skills from their parents. Girls were taught to collect medicinal herbs from forests by mothers; in initial stages, they were accompanied by mothers to the forest and learn right types of medicinal plants. There were individuals who were recognized as better herbalists. They came from special clan **Kapkerichek**. A person who wanted his/her child to learn their skills from the specialist would pay a fee and the training took a period of time. The apprentice learnt through observation and participation.

Persons practicing witchcraft did this in secret and even trained their children in the art .When discovered ,a suspected witch was driven out of his /her own home to live with maternal uncles; others could be subjected tom death through strangling. There were some specialists in exercising witchcraft; they passed skills to their offspring's.

Rono (2000) content that iron working was a major economic activity. The skills of iron work were transmitted from father to son. Blacksmith, **'Kitongik'** made hoes, knives and weapons.

Weaving was practiced by women and was taught to girls. The skill a girl obtained depended on personal interest in skills practiced by her older sister, mother or grandmother. She learnt through observation and participation.

The art of pottery was learnt by the kipsigis women from the Luo and Abagusii .In pottery, all the work from the start to finishing was done by women; the digging of the clay, beating and softening it ,the molding and drying and the burning of the pots. The y made pots of different sizes and shapes for various purposes.

Conclusion and Summary

There were two methods of instruction used by the kipsigis in pre-colonial time. These were formal and informal method a child were expected to learned by seeing and imitation it could only be given formal teaching over it had made a mistake or when the outcome of its work was found insanitation. Other forms of informal education were myths, talk fore riddles and songs

There were also some other forms of teaching which were essentially formed. learning through apprenticeship was formed and direct parent who wanted their children to acquire some

exceptional training normally sent their children to work with graft men such as potters , blacksmiths and basket makers who could then teach them formally

Formal education also took the form of initiation

REFERENCEES

Bogonko, S.N (1992). A *History of modern Kenya (1885-1991) Nairobi: Evans Brothers*

Burnette , C.Fish and Geral W.Fish (1995). *The kalenjin Heritage : Traditional Religious practices . Kericho: AGC*

Chesaina, C (1991). *Oral literature of the Kalenjin.* Nairobi: East Africa Educational publishers ltd.

Ocitti, J.P. (1973). African indigenous education as practiced by the Acholi: Kampala East African Literature Bureau.

Orchardson, I (1959). The kipsigis. Nairobi:East African literature Bureau.

Peristiany ,(1939). *The social institution of the kipsigis.* London: Routledge & Kegan Paul ltd.

Rono, T.k (2000). "A history of colonial Education among the kipsigis of Kenya Circa" (1895-1963) .

(Un published MA Thesis ,Egerton University .

Sifuna, D.N. & Otiende, J.E. (1992)*An introductory History of Education*. Nairobi.

Nairobi University Press.

The author

The author has P1, BED (Arts) (KU) MED (History of education), University of Nairobi and pursuing Phd in History of education at Kenyatta University.He is a tutor at Nakuru Teachers college and a part time lecturer in the department of Educational Foundation, Kenyatta University.

Teachers' Professional Development Issues and their Impact on Teachers' Service Delivery. A Case Study of Msimba Secondary School in Mombasa County, Kenya

Authors Affiliation: Mt Kenya University, School of Education

Corresponding Author

Dr Daniel Njane Thuo, Email: dnjanethuo@gmail.com

P. O. Box 80194-80100, Mombasa, Kenya, Tel No 0722572595

Not yet published

(oral presentation)

Abstract

The controversy between Teachers Service Commission (TSC) and Teachers Unions on teachers' professional assessment and development (TPAD) and its impact on teachers' service delivery has been an issue since the parties signed CBA in 2016 that needs to be investigated. The purpose of the study was therefore to document the issues the TSC and Unions have on TPAD and how they impact on teachers' performance in service delivery. The study was carried out at 'Msimba' Secondary School in Mombasa County, Kenya. The study employed *ethnographic* research design. The target population was 324000 teachers employed by the TSC in schools in Kenya. Respondents were 43 teachers at Msimba Girls Secondary schools in Mombasa County, Kenya. Data was collected using observation, probing and document analysis. The descriptive statistics used were frequency and percentage to compare the issues on teachers' professional development, between teachers' union, TSC and their effect on teachers' service delivery. The data collected in this study was analysed using Statistical Package for Social Sciences (SPSS) computer programme version 20.0. The research findings established that it was not clear who was in charge of quality standard in schools between TSC and MoES&T; TPAD was not used to promote teachers; certificate teachers earned after attending management courses were not recognised by the TSC; and that junior teachers were used by head teachers to manage and rate senior teachers on TPAD in the school. There is a silent war between TSC officers and MoES&T officers in trying to win control over teachers' management, quality and standards and students' management. Teachers are demoralised, frustrated and prepared professional documents that they never used in classroom. It was therefore recommended that TSC, teachers unions and MoES&T should solve the identified issues on TPAD for better teacher's service delivery in schools

Key Words: issues, professional development, service delivery, content knowledge, teaching skills, in-service training,

1.0 Introduction

Professional development is formal in-service training to upgrade the content knowledge and pedagogical skills of teachers. It is widely viewed as an important means of improving teaching and learning standards (Meichen, Prashant, Yaojiang, Fang, Chengfang & Scott, 2017). The professional development that is required goes far beyond the one-shot workshop approach that has been widely criticized. Professional development includes intensive in-service, follow-up group sessions, and coaching of individual teachers (Quint, 2011). Kubitskey, Fishman, and Ron (2004) points out that there are four components of quality professional development which are supported through plan, structure, community, and activities. According to Ogbonnaya (2007) teachers' professional development refers to the opportunities offered to practicing teachers to develop new knowledge, skills, approaches and dispositions to improve their effectiveness in their classrooms. It is advancement that enhances teachers' knowledge of the students, the subject matter, teaching practices, and education-related legislation (Professional Affairs Department, 2005). It also includes use of ICT and counselling interventions in teaching and learning activities (SMASE, 2017; Thuo, 2008). Kwang, Teresa, Sylvia, and Kathy (2008) argues that professional development improve teaching and raises students' achievement. If one link is weak or missing, better student learning cannot be expected. If a teacher fails to apply new ideas from professional development to classroom instruction, students will not benefit from the teacher's professional development. The effect of professional development on students learning is possible through two mediating outcomes; teachers' learning, and instruction in the classroom (SMASE, 2017).

Wanzala (2016) reports that, in recognition of the fundamental shift in policy in public employment and with a view to promote, enhance and maintain high performance standards in the teaching service, TSC and unions agreed to ensure continuous professional development and annual performance evaluation system in the CBA. The parties also agreed upon the annual performance evaluation which was to be undertaken by TSC using tools that was to be developed with the participation of the unions (Wanzala, 2016). However, TSC has reneged on its earlier promise and issued fresh guidelines that emphasise performance over academic qualifications in regard to promotion. Under the new arrangements, no teacher will be promoted based on the academic qualifications or any professional development certificates. The TSC argues that job evaluation they carried out in conjunction with the Salaries and Remuneration Commission agreed that promotion be based solely on work done rather than mere academic papers (Mbaka 2018).

Research studies show contradiction effect of teachers' professional development on students' academic outcome. According to UNESCO (2006), researches from developed countries show that quality of teaching is an important factor that may affect educational outcomes among both advantaged and disadvantaged students. Literature reviewed by Linda (2000) also show that differential teacher effectiveness is a strong determinant of differences in student learning, far outweigh the effects of differences in class size and heterogeneity in Dallas, USA. However, a study carried out by Bonney *et al* (2015) revealed that even though the quality of teachers was high in terms of their academic and professional qualifications, it did not reflect much in the performance of the students. Thuo (2018) in a study carried out in Coast girls shows that although there was a relationship between teachers' professional development and students' academic performance, the students' academic performance could not have been attributed to teachers' professional development. There is therefore need to investigate why students' academic performance remained low despite the high standard of teachers' professional development in some schools.

1.2 Statement of the Problem

Professional development is an important aspect in supporting green growth and knowledge economy through research, innovation and technology for sustainable development. Professional development that is not supported by the employer encounters challenges that may eventually affect the objective of the programme initiated and knowledge gained by the teacher during professional development. The researcher during literature review did not come across a research carried out to determine the impact of teachers' professional development on their service delivery since the TSC initiated TPAD and at the same time reneged on recognising certificate achieved by teachers after attending professional development programmes. The present study therefore investigated the impact of teachers' professional development on their service delivery in Msimba Secondary School in Mombasa County, Kenya.

1.3 Objective of the Study

The study investigated the impact of teachers' professional development on their service delivery at Msimba Secondary School in Mombasa County, Kenya.

1.4 Research Questions

The study was based on the following questions; -

What is the level of professional development of teachers at Msimba Secondary school in Mombasa County, Kenya?

What is the status of teachers' professional development at Msimba Secondary school in Mombasa County, Kenya?

What is the level of teaching experience for teachers at Msimba Secondary school in Mombasa County, Kenya?

At what job group are teachers in at Msimba Secondary school in Mombasa County, Kenya?

What is feeling of teachers on professional development advocated for by the employer at Msimba Secondary school in Mombasa County, Kenya?

What is the level of qualification, job group and experience for teachers' appraiser at Msimba Secondary school in Mombasa County, Kenya?

Which body is mandated to evaluate learning standards in schools and appraise teachers in Kenya?

Do teachers prepare professional documents before going to class at Msimba Secondary school in Mombasa County, Kenya?

Do teachers use prepared professional documents when teaching at Msimba Secondary school in Mombasa County, Kenya?

Do teachers attend classes on time as required by TSC at Msimba Secondary school in Mombasa County, Kenya?

3.0 Methodology

The study employed *ethnographic* research design. The design allows the researcher to carry out extensive data collection on many variables over a long period of extended time in a natural setting (Mugenda & Mugenda, 2003). The design fit in the study in that the researcher has been in the institution for a period of nine years under two different managements. The name of the school studied was changed to protect the participants and the school from victimisation. The researcher has been recording what has been happening in the institution and understands teachers' feeling as well as how they do their work. The researcher during his interaction with other members and during staff meetings obtained data on teachers' professional development as well as information on service delivery. The researcher obtained informed consents from the school administration and teachers to publish the findings of the study. Data obtained was analysed using descriptive statistics that included frequencies and percentages. Data is presented inform of tables.

4.0 Results and Discussion

The first question was designed to establish level of professional development of teachers at Msimba Secondary school in Mombasa County, Kenya and the finding is summarised in Table 1.

Table 1:

Teacher level of education

Level of education	Diploma	Degree	Masters	PhD
Number of teachers				
N=42	5 (11.9%)	32 (76.2%)	4 (9.5%)	1 (2.4%)

Table 1 shows that the number of teachers with first degree was the highest (76.2%) followed by teachers with diploma (11.9%). The high number of teachers with degrees and above compared to teachers with diploma was an indication that teachers in this institution were highly qualified. The TSC has been advocating for training of teachers with high qualification and has insisted that teachers who train with lower grades would not be employed by the TSC. However, since 2014, TSC has refused to recognise certificates obtained by teachers after attending institution of higher learning even when such teachers had grade C+ and above and with C+ in their teaching subjects (Wanzala, 2016). The research also established that teachers had other professional qualification attained during teachers' professional development which were different from levels of education. The findings are summarised in Table 2

Table 2

Teachers' professional development

Professional Development	KEMI	SMASE	ICT	Counselling	Others	None
Number of teachers N=42	4 (9.5%)	14 (33.3%)	5 (11.9%)	4 (9.5%)	2 (4.8%)	13 (31%)

Table 2 shows that 29 out of 42 teachers had attended professional development courses with the highest number being in strengthening of mathematics and sciences in secondary school education (33.3%). The SMASE course is for teachers who teach mathematics and sciences in secondary schools and last for one week. However, TSC insist of professional development that last for two weeks and this made the certificate obtained during SMASE training irrelevant.

The second question aimed at establishing the level of teaching experience for teachers in the institution. The data generated was summarised in Table 3

Table 3

Teachers Teaching experience

Teaching experience	Below 4yrs	Between 4 and 8yrs	Above 8yrs and below 12yrs	12yrs and above
Number of teachers N=42	5 (11%)	4 (9.5%)	4 (9.5%)	29 (70%)

Information in Table 3 shows that majority of teachers in the institution had taught for more than 12 years (70%). This indicate that most of the teachers in the institution had seen at least 11 group of Form 4 candidates leave school and therefore fall under highly experienced teachers. Kenya National Examination Council recognises teachers who have taught for five years as having experience in teaching. The relationship between teachers' teaching experience and their service delivery in other fields has generated contradicting findings. Teachers' experience has been associated with their high self-efficacy in teaching (Nabeel, 2001) but at the same time an experienced teacher can have low self-efficacy if not well rewarded in certain areas (Hoy, 2000). Thus, teacher's professional development alone is insufficient in promoting their service delivery.

The third question was designed to establish the number of teachers in each job group at Msimba Secondary school in Mombasa County, Kenya and the data generated was summarised in Table 4

Table 4

Number of teachers per job group

Job group	BOM	J	K	L	M	N
Number of teachers						
N=42	4	1	5	18	11	3
	(9.5%)	(2.4%)	(11.9%)	(42.3%)	(26.2%)	(7.6.%)

It can be observed from Table 4 that majority of teachers were in job group L (42.3%). These teachers as shown in Table 3 have teaching experience of above 12 years an indication that most teachers had stagnated at job group L for a long period of time. It takes three years for a graduate teacher and six years for diploma teacher to reach job group L where they seem to stagnate. Lack of promotion is a demotivating factor especially when teachers reach the maximum pay rise and no longer get yearly increment (Buchana & Andrzefa, 2010).

The forth question was meant to gather information on teachers' feeling on professional development advocated for by the employer at Msimba Secondary school in Mombasa County, Kenya. Teachers were asked whether TSC recognises the certificates they are awarded after attending teachers' development programmes or not. The question was posted to teachers who are employed by the TSC. Teachers response was summarised in Table 5

Table 5

Do you think TSC recognises TPD certificate you have obtained?

Response	YES	NO
Number of teachers	7	30
N=37	(18.9%)	(81.1%)

Table 5 shows that majority of teachers (81.1%) felt that TSC does not recognise their certificates awarded after attending professional development courses. According Wanzala (2016) the Kenya National Union of Teachers (Knut) and Kenya Union of Post Primary Education Teachers (Kuppet) have been demanding that serving teachers, upon attainment of higher qualifications and professional development courses, should be promoted automatically. However, TSC has been contradicting itself by refusing to recognise certificates obtained by teachers after attaining either higher qualification or after attending professional development courses. The TSC also insists that teachers must attend professional development courses to stand a chance of being promoted to higher grades and even gives teachers paid study leave for higher education (TSC, 2012; Mbaka, 2018; Mirror, 2016).

The fifth question was concerned with the qualification of head of department who are the appraisers of teachers at Msimba Secondary school and other schools in general. The data obtained was summarised in Table 6.

Table 6

Appraisers Qualifications

Appraiser	Job group	Teaching experience	Academic level	Other qualifications
Principal	N	26	Bachelor	Education admin
D/principal	M	24	Bachelor	None
HoD English	L	20	Bachelor	None
HoD Kiswahili	M	32	Bachelor	None
HoD Mathematics	L	22	Bachelor	None
HoD Religion	M	22	Bachelor	None
HoD Humanities	L	26	Bachelor	None
HoD Biology	M	26	Bachelor	Examiner/SMASE
HoD Chemistry	M	24	Bachelor	Examiner /SMASE
HoD Physics	M	28	Dip	Counselling/SMASE
HoD Applied sc.	M	24	Bachelor	None
HoD Counselling	M	24	Dip	Examiner/SMASE
HoD Boarding	L	24	Bachelor	None
HoD Games	L	04	Bachelor	None

Table 6 shows that five of the head of department were in job L and seven in job group M. There were two teachers in job group N and three teachers in job group M who were not assigned any administrative duties. These teachers were among the most highly qualified in terms of teaching experience, academic level (except one who had Dip) and had other certificates advocated for by their employer ie certificate in education administration, counselling and other certificates. There were three teachers who had attended administrative courses yet they were not in the management in the institution. This is an indication that some teachers' appraisers were below those they appraised and that in some department, a none professional counsellor was in charge of the department when there were trained counsellors in the school. This indicates unclear policy from the TSC how head teachers should allocate administrative duties in school or lack of follow up where such policies exist. This study supports the unions demand that TSC should come up with clear policies on teacher promotions and redeployment to administrative duties (Wanzala, 2016). This situation is replicated by the TSC where Deputy principals are appointed from lower job than those of HoDs that she/he was supposed to supervise and appraise.

Question six was based on teachers feeling on whether the TSC was the rightful body to evaluate and appraise them on teaching standards and job evaluation. The information generated was summarised in Table 7

Table 7

Teachers' evaluation and standard

Teachers' feelings	TSC harass teachers during inspection N=42	Teachers' evaluation is the work of TSC N=42	Teachers' evaluation is the work of QASO N=42	I don't know who is supposed to evaluate teachers N=42
Number of teachers	36 (85.7%)	9 (21.4%)	30 (71.4%)	3 (7.1%)

Majority of teachers (85.7%) felt that their employer was harassing them, 21.4% of teachers felt that evaluation of teachers during teaching was the function of TSC while 71.4% felt that evaluation of teachers is the docket of quality assurance and standard officers who fall under the ministry of education. There has been disagreement between TSC, unions and Ministry on who is supposed to evaluate teachers in teaching (Mbaka, 2018; mirror, 2016). However, under the article 237(2) of the constitution of Kenya 2010, inspection and teacher appraisal is not the mandate of TSC (GoK, 2010). This mandate is placed under QAS in the MoES&T. These disagreements have resulted in teachers' deviant behaviour where some of them were reported to have burnt their appraisal form (Obebo, 2018).

Question seven was based on preparation of professional documents required by the employer before a teacher goes to class. Teachers were required to state whether they prepared the documents, show evidence and state whether they use them as they teach. The data generated was summarised in Table 8.

Table 8

Professional Documents

Professional documents	Scheme N=42	Lesson plan N=42	Lesson notes N=42	Mark book N=42
Number of teachers with the document	30 (71.4%)	15 (35.7%)	24 (57.1%)	42 (100%)
Number of teachers who use professional document to teach	9 (21.4%)	4 (9.5%)	5 (11.9%)	42 (100%)

Table 8 shows that 71.4% of teachers had scheme of work but only 21.4% of teachers used their scheme of work an indication that teachers prepared scheme of work as a formality. Table 8 also show that 35.7% of teachers prepared lesson plan but 9.5% of teachers used the lesson plan in class and others prepared them as a formality. The researcher perused the mark books and found out that most of them had marks for Continuous Assessment Tests (CAT) and examination marks but most of them did not have analysis or entry behaviour of their learners as recommended by the employer. According to Kwang *et al* (2008) argument, when a teacher fails to apply new ideas from professional development to classroom instruction, students do not benefit from the teacher's professional development. The effect of professional development on students learning is possible through two mediating outcomes; teachers' learning, and instruction in the classroom.

Question eight was based on class attendance, use of ICT, checked and marked students exercise book. The data generated was summarised in Table 9

Table 9

Class attendance

Class attendance	Arrive in class on time always N=42	Leave class early most of the time N=42	Use ICT in class regularly N=42	Check learners' exercise book N=42
Number of teachers	29 (69%)	9 (21.4%)	5 (11.9%)	19 (45.2%)

Table 9 shows that 69 of teachers regularly go to class on time, 21.4% of teachers do not teach the full lesson and leave early and 11.9% of teachers used ICT regularly in teaching. Teachers argues that staying in class for 40 minutes did not mean teaching was taking place throughout the lesson. The number of teachers who check students' note was 19 and that meant that majority of students notes went unchecked. When asked why they do not supervise teachers in their department on class attendance, some HoDs stated that some of the teachers in their department were actually their seniors and felt intimidated by them. The HoDs also felt that they do the donkey's work while their seniors earn higher salaries. The HoDs during management meeting had complained to the principal on the issue where senior teachers were not being allocated duties yet they received higher salaries compared to acting head of departments. The TSC circular to principals and County directors TSC had directed teachers in administrative job group be assigned administrative duties which has been ignored (TSC circular, 2016).

5.00 Conclusion and Recommendation

The study objective was to investigate the impact of teachers' professional development issues on teachers' service delivery at Msimba secondary school in Mombasa county. The study established

that some teachers in this school were highly qualified, experienced and had attended various forms of teachers' professional development courses. The study established that some of the teacher who attended professional courses had not been given a department to head. The findings also established that the school had some highly experienced teachers who were managed by teachers who had lower experience and lower job group. The study findings also showed that teachers were preparing professional documents for paper work only and never used the prepared document in teaching and learning activities. Teachers felt that there was war between their unions, TSC and MoES&T that negatively impacted on teachers' service delivery.

The researcher recommends that TSC, Teachers' unions and MoES&T should sit together and iron out their differences for the better working conditions for teachers so as to improve on teachers' service delivery. The TSC should also enforce their appointments and deployment of teachers to make sure that teachers perform duties they are appointed to do and that leadership in school respect teachers' seniority as delegated to teachers by the TSC.

Reference

Bonney, E., A., Amoah, D., F., Sophia A, M., Ahiamenyo, C., & Lemaire, M, B (2015). The Relationship between the Quality of Teachers and Pupils Academic Performance in the STMA Junior High Schools of the Western Region of Ghana. *Journal of Education and Practice;* Vol.6, No.24, 2015. pp139-151

Buchana, D., A & Andrzefa (2010). *Organisation Behaviour. Edinburgh;* Pearson Education Ltd

GoK (2010). *Constitution of Kenya, 2010.* Nairobi; government printers

Hoy, W. A. (2000). Changes in Efficacy during the Early Years of Teaching. New Orleans, LA. Session 43:22

Kubitskey B., Fishman, B. J. & Ron M. (2004). *The Relationship Between Professional Development and Student Learning: Exploring the Link Through Design Research Center for Highly Interactive Computing in Education, University of Michigan 610 E.* University, Ann Arbor, MI 48109

Kwang, S. Y., Teresa, D., Sylvia, L., & Kathy S. (2008). *The effects of teachers' professional development on student achievement: Findings from a systematic review of evidence*. Paper presented at the Annual Meeting of the American Educational Research Association, March 24-28, 2008, New York

Linda D., H (2000). *Teacher Quality and Student Achievement: A Review of State Policy Evidence.* Stanford University

Meichen L., Prashant L., Yaojiang S., Fang C., Chengfang L., Scott R. (2017). *The Impact of Teacher Professional Development Programs on Student Achievement in Rural China.* Working Paper 313; rural education action plan. reap.fsi.stanford.edu

Mbaka, J (2018). Uncertainty clouds promotion of teachers with higher grades. *Daily nation;* Nairobi: nation media, Feb. 24, 2018.

Nabeel, T. (2001). Teachers' Efficacy as Predictor of Self-efficacy Among Students in Pakistan. International Peer Reviewed Journal: Vol. 1 May 2011 ISSN 22438327.

Obabo, M (2018). TSC Takes Action Against the Tutors who Burnt their Appraisal Form. *Daily nation:* Nairobi; nation media, pp 1-2.

Ogbonnaya, U. I. (2007). *The Influence of Teachers' Background, Professional Development and Teaching Practices on Students' Achievement in Mathematics in Lesotho*. Unpublished MA Thesis, University of South Africa.

SMASE (2017). *Training Module for Secondary School Teachers on Inquiry Based Learning in Mathematics and Science.* Nairobi, CEMASTEA

Thuo, D. N. (2008). *The Relationship Between on Guidance and Counselling and Academic Performance of Secondary School Students in Kwale District, Kenya*. Unpublished MPhil Thesis: Eldoret; Moi University.

Thuo, D., N. (2018). *Teachers' Professional Development and Students' Academic Performance: A case study of Coast Girls Secondary School in Mombasa County, Kenya.* Chuka 5th international University International Conference, 2018

UNESCO (2006). Teachers and Educational Quality: Monitoring Global Needs for 2015. International Institute for Educational Planning. Montreal; UNESCO,

Wanzala O (2016). Teachers attaining higher qualification won't be automatically promoted. *Nation Sunday*; Nairobi: nation media. Oct., 30,2016

A New Dimension in School Discipline in Secondary Schools in Kenya

By DR Aliva Luvaso Elphas PhD luvasoaliva@yahoo.com +254722381328 AND DR Lornah Sirima,PhD lornahsiri@yahoo.com +254722215823 of RONGO UNIVERSITY

Abstract

Graffiti is writing or drawings made on a wall or other surface, usually without permission and within public view. Graffiti ranges from simple written words to elaborate wall paintings, and it has existed since ancient times, with examples dating back to ancient Egypt, ancient Greece, and the Roman Empire. In modern times, paint and marker pens have become the most commonly used graffiti materials. In most countries, marking or painting property without the property owner's permission is considered defacement and vandalism, which is a punishable crime. Many students in our public secondary schools have embraced the use of graffiti in books, buildings and even on their bodies which is also done by our various worldly sportspeople, heroes and heroines in various fields. The kind of graffiti the youth draw is a replica of who they are. This literary paper investigates the various types of graffiti drawn by our secondary school students, interpret their meanings and determine their effects on students' performance and discipline. This paper is guided by Behaviour Modification theory by B.F. Skinner on "how our voluntary actions are influenced by what happens to us immediately after we perform a given act". Controversies that surround graffiti continue to create disagreement amongst city officials, law enforcement, school administrators and writers who wish to display and appreciate work in public locations. This paper finds that many students enjoy the use of graffiti but they are not so specific about the meaning they are portraying. The paper concludes that there is need to develop guidelines especially on use of graffiti in our schools. Interventions are needed which include all stake holders to ensure change is effected and lastly sensitization programs need to be put in place to help the youth understand the effects of graffiti.

Keywords: Graffiti; School discipline; Dimension; academic performance;Secondary school

Introduction

Graffiti is the term given to letters, images or artwork that is painted, sketched, marked or drawn in any manner on property (Mores G,1992). It is a form of social expression and an art movement that is on the rise on global scale. The use of graffiti dates back to centuries, where walls and trees and mountain rocks were used as a canvas for people to leave messages and express themselves over various issues of human existence, however majority of the world is against graffiti (Senator Campell,1996).

Background to the Study

Graffiti started in the early 1960's but can be argued that the first ever pieces of artwork located in the caves, where our ancient ancestors resided, were graffiti. These cave drawings were how the people of that time would express themselves by telling a special story correlated to their lives, and the style the cave men used is pretty similar to the same principles used in graffiti today, (Watson T,1996). The media used obviously has progressed from berries and dirt, to the modern aerosol spray paint can, marker pen but it is still just art on a wall.

Rolling through the dusty roads of Nairobi capital city, you see wild, fanciful vehicles zipping by, their sides daubed with vibrant messages of graffiti, this is "Matatu" culture in Kenya, the practice of pimped-out, colour-exploding, happy-tatted local transit buses and matatus.

Statement of the problem

School administrators have the responsibility of maintaining discipline and high academic performance as one of their most important areas of emphasis. Recently schools are faced with modern acts of indiscipline including fighting, bullying, insubordination and of recent graffiti drawings which summarily results in poor academic results.

Graffiti drawings can form just one tool in an array of resistance techniques. It's often a subculture that rebels against authority, although the considerations of the practitioners often diverge and can relate to a wide range of attitudes. Many students in our public secondary schools have embraced the use of graffiti in books, buildings and even their bodies.

Purpose of the Study

This research paper examined emergence of graffiti in our secondary schools and its effects on discipline and academic performance. Not considered here is graffiti which is legal and commissioned by property owners for example matatu and buses.

Literature Review

Most studies in graffiti to date have used either content analysis to determine the reasons behind graffiti behavior, (Norlander, T .1996). There are no studies to date that use a school sample to examine the prevalence of 'tagging' in adolescents and its indiscipline and psychological covariates. However, studies on general antisocial behavior including vandalism provide some insight into the possible covariates of graffiti behavior (Marcus, R,F .1999).

Antisocial behaviors including vandalism have been associated with family and parental factors, drug and alcohol use, self-esteem, and locus of control.

A study of girls referred for out-of-home placement because of repeated and chronic juvenile indiscipline, (Chamberlain and Moore, 2002) noted several risk factors including family fragmentation, physical and sexual trauma, mental health problems, official arrest and self-report offending histories. In addition, apart from sexual trauma histories, these sample characteristics were similar to those found in a sample of chronically offending boys.

Another study (Vermeiren, Deboutte, Ruchkin and Schwab-Stone,2002) assessing 955 students in Belgium, 1,026 in Russia, and 1,391 in the United States, all aged between 14 and 17 years adolescents were assigned antisocial group status according to the nature of their reported indiscipline behavior. A non-antisocial group, a moderate antisocial group (non aggressive behavior) and a severe antisocial group (mainly aggressive behavior) were identified. Results show that in both genders and in all three countries, depression, somatization, negative expectations for the future and sensation seeking gradually increased from the non-antisocial group to the moderate antisocial group, and finally to the severe antisocial group. Levels of

anxiety were insignificant across most groups. The study concluded that although cross-national differences exist, the variables of interest showed markedly similar trends between antisocial groups across countries. Despite some work in these areas there is still much to understand about indiscipline behaviors in our schools this forms the basis of this study.

Research Objectives

The current study investigated possible co-variates of graffiti drawings in relation to behavioral characteristics that affect discipline and academic performance. This is because graffiti is used almost everywhere now and is really starting to adapt more to our schools' culture it's on high spread. To some its seen as a form of indiscipline and measures are being taken to discourage it but the more its discouraged the more it spreads.

Research Design

This study adopts cross-sectional survey research design recommended in collecting data from a sub-set of cognitive constructs.

Sampling

Participants in the study were 3603 (n = 1942 males; n = 1654 females; n = 17 undefined) secondary form three students (aged 15-19 years) from 28 public and 28 private schools. Participating schools were from both rural and suburban areas and in low to middle and high socioeconomic status in fourteen counties.

Administration of Instruments

Teachers supervised the administration of questionnaires, informed students their participation was voluntary, and that non-participation would have no adverse consequences. A teacher counsellor was made available to talk with any student showing distress and a group debriefing session followed the completion of the questionnaire. Students placed their responses in a sealed container to maintain confidentiality.

Instruments

Items of interest reported here form part of a comprehensive questionnaire – the Youth Assessment Checklist [20]. Socio-demographic information collected included school, gender, age, county of birth, vernacular language.

(i) Graffiti behaviour was assessed by a single item drawn from the DSM-IV criteria for conduct discipline: "I have graffitied (tagged) things in school " with a yes/no response.

(ii) Indiscipline behaviour was assessed with an adaptation of the Self-Report Delinquency Scale [21]. Students responded 'yes' (score 1) or 'no' (score 0) to statements such as "I have stolen from a colleague". Three items were added to bring the scale closer to DSM-IV diagnostic guidelines for conduct discipline disorder. These were: "I have imagined setting fires to things"; "I have deliberately tried to physically hurt fellow students"; "I have deliberately tried to attack someone in a sexual way". Reliability for the adapted 21-item scale was good ($\alpha = 0.82$). Total scores were calculated and recoded to new 2 category variables based on cut-offs calculated

from the mean (2.38) plus one standard deviation (SD) (3.24) and mean + 2SD. Thus, total scores 0-5 were coded 'low indiscipline', scores between 6 and 8 coded 'serious', and scores ≥9 coded 'extreme'.

(iii) Drug use was assessed by asking, "Which of the following drugs have you used in the last year? alcohol; cigarette; bhang, acid or LSD; sniffed glue, petrol, or solvents; injected illegal drugs (heroin); oral stimulants". Respondents rated frequency of use for each on a five-point scale: 0 (never), 1 (less than once per month), 2 (one to three times a month), 3 (once a week) or 4 (more than once a week). Total scores (0-32) were recoded to new 2-category variables based on cut-offs of the mean (1.82) plus SD (2.87) and mean + 2SD. Thus, total scores ≥5 coded 'serious', and scores ≥8 coded 'extreme'. Internal reliability for the summed items was good, (α= 0.82).

(iv)Risk-taking was assessed with the 'Brief Adolescent Risk-Taking Scale' (BART), a 9-item measure. Items include, "I accept rides in cars from people I do not know"; "I take part in dangerous activities"; "I usually talk things over with my parents before doing something new". Responses are 'never' (score 0 or 2), 'sometimes' (score 1) or 'often' (score 0 or 2). Reliability of the summed items is good (alpha=0.72). Principal components analysis indicates two factors – danger and caution.

(vi)Students were asked to rate their current overall academic performance as; 'failing', 'below average', 'average', or 'above average'. For this analysis, scores were recoded to a 2-category variable of failing/below average ('failing') or average/above average ('ok').

(vii) Sexual and physical abuse were assessed simply: "Have you ever been sexually abused"; and "Have you ever been physically abused, bullied or beaten up", with yes/no responses.

Data Presentation and Analysis

Data analysis was performed with SPSS v24 using both parametric and nonparametric procedures to investigate graffiti related differences in indiscipline behaviour and other individual, parental and school factors. Separate analyses were conducted for boys and girls as significant gender differences were expected. Pearson Chi-square tests were used to detect significant differences between groups for dichotomous variables including extreme indiscipline behaviour, drug use, abuse and poor academic performance. Analysis of variance was used to detect differences in means of continuous variables for the same groups. Where the homogeneity of variance tests failed for groups that were significantly different, nonparametric Kruskal Wallis tests were performed to confirm any significant findings.

Research Results Findings

Characteristics of the sample and prevalence of graffiti and indiscipline behaviour are presented in Table 1. Similar proportions of graffiti occur girls (10.9%) and boys (12.3%), while the prevalence of serious or extreme indiscipline behaviour is between 2 and 3 times more likely in boys. Six participants indicated 'yes' to graffiti and 'no' to all other forms of indiscipline behaviour.

Table 1; Characteristics of the sample and prevalence of graffiti and indiscipline behaviour

	BOYS (%)	GIRLS N(%)
TOTAL	1942	1654
Born in study counties	1838(92.9)	1550(93.4)
Kiswahili main language	1386(96.4)	1111(96.3)
Other counties	17(1.2)	7(0.6)
Graffiti	169 (12.3)	121 (10.9)
No ASB†	407 (29.2)	516 (45.9)
Low ASB (scores 0-5)	1139 (81.7)	1038 (89.9)
Serious ASB (scores 6-8)	145 (10.4)	62 (5.4)
Extreme ASB (scores ≥ 9)	110 (7.9)	25
Graffiti + No ASB	2	4
Graffiti + Low ASB	45	74
Graffiti + Serious ASB	49	30
Graffiti + Extreme ASB	75	17

Note. Other counties; ASB=antisocial behaviour. †Antisocial Behaviour is a 22-item Scale excluding graffiti item.

Those in the graffiti group are more likely to report serious or extreme drug use, perceived academic failure, physical and sexual abuse, suicide thoughts and behaviours, and are more likely to indicate higher family pathology, parental overprotection and criticism, depression, hopelessness, anxiety, external locus of control and risk-taking behaviours, and lower parental care and self-esteem.

Graffiti is also significantly related to low, serious and extreme antisocial behaviour. Given this strong association, the sample was grouped to aid elucidation of effects uniquely associated with graffiti. Thus, low antisocial behaviour (Low ASB) with graffiti was compared to Low ASB without graffiti, serious antisocial behaviour (SASB) with graffiti was compared to SASB without graffiti and extreme antisocial behaviour (EASB) with graffiti was compared to EASB without graffiti. Results of these group comparisons using chi-square analysis and analysis of variance are summarised in tables 3 to 5 and the in following sections.

(Table 2) Graffitti groups

		BOYS			GIRLS	
	G (%)	NoG (%)	x^2	G (%)	NoG (%)	x^2
Low ASB	26.6	89.4	388.57	61.2	96.1	186.13
SASB	29	7.9	70.11	24.8	3.1	97.02
EASB	44.4	2.7	353.90	14	0.6	95.705
'failing' PAP	19.9	7.7	41.52	15.9	4.3	30.46
Physical Abuse	42.2	32.8	5.70*	44.2	16.4	52.43
Sexual Abuse	4.8	1	14.60**	12.5	5.9	7.55**
Serious Drug	49.1	5.3	291.96	40.5	5.2	162.65
Extreme Drug	26.3	1.3	219.84	22.3	1.7	119.02
	15.4	2.1	67.96	21.5	4.4	53.79
	G (M)	NoG (M)	F	G (M)	NoG (M)	F
FADGF	2.10	1.81	64.73	2.15	1.74	80.02
Depression	16.98	10.50	81.23	21.62	12.58	71.05
Hopelessness	5.26	3.18	53.33	6.23	3.38	61.18
LOC	16.09	13.48	29.86	17.19	13.49	48.65
Self-Esteem	37.26	41.14	45.50	34.15	39.62	58.96
Anxiety	5.95	3.59	55.13	7.80	4.54	53.54
Risk-Taking	10.00	6.61	227.30	8.66	5.36	166.60

Low Antisocial Behaviour With or Without Graffiti

For boys, there are significant differences between the Low ASB plus graffiti group and the Low ASB minus graffiti group, including for suicide thoughts, deliberate self-injury, drug use, family functioning, locus of control and risk-taking with those in the Low ASB and graffiti group (Table 3). In addition to those presented in Table 3, groups are significantly different for perceived academic performance (15.6% vs 6.6%; =8.50, $p<0.05$), mother care (M=25.63 vs M=27.65;F=6.00, $p<0.05$), father care (M=23.46 vs M=25.69; F=5.13, $p<0.05$), and father overprotection (M=13.32 vs M=11.16; F=5.75, $p<0.05$) with boys in the Low ASB plus graffiti group more likely to report 'failing' perceived academic performance, and lower parental care and higher father overprotection.

Girls in the Low ASB plus graffiti versus Low ASB minus graffiti groups are significantly different on all variables measured in this study (Table 3). In addition to those results reported in Table 3, groups are significantly different in mother care (M=25.07 vs M=28.37; F=24.67, p<0.001), mother overprotection (M=14.70 vs M=12.08; F=13.38, p<0.001), mother criticism (M=11.36 vs M=9.12; F=12.62, p<0.001), father care (M=21.75 vs M=26.12; F=29.52, p<0.001), father overprotection (M=14.84 vs M=11.45; F=19.63, p<0.001) and father criticism (M=12.52 vs M=9.21; F=22.82, p<0.001). Those in the Low ASB plus graffiti group reported lower parental care and higher parental overprotection and criticism.

Table 3;Boys and Girls in the Low ASB plus graffiti versus Low ASB minus graffiti groups]

	Boys with low ASB			Girls with low ASB		
	G (%)	NoG (%)	x^2	G (%)	NoG (%)	x^2
Physical abuse	-	-	ns	36.5	15.5	21.45
Suicide Thoughts	25.6	12.6	6.07*	48.6	21.5	28.14
Suicide Plans	-	-	ns	27.4	10.1	20.22
Suicide Threats	-	-	ns	30.1	7.3	42.98
DSI	20.9	9.6	5.87*	34.2	12.9	25.10
Suicide Attempts	-	-	ns	14.9	3.6	20.88
Serious Drugs	22.2	3.2	40.57	20.3	3.4	44.40
Extreme Drug	4.4	0.4	13.15*	10.8	0.8	44.03
	G (%)	NoG (M)	F	G (%)	NoG (M)	F
FADGF	1.98	1.79	8.19**	2.03	1.72	30.57+
Depression	-	-	ns	18.61	12.16	25.51
Hopelessness	-	-	ns	4.96	3.29	16.45+
LOC	15.58	13.23	7.07**	16.32	13.37	20.88
Self-Esteem	-	-	ns	35.94	39.76	19.64
Anxiety	-	-	ns	6.56	4.41	16.38+
Risk-Taking	8.42	6.30	30.10	7.23	5.18	49.53

Serious Antisocial Behaviour With or Without Graffiti

For boys, there are several significant differences between the serious antisocial behaviour (SASB) plus graffiti and the SASB minus graffiti, including with deliberate self-injury, drug use, mother criticism, depression, anxiety and risk-taking. Group percentages, chi-square statistics, means and F values are reported in Table 4.

For girls, there are several significant differences between the SASB plus graffiti group and the SASB minus graffiti group including on suicide plans, serious drug use, self-esteem and anxiety. Details are provided in Table 4.

Table 4; Group percentages, chi-square statistics, means and F values

	Boys with SASB			Girls with SASB		
	G (%)	NoG (%)	x^2	G (%)	NoG (%)	x^2
Suicide Plans	-	-	ns	60	33.3	4.29*
DSI	44.9	28.6	3.77**	-	-	ns
Serious Drug	34.7	17	5.67**	73.3	46.7	4.44**
Extreme Drug	16.3	4.3	6.11*	-	-	ns
	G (M)	NoG (M)	F	G (M)	NoG (M)	F
Mother	12.77	10.91	4.42*	-	-	ns
Criticism	18.91	13.08	9.30**+	-	-	ns
Depression	-	-	ns	31.46	36.37	4.56*
Self-Esteem	5.93	4.22	4.90*+	9.33	6.50	5.06*
Anxiety	9.90	8.93	4.79*	-	-	ns
Risk-Taking						

Extreme Antisocial Behaviour With or Without Graffiti

For boys there are several significant differences between the extreme antisocial behaviour (EASB) plus graffiti group and the EASB minus graffiti including suicide thoughts, deliberate self-injury, suicide attempts, drug use, mother care, mother overprotection, mother criticism, and depression. Details are provided in Table 5. For girls, there were no significant differences between these same groups on any of the variables measured in this study.

Table 5; Extreme Antisocial Behaviour With or Without Graffiti

	Boys with EASB		
	G (%)	NoG (%)	x^2
Suicide Thoughts	52.8	33.3	3.44*
Deliberate Self-Injury	58	24.2	10.19**
Suicide Attempts	29.2	6.1	6.98**
Serious Drug	75.3	40.6	11.75**
Extreme Drug	46.6	21.9	5.70*
	G (M)	NoG (M)	F
Mother Care	21.35	26.61	13.48
Mother Overprotection	16.24	12.97	4.33+
Mother Criticism	14.41	11.00	6.26*
Depression	19.04	14.09	4.82*

Summary

In all the results reported in Tables 3 to 5, those groups that included graffiti showed higher reported perceived academic failure, physical abuse, suicidal thoughts and behaviours, drug use, family pathology, parental overprotection and criticism, depression, hopelessness, external locus of control, anxiety, risk-taking and lower self-esteem and parental care.

Discussion

The results of this study suggest that adolescent who graffiti ('tag') are significantly different to those who do not graffiti on all of the factors measured in this study. Although this is the first population-based study to date comparing these groups, the result is similar to the differences found with general indiscipline and antisocial behaviour groups. Adolescents who graffiti show higher reported drug use, perceived academic failure, physical and sexual abuse, suicide thoughts and behaviours, and are more likely to indicate higher family pathology, parental overprotection and criticism, depression, hopelessness, anxiety, external locus of control and risk-taking behaviours, and lower parental care and self-esteem.

Results also suggest that antisocial behaviour (low, serious and extreme) with graffiti is significantly different from antisocial behaviour without graffiti. Adolescent who graffiti in addition to various levels of antisocial behaviour show higher reported perceived academic failure, physical abuse, suicidal thoughts and behaviours, drug use, family pathology, parental overprotection and criticism, depression, hopelessness, external locus of control, anxiety, risk-taking and lower self-esteem and parental care.

One limitation of this study was the one-item measure of graffiti behaviour. Our focus in this study was 'tagging' but there are several other forms of vandalism that may be defined as graffiti. In addition, we did not measure the severity of the problem behaviour. The number of graffiti acts may have been an important factor to include in the analysis. Our measure of graffiti may have captured wrongly, graffiti art and other forms of doodling, which would not be considered vandalism.

Graffiti is not only a significant community problem but should be considered a serious action, which may have many other coexisting family, parental, behavioural and psychological problems. Clinicians may need to ask about graffiti even when an adolescent present with low levels of antisocial behaviour.

Recommendations

There is need to develop guidelines especially on use of graffiti in our schools and sensitization programs need to be put in place to help the youth understand the effects of graffiti on discipline and academic performance to avoid falling prey

REFERENCES

Mueller MM, Morre JW, Doggert RA, Tingstrom DH. *The effectiveness of contingency-*

Marcus RF. *A gender-linked exploratory factor analysis of antisocial behavior in young adolescence. Adolescence 1999;34(133):33-46.*

Senator Campbell I. Dealing with Graffiti: *First National Conference on Graffiti Control. In. Perth; 1996*

Norlander T, Nordmarker A, Archer T. *Effects of alcohol and frustration on experimental graffiti. Scandinavian Journal of Psychology 1998;39(4):201-207.*

Watson T. A prompt plus delayed contingency procedure for reducing bathroom graffiti. Journal of Applied Behaviour 1996;29(1):121-124.

Norlander T, Nordmarker A, Archer T. *Effects of alcohol and frustration on experimental graffiti. Scandinavian Journal of Psychology 1998;39(4):201-207.*

Vermeiren R, Deboutte D, Ruchkin V, Schwab-Stone M. *Antisocial behavior and mental health: Findings from three communities. European Child and Adolescent Psychiatry 2002;11(4):168-175. Goldstein AP.*

2011. 13 April 2013 <http://www.fatcap.com/>. *(This website is one of the biggest graffiti websites where I acquired many of my images and retained a lot of knowledge about each style)*

Bomb It. Dir. Jon Reiss. 2007. (*This was a documentary about various artists and their love for graffiti)*

Eric. History of Graf. 198. Davey D. 13 April 2013 <http://www.daveyd.com/historyofgraf.html>. (*This website was a more in depth site about the origins and history of graffiti)*

Rediscovering The Core Cognitive Processes That Define Scientific Competence.

Prof.H.E.Embeywa,

School of Education,

Machakos University.

embeywa@mksu.ac.ke.

ABSTRACT

Scientific competence has largely been portrayed in terms of observable attributes like: observation, classification, experimentation, problem-solving, explanation among others. This conceptualization ignores the cognitive processes involved in the construction and assessment of scientific knowledge. This paper argues that the greater focus should be on the justification of the central cognitive processes if scientific competence is to be the goal of any science curriculum.

Key words: Scientific, competence, core, cognitive, process, construction, assessment.

INTRODUCTION

Great scientists have displayed puzzling mental abilities in contributing to the growth of scientific knowledge. Johannes Kepler systematized the laws of planetary motion; Galileo invented the telescope; Alexander Graham Bell invented the telephone and gramophone; Albert Einstein for example formulated the special theory of relativity (1906) and the general theory of relativity (1916) besides his research in Quantum Physics.

The great scientists had a unique mental focus and demonstrated thinking modes that not only questioned what was known, but also provided new explanatory insights for new knowledge. This paper contends that an insight into the central cognitive processes of their scientific competence may build a good foundation for the science curriculum.

The key question are:

(i) How did great scientists represent knowledge in their minds?
(ii) What logic guided their processing of new information?
(iii) What criteria did they apply to scientific explanations?
(iv) *What methodology can be infused into the science curriculum to develop the core cognitive competences for scientific knowledge?*

We shall take note that Instrumental generic competences across disciplines, Sánchez, A. & Manuel P. Eds. (2008) have been construed to include the following:

1. **Analytical thinking: T**his is the mental behaviour that enables one to distinguish and separate the parts of a whole to arrive at its principles or elements. Analytical thinking is thinking in detail, accurately, Enumerating and distinguishing.

2. **Systemic thinking:** This is the mental behaviour that enables one to organize and integrate interrelated components to form a whole.

3. **Critical thinking:** This is the mental behaviour that questions things and concerns itself with the foundations on which our own and others' ideas, actions and judgements are based.

4. **Creative thinking:** This is the mental behaviour that generates searches to find new and unusual solutions that make sense in different areas of life.

5. **Reflective thinking:** This is the mental behaviour that facilitates the recognition and growth of the modes of thinking that we use in solving problems or performing tasks.

6. **Logical thinking:** This is the mental behaviour that develops ways of thinking that lead to knowledge in general and to scientific knowledge in particular, paying close attention to its structure. It means proceeding in a reasoned, sufficiently argued way.

7. **Practical thinking:** Is the mental behaviour that makes it easier to select the best course of action on the basis of available information and to decide how to proceed to achieve objectives with effectiveness and efficiency. It is the action-oriented way of thinking.

8. **Team thinking:** This is a way of working with other people to arrive at shared views.

9. **Time management**: Is the distributing of time wisely according to priorities, taking into account short-, medium- and long-term personal objectives and the areas of personal and professional life that one spends most time on.

10. **Problem-solving**: identifying, analyzing and defining the significant elements constituting a problem in order to solve it effectively and with good criteria.

11. **Decision making**: choosing the best course of action, following a systematic process and assuming responsibility for the scope and consequences of the option taken.

12. **Planning**: deciding effectively the objectives, priorities, methods and controls for work to be done, by organizing tasks within deadlines and available means.

13. **Computer skills**: utilizing computer skills or information and communication techniques (ICTS) as tools for expression and communication, for accessing information sources, for data and document filing, for presentation.

14. **Data management**: effectively organizing (structuring, gathering, processing and obtaining results from) information in a situation or phenomenon, and making best use of the possibilities afforded by computer systems for database management.

15. **Oral communication**: expressing clearly and opportunely one's ideas, knowledge and feelings in speech, adapting to the audience and situation to ensure good comprehension and attention.

16. **Writing skills**: relating effectively to other persons through clear written expression of what one thinks and/or feels, using graphic support as necessary

The Information Processing Model as a **framework used by cognitive psychologists to explain and describe mental processes** describes representational systems that fall into three basic families:

1. ***Propositional representations***-a set of discrete symbols or propositions equivalent to formal statements.
2. ***Analogical representations- a*** correspondence between the represented world and the representing world as direct as possible in terms of maps, models, images and pictures.
3. ***Procedural representations***- where knowledge is represented in terms of active process or procedures directly interpretable by an action system.

Scientific knowledge on the other hand is generated through five processes:

(I) ***Observation***-making use of the five senses to gain information about the real world.

(II) ***Experimentation***- the systematic process of gathering data in order to test the validity or authenticity of a given hypothesis.

(III) ***Speculation***-the process of going beyond available data in order to anticipate relationships that can be used to make predictions.

(IV) ***Imagery***-the process of constructing images in the mind for representing interactions, mechanisms, processes or structures in the real world.

(V) ***Intuition***-the faculty of mind that generates true knowledge without a clear or immediate explanation.

The concept of Scientific Competence

Ornstein(1986) asserts that, "the content of our consciousness is a representation of outside reality" and thus consciousness must include a process for constructing a 'representation' or a model of the world; and a mental operating system endowed with acts of creation…. to process, infer, as well as analyze information to arrive at a reliable solution the percept.

Miller (1984) observes that Quantum Physics and Relativity Theory have changed the conception of scientific visualization. Practicing scientists now admit to the use of:

(i) Mental Imagery and Thought experiments as tools for advancement of scientific knowledge;
(ii) Probabilistic/statistical notions in constructing explanations;
(iii) Contextual considerations in constructing an acceptance criteria for scientific explanations.

The cognitive process of science therefore demands higher competences and it may be necessary to review curriculum focus to effectively develop such competences. This task will further require an integration of memory theory and information processing models.
A brief discussion of a model of Scientific Competence by Embeywa (1990) is presented below. In this model three cognitive competences are identified and their interactive nature is discussed. Embeywa (1985) explains that:

A decision on the part of a scientist that an explanation is valid or invalid ……is usually taken after a period of active processing of the input data (p.15).

The active processing is enabled by four competences:

C1: An ability to construct clear representation of events described in scientific language defined as ***visualization competence.***
C2: An ability to discern logical structure in sentences relating to scientific Knowledge called ***logical sensitivity***.
C3: An awareness of the role of logical laws in science called ***logical competence.***
C4: A readiness to subject scientific statements to logical scrutiny referred to as ***logical predisposition.***

In relation to C1, Embeywa (1990) explains three categories of visualization:

(i) ***Pictorial Visualization***~ the construction of mental pictures, models and images.
(ii) ***Mechanistic Visualization***~ the construction of propositions about the underlying mechanisms of natural events.
(iii) ***Formal Visualization***- the use of known formal/mathematical models relevant to the situation.

The other three competences are prerequisites to ***Mental Manipulation and Explanation~Perception*** and are more energized by ***Imagery, Intuition and Speculation.***
Manipulation involves:

(i) **Logical reasoning**- the recognition of logical structure in discourse and the search for consistency and completeness to avoid errors of implication, tautology and contradiction.
(ii) **Causal reasoning**- reasoning of the type:
A is the cause of B.
A causes B.
A is a causal factor for B.

(iii) **Analogical reasoning**- the transfer of knowledge to new situations by tracing similarities and differences between knowledge representations to enable: pattern completion; pattern extension; or pattern deletion.

Explanation~Perception is the final act of comprehension that involves:

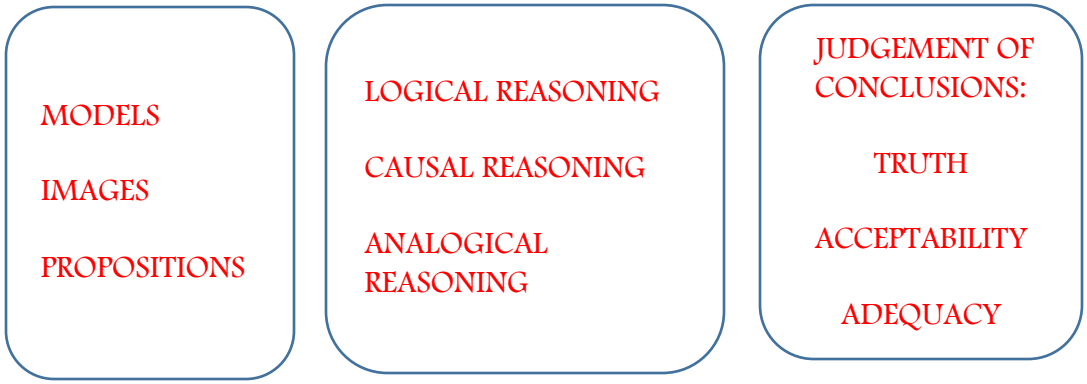
(i) Explanatory **conceptions**.
(ii) Explanatory **models**.
(iii) **Acceptance criteria** for explanations.

Embeywa's model of Scientific Competence.

STRUCTURE

COGNITIVE INTERPRETATION	MANIPULATIVE INFERENCE GENERATION	EVALUATIVE CONCEPT SYNTHESIS

VISUALIZATION → MANIPULATION → EXPLANATION- PERCEPTION



ESSENCE

Some aspects of Scientific Competence in the History of Science.

In 1923, Louis de Broglie, a French physicist, proposed a hypothesis to explain the theory of the atomic structure. By using a series of substitution de Broglie hypothesizes particles to hold properties of waves. Within a few years, de Broglie's hypothesis was tested by scientists shooting electrons and rays of lights through slits. What scientists discovered was the electron stream acted the same was as light proving de Broglie correct.

Although de Broglie was credited for his hypothesis, he had no actual experimental evidence for his conjecture. In 1927, Clinton J. Davisson and Lester H. Germer shot electron particles onto onto a nickel crystal. What they saw was the diffraction of the electron similar to waves diffraction against crystals (x-rays). In the same year, an English physicist, George P. Thomson fired electrons towards thin metal foil providing him with the same results as Davisson and Germer.

Kekule is regarded as one of the principal founders of modern organic chemistry, the chemistry of carbon-based compounds. In 1858 he showed that carbon can link with itself to form long chains. In 1865 he reported his discovery of the benzene ring as the basis for another major group of carbon molecules.

Erwin Schrödinger was awarded the Nobel Prize in Physics in 1933. He is best known for his work regarding quantum theory, particularly about his **thought experiment involving a cat** in order to explain the flawed interpretation of quantum superposition.

Schrödinger's cat is a thought experiment, sometimes described as a paradox, devised by Austrian physicist Erwin Schrödinger in 1935.It illustrates what he saw as the problem of the Copenhagen interpretation of quantum mechanics applied to everyday objects.

In 1957, Hugh Everett formulated the many-worlds interpretation of quantum mechanics, which does not single out observation as a special process. In the many-worlds interpretation, both alive and dead states of the cat persist after the box is opened, but are decoherent from each other. In other words, when the box is opened, the observer and the possibly-dead cat split into an observer looking at a box with a dead cat, and an observer looking at a box with a live cat. But since the dead and alive states are decoherent, there is no effective communication or interaction between them.

Paul Adrien Maurice Dirac was an English theoretical physicist who is regarded as one of the most significant physicists of the 20th century.

Dirac made fundamental contributions to the early development of both quantum mechanics and quantum electrodynamics. Among other discoveries, he formulated the Dirac equation which describes the behaviour of fermions and predicted the existence of antimatter. Dirac shared the 1933 Nobel Prize in Physics with Erwin Schrödinger "for the discovery of new productive forms of atomic theory" He also made significant contributions to the reconciliation of general relativity with quantum mechanics.

The key questions in this paper were:

(i) How did great scientists represent knowledge in their minds?
(ii) What logic guided their processing of new information?
(iii) What criteria did they apply to scientific explanations?
(iv) *What methodology can be infused into the science curriculum to develop the core cognitive competences for scientific knowledge?*

Conclusion

It has been argued that a decision on the part of a scientist that an explanation is valid or invalid ……is usually taken after a period of active processing of the input data (Embeywa , 1985). The active processing is enabled by four competences:

An ability to construct clear representation of events described in Scientific Language defined as ***visualization competence;*** an ability to discern logical structure in sentences relating to scientific Knowledge called ***logical sensitivity***, an awareness of the role of logical laws in science called ***logical competence; and a*** readiness to subject scientific statements to logical scrutiny referred to as ***Logical predisposition.***

Embeywa (1990) explains three categories of visualization:

(i) ***Pictorial Visualization***- the construction of mental pictures, models and images.
(ii) ***Mechanistic Visualization***- the construction of propositions about the underlying mechanisms of natural events.
(iii) ***Formal Visualization***- the use of known formal/mathematical models relevant to the situation.

The three competences are prerequisites to ***Mental Manipulation and Explanation-Perception*** and are more energized by ***Imagery, Intuition and Speculation.***

Manipulation involves:

(iv) **Logical reasoning**- the recognition of logical structure in discourse and the search for consistency and completeness to avoid errors of implication, tautology and contradiction.

(v) **Causal reasoning**- reasoning of the type:
A is the cause of B.
A causes B.
A is a causal factor for B.

(vi) **Analogical reasoning**- the transfer of knowledge to new situations by tracing similarities and differences between knowledge representations to enable: pattern completion; pattern extension; or pattern deletion.

Explanation-Perception is the final act of comprehension that involves:

(iv) Explanatory **conceptions**.
(v) Explanatory **models**.
(vi) **Acceptance criteria** for explanations.

The *Embeywa Model* captures the essence of the scientific process of knowledge construction and assessment. It is therefore the conclusion of this paper that Pedagogy in Science needs to use the above discussed competences to guide both the delivery and assessment in Science.

Academic Advising Needs of University Students: The Case of Machakos University

MACHAKOS UNIVERSITY

By

Prof. James M. Muola, jmuola@mksu.ac.ke

Dr. Wycliffe Amukowa, kwamukowa@gmail.com

Dr. David Mulwa, davimulwa@gmail.com

Dr. Peter Kimiti, prickimiti@mksu.ac.ke

Abstract

Academic mentorship has been practiced in a number of universities including Machakos in Kenya though ineffectively due to the big student numbers and the presumably misconceived assumption that all students are in need and will voluntarily seek assistance. Most of the students admitted in public universities have the potential to excel academically if properly guided, supported and challenged. For academic mentorship to be successful and profitable to students, there is need to identify areas of need for purposes of prioritization. Study findings have identified academic advising needs of university students including maintaining high grades, handling heavier academic workload, setting career goals, setting academic goals, time management, personal development, social relationships, financial management and study skills among others. This survey was conducted on 187 students from Machakos University. Data was analysed using descriptive statistics. The findings show that students have a fairly positive (mean 3.62, n=187) perception towards academic mentorship. Despite rating themselves highly on various competences, the respondents expressed need for mentorship on orientation (73%), examination preparation (88%), financial management (79%), developing a good study schedule (78%), maintaining high grades (78%), setting academic goals (83%), setting career goals (85%) among other areas. It was concluded that students have a positive attitude towards academic mentorship, mentorship can provide information required by students to excel academically and advantage can be made of students' feelings of inadequacy in certain competency areas that are necessary for academic excellence. It was recommended that Schools and departments should take advantage of the positive perception to operationize and institutionalize academic mentorship and the mentorship programme should focus on areas that students expressed need for academic advising.

Key words: mentorship, academic advising, needs, students.

Introduction

Academic advising has been practiced in a number of universities in Kenya. In most cases it involves assigning students to academic mentors irrespective of whether they are in need of it or not. The assumption that every student is in need of academic advising has resulted to a scenario where students hardly seek assistance from designated faculty staff. The growing numbers of students in our Kenyan universities have resulted to a situation where academic members of staff are assigned unmanageable numbers of mentees. This has resulted to a negative attitude towards academic mentorship. It has been assumed that students who are faring poorly in their academic work will see and feel the need to seek academic advising which has not been the case. Many students who are admitted to the university do not consider themselves poor academically since they were able to perform significantly above average to gain admission to the university which is normally very competitive for government sponsored students. Despite all deliberate efforts by universities to minimize the number of students failing in university examinations, the numbers have continued to rise.

It is the conviction of the researchers that students who were able to pass their end of secondary examination to an extent of being admitted to university competitively have the potential to excel academically all other factors held constant.

Academic mentorship is practiced in Machakos University in an unstructured manner and hence not fully operational. The university does not have a policy to guide academic mentorship of newly admitted and continuing students.

The aim of this survey was to assess students' perceptions and need for academic mentorship. The survey also aimed at documenting the areas of focus on academic mentorship and students' rating on various competences/skills which they need to possess to be able to do well academically. The findings informed the choice and implementation of an appropriate mentorship model focusing specifically on students at risk academically.

Mentoring is a 'personal, helping relationship between a mentor and a mentee that includes professional development and growth and varying degrees of support. While mentoring relationships are reciprocal, mentors tend to be those with greater experience' (Hansford et al. 2003, p. 5). Mentorship focuses on maximizing performance (Whitmore, 2002) and the person's overall life development. The process of mentorship aims at unlocking people's potential to maximise their own performance. In mentorship, the mentor tries to develop the skills, knowledge and attitudes required to complete a task or perform a job.

Mentoring is a personal relationship which develops over time between a mentor and a mentee. This relationship has to exist in an atmosphere of confidentiality based on the sharing of thoughts, questions, life and work experiences such that trust is built up. It is an unequal relationship in the sense that the mentor is deemed to have knowledge, experience and skills to offer to the mentee. At the same time, it is a dynamic relationship in which the mentee is growing in capacity to reflect, make decisions and offer ideas.

In formal mentoring programs, the purpose of mentoring is likely to be articulated in a set of guidelines or via training that is provided for both parties, where they are informed of the goals and purposes of the program. As an example, the purpose of a formal mentoring program for new university students might be to help them develop skills and strategies, to adjust to life in

the university, become socialised into the university's values and culture, and develop a good working knowledge of university policies and procedures.

In contrast, in informal mentoring arrangements, the parties may not have any set goals or specific expectations except to get together informally and discuss university-based issues as they arise. The purpose of the relationship may change depending on the needs of either party. Whether the mentoring relationship is organisationally driven or informal and more personally driven, it is likely that the overall purpose of the relationship will be for both parties to learn, engage in knowledge transfer, and support one another's development and growth.

The findings of a study by Muola and Migosi (2012) showed that the top ranking academic advising needs for university students were maintaining high grades, setting career goals, handling heavy academic workload, and setting academic goals irrespective of the year of study and gender.

In a study of 920 undergraduate students conducted in Nigeria, it was found that there is need of counseling on time management, drug abuse, domestic problems, career needs, relationship problems, finance, sexual harassment, academic ability, personality types and anxiety/depression (Aluede, Imhonde, & Eguavoen, 2006). Among other areas in which students seek help include improvement of their study skills; career uncertainty; self-confidence problems; lack of motivation; fear of failure; depression; lack of purpose in life; anxiety and nervousness (Gallagher, 1992). Other areas include: academic and school related problems, study skills; time management; overcoming fear about taking examinations; meeting academic and career needs (Bertocci, Hirsch, Sommer & Williams, 1992). Fear of examinations and worries about getting a job seems to be a common theme in many of the highly ranked concerns of students (Gallagher, Golin & Kelleher, 1992).

Guneri, Aydin and Skovholt (2003) did a study on university students in Turkey and found that students' academic related needs ranked as follows:

Managing time (60%),

Identifying and planning goals for life and concentrating on studies (53%),

Getting a job after school (50%),

Getting better grades (46%) and

Completing assignments on time (45%).

In a study conducted in Spain (Arco, Fernandez, Heilborn & Lopez, 2005), it was reported that the profile of university students, revealed that students rated academic needs such as getting easily distracted, need to improve their study skills, problem of time management and problem of test taking anxiety as the areas desiring significant attention. Despite the context and location of study, the foregoing research findings seem to show a lot of concurrence on the general academic areas in which students need assistance. Academic advising programmes in Kenyan colleges and universities can benefit from these findings in planning for academic mentorship and prioritizing the areas to be addressed.

According to available literature, mentoring is a very positive experience (Clutterbuck, 2004; Long, 1997; Hansford, Tennent, & Ehrich, 2003). To discover the outcomes of mentoring, Hansford et al., analysed and coded 159 pieces of research on mentoring in schools and universities to determine the benefits and the shortcomings for the mentee, mentor and the organisation.

Hansford et al. (2003) found that benefits for mentees included psycho-social supportive outcomes such as support, encouragement, friendship, role modelling and increased confidence. For teachers, they included the development of teaching strategies and subject knowledge, as well as the opportunity to learn and develop through discussion and sharing ideas, reflection on their practice, and feedback and constructive criticism. Mentoring benefited mentees by having their careers affirmed and enabling them to be committed to their academic work and profession.

The availability of caring mentors is important for the retention (Walker & Taub, 2001) and success of college students who do not have role models at home. Research on mentoring indicates that it has a positive impact on the personal and professional development of young adults (Levinson, 1978). Research shows that students highly value academic advisors who are perceived to be accessible, approachable, and helpful in providing guidance that connects their present academic experience with their future life plans (Gordon, Habley, & Associates, 2000; Frost, 1991).

The most frequently cited benefits for the mentors included collegiality, collaboration and networking, cross-fertilisation of ideas and the opportunity to exchange ideas. Other outcomes according to Hansford et al. (2003) related to providing opportunities for reflection on mentors' practice, professional development, improvement in interpersonal skills and teaching practice, personal satisfaction, and enjoyment and challenge in their work.

The most frequently cited outcome regarding benefits for the organisation was improved grades, good peer relationships, less work for staff because mentees provide help; increased retention of staff; and better communication between parties. Organisationally, mentoring can also increase retention of students and their psycho-social functions in a learning institution (Harvard Business Essentials, 2004 p. 86).

A number of studies have indicated that the quality of academic advising can directly affect a student's chances of graduating (Backhus, 1989; Pascarella & Terenzini, 2005). Steingass and Sykes (2008) reported a positive relationship between effective academic mentorship and student retention, especially for first-year college students. Students who receive quality professional academic advising tend to have better retention and graduation rates (Pascarella & Terenzini, 2005; Steingass & Sykes, 2008).

A study by Pargett (2011) reported a positive relationship between academic advising and student development and student satisfaction with college life. Students who are satisfied with college life are likely to be adjusted and focused as a result of which they may do well in their studies.

This was anchored on Daloz's (2012) theoretical model which is more recent and was assumed to appropriate to the current study. Daloz's (2012) model was developed within the context of mentoring in community college environment. The model demonstrates that optimal learning

in a mentoring relationship (between a lecturer learners) occurs when two key constructs are said to be apparent. These constructs are **challenge** and **support**, as in the diagram below.

Table 1. The developmental model of mentoring

High challenge	High challenge + low support = **retreat**	High challenge + high support = **growth**
Low challenge	Low challenge + low support = **stasis**	Low challenge + high support = **confirmation**
	Low support	High support

Adapted from Daloz, L. (2012). *Mentor: Guiding the journey of adult learners*. Wiley: New York, p. 208.

Daloz (2012) argues that there are four possible ways of understanding learning outcomes for a learner (or mentee), and these relate to the key functions performed by the mentor: **challenge** and Support.

By challenge, Daloz (2012) referred to stretching the mentee - questioning, providing thoughtful questions that have the effect of encouraging the mentee to question his/her values, beliefs and behaviours.

By support, Daloz (2012) referred to psycho-social support such as listening, encouraging, being a sounding board and being there for the mentee.

Daloz (2012) claims that when: a mentor provides **low support** and **low challenge** for his/her mentee, then little learning is likely to occur from that relationship (he refers to this as stasis, since not much change occurs)

support is low, but challenge is high, the learner is likely to retreat from development

Support is high, but challenge is low, the potential for growth increases, but the learner may not engage productively with the environment, and therefore he/she may not move beyond his/her present situation. Daloz refers to this as confirmation.

Dolaz argues that high challenge and high support is the combination where development is likely to occur to the greatest extent. He coined this as growth.

At the moment there is no well-structured mentorship programmes in most of the Kenyan universities including Machakos. Student mentorship is offered informally by various university organs including the offices of the dean of students, deans of schools, departments, counselling, among others. These organs concentrate on general mentorship that may not be specially focused on academic matters. Hence the need to have a well-structured student mentorship focusing on raising learning outcomes which is the ultimate reason why students enrol for studies in various programmes in university. Most of the other services available to the students are instrumental in ensuring that they realize their sore purpose of being in the university.

The main purpose of this survey was to establish the need and priority areas of academic mentorship in Machakos University.

The survey was guided by the following objectives:

To assess students' perceptions on academic mentorship

To determine areas in need of academic mentorship

Determine the priority areas of academic mentorship among students

To establish students' rating on personal attributes/skills

METHODOLOGY

Research Design

The survey employed the descriptive research design in which a sample of 187 randomly selected sample of students from the school of Education. A questionnaire seeking information about respondent's background and demographic characteristics, areas of focus in mentorship, need for academic mentorship and rating on academic related competences/skills was administered.

The responses of the students were analysed descriptively to determine the status of academic advising in the university and the need for a more formal academic mentorship programme.

Data Analysis Procedures

The filled questionnaires were coded and scored. Descriptive statistics including means and percentages were applied to determine students' level of need for academic mentorship. The was hoped that in addition to providing other useful information for this study, the questionnaires will provide information to determine the appropriateness of Daloz's model of academic mentorship which is anchored on the assumption that learners who are highly challenged and given high support will register improvement in academic growth and learning outcomes. The opposite is true that leaners who feel unchallenged and are not adequately supported will tend to retreat or maintain a status quo (Daloz, 2012).

The findings were used to determine and inform the suitability of the proposed model whose main emphasis is to offer significant challenge to the low achieving students while at the same time giving them the support they need to improve their academic performance. The survey was aimed at determining areas which provide a challenge to students.

FINDINGS AND DISCUSSION

Introduction

Data collected from students and lecturers was analysed and the findings were discussed in relation to the objectives of the survey. The data that was collected and analysed was mainly on

respondents' background information, perceptions on academic mentorship, priority areas in academic advising, need for academic mentorship and rating on personal attributes/skills.

Background Information

The study involved a total of 187 respondents, 88 female and 99 male first (154), second (7) and fourth (26) year students. A big proportion (80%) of the students involved in the survey were not aware on whether they had been assigned to a mentor or not. The few (20%) who had experienced mentorship were second and fourth year students who at one time in their stay in the university had been formally assigned to a mentor and at least were aware of it. According to about 20% of the respondents surveyed, students should be the ones to initiate the academic mentorship process while 19% felt that it should the academic mentor himself. Twenty five percentage (25%) felt that the dean of school should be the one to trigger the mentorship process as compared to 27% who felt that the dean of students should initiate the mentorship process. This means that the responsibility of the academic mentor should be seen as a shared responsibility between various stakeholders for the process to be active and productive.

According to 33% of the respondents, lecturers do not have time to engage in student mentorship. On the other hand, twenty five (26%) of the respondents indicated that lecturers have time to get involved in student mentorship. The rest (41%) were not sure on whether or not lecturers have adequate time to mentor students.

Interesting, a majority (78%) of the students were of the opinion that they should be given an opportunity to choose their academic mentors. As much as this may be possible, it may be difficult to implement because some lecturers may be overwhelmed by the number of students who may prefer them to be their mentors whereas others who may be less popular. A smaller percentage (7%) felt that students need not be given the opportunity to choose their academic mentors. The remaining 13% were non-comital on whether students should be given the opportunity to choose their mentors or not.

Students' Perceptions on Academic Mentorship

The first objective of the survey sought to assess students' perceptions on academic mentorship. The data was analysed and the findings are presented in table 2.

Generally, the students who responded to the questionnaire on perceptions on academic mentorship have a fairly positive (mean 3.62, n=187) perception towards academic mentorship. This implies that given an opportunity they would embrace it. Schools and departments should take advantage of the positive perception to operationalize and institutionalize academic mentorship. This will hopefully reduce the number low achieving students.

Table 2. Students' perceptions on academic mentorship

Key: SA = Strongly Agree, A = Agree, U = Uncertain, D = Disagree, SD = Strongly Disagree

SNo	Statement	Rating/percentage			Mean
		A	U	D	
1	Academic mentorship is for students who fail in their academics	35(18%)	4(2%)	148(79%)	1.99
2	Academic mentorship is an important component of University life	172(92%)	12(6%)	11(6%)	4.48
3	Many students are in need of academic mentorship	152(81%)	20(11%)	14(7%)	4.24
4	It is not right for the administration to impose academic mentorship on students	41(22%)	23(12%)	123(81%)	3.75
5	Academic mentorship can reduce the number of students who fail	161(86%)	9(5%)	16(9%)	4.18
6	A formal academic mentorship activity can help to reduce the number of students who fail every year	150(80%)	21(13%)	13(7%)	4.12
7	Academic mentorship can help me to develop a successful academic plan	169(90%)	13(7%)	5(3%)	4.45
8	I understand what academic mentorship is all about	92(49%)	48(26%)	47(25%)	3.37
9	My academic performance could improve if I consulted an academic mentor	158(84%)	19(10%)	10(5%)	4.24
10	My academic performance could improve if I consulted my subject lecturers	151(81%)	22(12%)	14(7%)	4.12
11	Before and during the examination period, students need to consult their academic mentors	143(76%)	201(11%)	24(13%)	3.93
12	During the examination period students need to consult their lecturers	113(60%)	30(16%)	44(23%)	3.55
13	I feel confident whenever I sit for my examinations	109(58%)	38(20%)	39(21%)	3.55
14	Academic mentorship is a waste of time	31(17%)	21(11%)	134(72%)	3.98
15	Academic mentors should be available for consultation	152(81%)	16(9%)	19(10%)	4.07
16	Academic mentors should communicate consultation hours to their students	158(84%)	18(10%)	11(12%)	4.2
17	Academic mentorship should be made compulsory for all students	89(48%)	30(16%)	68(36%)	3.25
18	Academic mentorship should be made compulsory for only the students who fail	51(27%)	18(10%)	118(63%)	2.41
19	Academic mentorship can be enhanced by the use technology (e.g., sharing of information through social groups and students portal)	141(75%)	15(8%)	30(16%)	3.97

Seventy nine percent (79%) of the respondents felt that academic mentorship should target all the students and not just the low achievers. A big percentage (92%) of the students were of the opinion that academic mentorship is an important component of university life. According to 81% of the respondents, many university students are in need of academic mentorship. This implies that mentorship should be an important aspect for all students. Equally, a reasonable percentage (86%) of the students were in agreement that academic mentorship can reduce the number of students who fail. This means that if academic mentorship is strongly embraced the number of students who sit for supplementary examinations every year can reduce significantly.

Ninety percent (90%) of the students agreed that academic mentorship can help them to develop a successful academic plan. This implies that there is much that students may not know about their programmes that can be clarified through academic mentorship.

Students expressed need to be in consultation with academic mentors during (76%) the examination period and as they sit (58%) for the examinations. They need to be reminded about revision strategies, examination taking skills and regulations governing the examination process. On the same note, three quarters (75%) of the students were of the opinion that academic mentorship can be enhanced by the use technology. For example, sharing of information through social groups and students portal. At this age of technology, this is important since one academic mentor can be able to reach as many students as possible.

A high percentage (81%) of the respondents felt that academic mentors should be available for mentorship and also communicate the hours/time (84%) when they are available for consultation.

Seventy two (72%) of the respondents felt that academic mentorship is not a waste of time as compared to 17% who thought that it is a waste of time and 11 % who were undecided. Forty eight (48%) were of the feeling that academic mentorship should be made compulsory for all students while 36% and 16% were of the contrary opinion and undecided respectively. In general it was concluded that students have a positive perception on academic mentorship.

General Priority Areas in Academic Mentorship

The second objective of the survey sought to determine priority areas that academic mentors need to focus on as they offer academic advising to students. The data was analysed and the findings are presented in table 3.

Table 3. Areas of Priority in Academic Mentorship (N=187)

SNo	Area of focus	Frequency	Percentage
	First year orientation	137	73.26%
	Unit registration	77	41.17%
	General guidance and counselling sessions	132	70.58%
	Mentorship during lecture time	59	31.55%
	Counselling students who fail	109	58.28%
	Counselling students whose academic performance drop	113	60.48%
	Counselling students who want to improve their academic performance	107	57.21%
	Advising students when they want to defer a course	99	52.94%
	Talking to students when they are not sure about University regulations and policies	58	31.01%
	Career development after college	118	63.10%
	Further studies after the first degree	109	58.28%

Sixty percent (60%) of the students involved in the study felt that academic advising should be focused on students whose academic performance drop. Seventy three (73%) were of the opinion that mentorship should put more emphasis on student orientation when students report on campus for the first time. This implies that majority of students see orientation as an appropriate time during which a great deal of information concerning their studies can be conveyed band clarified. New students are yet to learn college culture and may be more receptive to information concerning their academic life. As much as first year orientation is focused on general university life, it is a time when a lot of emphasis need to be put on academic related issues.

Sixty three percent (63%) expressed the need for guidance on career development after college. Fifty eight (58%) wanted academic mentorship to be focused on guidance on further studies after the first degree. Two other areas that were ranked relatively highly are improvement on academic performance (57%) and deferment (52%). There has been cases of students who just disappear out of college when they are unable to pay fees or overwhelmed by other problems without proper deferment. Although not all the areas were highly ranked, the information in table 3 can assist academic mentors to decide on what to give priority.

Need for Academic Mentorship

The third objective of the survey sought to determine the need for academic mentorship among students in a number of areas. The data was analysed and the findings are presented in table 4.

Table 4. Students' perception on competences that need upgrading through mentorship

SNo	Statement	HN	MN	LN	NN	Mean
		Freq(%)	Freq(%)	Freq(%)	Freq(%)	
	Academic mentorship	139(74%)	35(18%)	8(4%)	4(2%)	3.66
	Writing skills	43(22%)	69(36%)	42(22%)	32(17%)	2.66
	Oral expression	56(30%)	84(44%)	31(16%)	16(16%)	2.96
	Communication skills	83(44%)	66(35%)	21(11%)	17(10%)	3.15
	Study habits	94(50%)	53(28%)	24(13%)	15(8%)	3.22
	Note taking	67(36%)	63(34%)	30(16%)	26(14%)	2.92
	Examination preparation	103(55%)	61(33%)	15(8%)	8(4%)	3.39
	Test-taking skills	90(48%)	60(32%)	25(13%)	12(6%)	3.22
	Time management	88(47%)	60(32%)	23(12%)	16(9%)	3.18
	Financial management	94(50%)	54(29%)	26(14%)	13(7%)	3.22
	Developing a good study schedule	102(55%)	44(23%)	29(15%)	12(6%)	3.26
	Answering examination questions	90(48%)	62(33%)	19(10%)	16(9%)	3.21
	Organizational skills	79(42%)	62(33%)	35(19%)	11(6%)	3.12
	Awareness of university rules and regulations	60(32%)	75(40%)	31(17%)	21(11%)	2.92
	Maintaining high grades	101(52%)	48(26%)	20(11%)	10(5%)	3.28
	Managing academic workload	97(52%)	58(31%)	20(11%)	10(5%)	3.29
	Setting academic goals	100(52%)	58(31%)	19(10%)	10(5%)	3.33
	Knowledge of programme requirements	70(37%)	79(42%)	25(13%)	13(7%)	3.1
	Setting career goals	98(52%)	61(33%)	18(10%)	10(5%)	3.32
	Social relationships	61(32%)	68(34%)	32(17%)	31(17%)	3.82

The percentage of respondents who felt that there is a high and moderate need for academic mentorship was 74% and 18% respectively. Few students felt that there is low (4%) or no need (2%) for academic mentorship. The mean score of 3.66 on the area on general Academic mentorship shows that students feel that there is need for advising by mentors. This implies that there is need to institutionalize and operationalize the academic mentorship programme.

Most of the areas in which the researchers sought to find out whether students see them as of high priority were confirmed to be so from the average scores that ranged above the mean (between 2.66 and 3.82). The possible range of average scores on the various items was between 1 and 4. The respondents scored above average in all the 20 items. The findings in table 4 can serve as guide on areas that academic mentors can concentrate on.

Students' Rating on Personal Attributes/Skills

The fourth objective tried to establish students' rating on personal attributes/skills. These are competences that students need to possess to be able to excel in their studies. Data from the respondents was analysed and the findings are presented in table 5. **Table 5. Students' Rating on Personal Attributes/Skills (N=103)**

Key: 1 = Low, 2 = Average, 3 = Good, 4 = Very good

SNo	Statement	Rating/percentage				Average
		L	A	G	VG	
		1	2	3	4	
	The expectations you have for yourself and your future	17(9%)	20(11%)	41(22%)	107(58%)	3.29
	Academic performance	14(8%)	45(24%)	76(41%)	50(27%)	2.88
	Articulation of ideas	13(7%)	47(25%)	84(45%)	39(21%)	2.8
	Ability to revise for examinations	16(9%)	29(26%)	76(41%)	44(24%)	2.8
	Preparation for examination	27(14%)	44(24%)	78(42%)	39(19%)	2.66
	Ability to pass examinations	17(19%)	47(25%)	77(41%)	44(24%)	2.8
	Answering examination questions	15(8%)	35(19%)	81(44%)	54(29%)	2.94
	Self-discipline	12(6%)	25(14%)	64(35%)	84(45%)	3.19
	Setting future goals	10(5%)	26(14%)	75(41%)	74(40%)	3.15
	Self-motivation	12(6%)	32(17%)	70(38%)	71(38%)	3.08
	Ability to solve problems alone	32(17%)	54(29%)	57(31%)	42(23%)	2.59
	Working in groups	25(14%)	57(31%)	53(28%)	50(27%)	2.69
	Organizational skills	19(10%)	66(56%)	58(31%)	42(23%)	2.66
	Time management skills	25(14%)	60(32%)	64(35%)	36(19%)	2.6
	Knowledge of requirements for employment	27(15%)	60(32%)	65(35%)	33(18%)	2.56
	Awareness of the benefits of academic mentorship	31(17%)	52(88%)	52(28%)	50(27%)	2.65
	Understanding of university rules and regulations	21(11%)	47(25%)	54(29%)	63(34%)	2.56
	Awareness of referral services such as counselling and medical services	24(13%)	52(28%)	72(39%)	37(20%)	2.86
	Setting career and life goals	21(11%)	57(23%)	64(35%)	43(23%)	2.66
	Awareness about available educational recourses	35(19%)	48(26%)	56(30%)	46(25%)	2.7
	Decision making skills	20(11%)	41(22%)	76(41%)	48(26%)	2.61
	Understanding of programme requirements	27(15%)	56(30%)	52(28%)	50(27%)	2.82
	Making notes in class	27(15%)	38(21%)	70(38%)	50(27%)	2.68
	Time management	28(15%)	43(23%)	62(33%)	52(28%)	2.75
	Handling academic workload	18(10%)	59(32%)	61(33%)	47(25%)	2.74
	Setting academic goals	21(11%)	47(25%)	73(39%)	44(24%)	2.76
	Test-taking skills	23(12%)	61(33%)	66(36%)	35(19%)	2.71
	Oral expression	24(13%)	51(28%)	68(37%)	42(23%)	2.69
	Study habits	16(9%)	49(26%)	79(43%)	41(22%)	2.78
	Developing a good study schedule	21(11%)	58(31%)	67(36%)	39(21%)	2.67
	Following my study schedule	28(15%)	55(30%)	57(31%)	45(24%)	2.64

Despite the high rating on the need for academic advising in various competences (Table 4), the respondents rated themselves slightly above average (mean 2.78) on the personal attributes measured. The mean rating was between 2.56 and 3.29. They rated themselves as being good (above the mean of 3.00) in only 4 areas, as follows:

Future expectations (3.29)

Self-discipline (3.19)

Setting future goals (3.15)

Self-motivation (3.08)

The respondents rated themselves average (between 2.56 and 2.94) in 27 out of the 31 statements that were meant to elicit responses on how they saw their academic related competences. This was the scenario with a possible mean score of between 1.00 (lowest) and 4.00 (highest). This implies that they felt that there is need to improve and perfect competences related to academic excellence including, organizational skills (2.66), time management skills (2.6), understanding of university rules and regulations (2.56), setting career and life goals (2.76), making notes in class (2.68), test-taking skills (2.71), developing a good study schedule (2.67) among other key competences. This can be possible through a well-coordinated institutionalized academic mentorship programme.

Student academic mentorship need to strongly focus on advising students on how they can improve competences in the areas in table 5. These findings are important in that they can be used to inform the preparation and induction of academic mentors as well as the areas to focus on in Machakos University where the main study was to be conducted and other institutions of higher learning.

Conclusion

Following the findings it was concluded that:

Students have a positive attitude towards academic mentorship. It can therefore be concluded that given an opportunity, many students would be willing the embrace the academic mentorship programme.

Active academic mentorship can go a long way in supplementing the efforts made by chairmen of departments and deans of schools in ensuring that students are up to date with all the information they require to excel academically.

Academic mentorship should take advantage of students' feelings of inadequacy in certain competency areas that are necessary for academic excellence.

Recommendations

Based on the findings of the survey, the following recommendations were made:

Schools and departments should take advantage of the positive perception to operationalize and institutionalize academic mentorship.

There is need to encourage students to be consulting widely with their chairmen of departments, deans and academic mentors instead of fellow students who are less knowledgeable on academic matters.

Academic mentorship should be focused on areas that students expressed need for academic advising.

References

Aluede, O., Imhonde, H. & Eguavoen, H. (2006) Academic, career and personal needs of

Nigerian university students. Journal of Instructional Psychology. Retrieved July 18, 2018 from http://findarticles.com/p/articles/mi_m0FCG /is_1_33/ai_n16118903/

Bertocci, D., Hirsch, E., Sommer, W. & Williams, A. (1992) "Student mental health needs:

Survey results and implications for service," Journal of the American College Health Association, Vol.40, No.1, pp. 3-10

Guneri, O.Y., Aydin, G., & Skovholt, T. (2003) "Counselling needs of students and evaluation

of counseling services at a large urban university in Turkey" International Journal for the Advancement of Counselling, Vol.25, No.1, pp.53-63.

Clutterbuck, D. (2004). *Everyone needs a mentor: Fostering talent in your organisation* (4th Ed.).

Chartered Institute of Personnel and Development: London.

Cohen, N. (1999). *The mentee's guide to mentoring*. HRD Press: Canada.

Daloz, L. (1986). *Effective teaching and mentoring: Realizing the transformational power of adult*

learning experiences. Jossey Bass: San Francisco.

Daloz, L. A. (2012). *Mentor: Guiding the journey of adult learners*. Wiley: New York.

Hansford, B. C., Tennent, L. & Ehrich, L. C. (2003). Educational mentoring: Is it worth the effort?

Education Research and Perspectives, 39(1), pp. 42–75. http://eprints.qut.edu. au/archive/00002259/)

Harvard Business Essentials. (2004). *Coaching and mentoring*. Harvard Business School Press:

Boston.

Johnson, W. B. & Huwe, J. (2003). *Getting mentored in graduate school*. American Psychological Association: Washingaton, DC.

Gallagher, R. P. (1992) "Student needs survey have multiple benefits" Journal of College Student Development, Vol.33, pp.281-282

Gallagher, R. P., Golin, A., & Kelleher, K. (1992) "The personal, career and learning needs of college students" Journal of College Student Development, Vol.33, pp. 301-309.

Muola, J. M. & Migosi, J. A (2012): "Academic Advising Needs among University Students in Kenya" International Journal of Asian Social Science Vol.2, No.4, pp 972-983.

SUB-THEME 8: BUSINESS, ENTREPRENEURIAL INNOVATION, SMES & MARKETING

Influence of Budget Efficacy On Household Effects In Kenya

Cyrus M Munyua[1] Karatina University o Box 1957, Karatina

Email: cmmunyua@gmail.com Mobile: 0715-951-054

Abstract

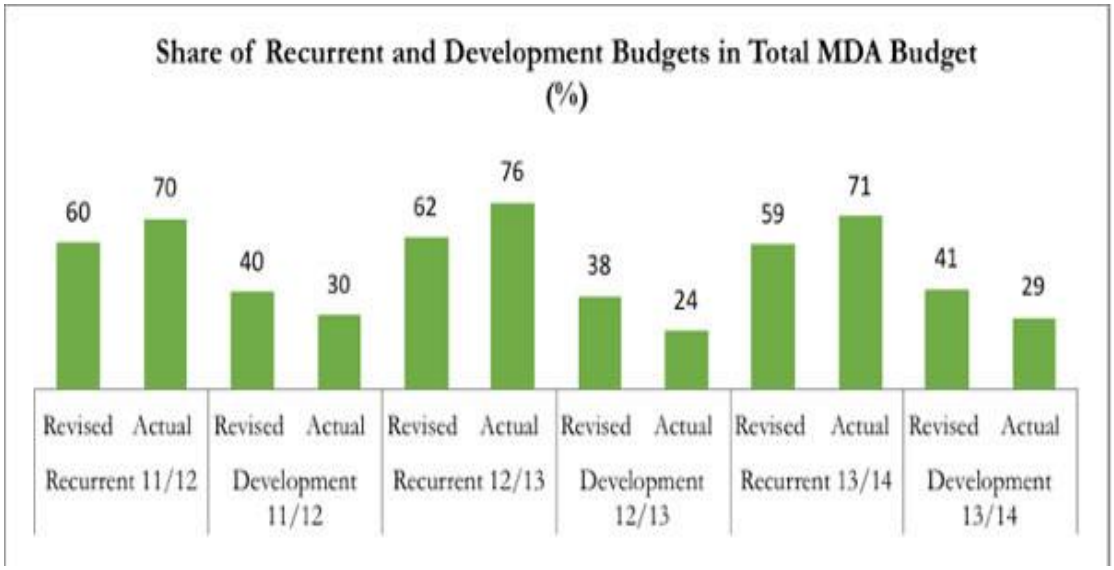
The purpose of this study is to find out whether Budget Efficacy influences household effects under Fiscally Decentralized economy as it is today in Kenya. The study was anchored on the theory of fiscal federalism and Agency Theory and adopted a positivist research philosophy in determining the research strategy and method of this strategy. A Census involving the 47 county governments was conducted based on population size, nature of the county i.e rural or urban set up and size of the annual budget support from the national government. The Study adopted the Survey and Evaluation Program (NASSEP V) frame that the Kenya Bureau of Statistics currently operates to conduct household-based surveys to also conduct a household survey in the county governments on household effects in Kenya. The study employed an inductive ex post facto cross sectional quantitative survey design. Secondary panel data was collected from County Treasuries while Primary data was collected through household surveys and Fiscal and Monetary Departments of county assemblies. Data for the period 2015-2017was used to run an univariate and multiple regressions using STATA software. Both descriptive and inferential statistics were generated and provided results for interpretation. The study established a significant association between budget efficacy and household effects. The findings of this study are expected to empower citizens through access of information on the real meaning and effects of fiscal asymmetric decentralization while policy makers will know the strength of the correlation between fiscal asymmetry and household effect in order to match monetary policy with the needs of lower government levels for implementation of the country's financial framework.

Key Words: NASSEP V, Budget Efficacy, Household Effects, Positivist Philosophy, Fiscal, Policy,Actual Expenditure

1.0 Introduction

The basic objective of budgeting is to give those targets and plans financial values, hence making an early progress in an easily measurable manner to transform the strategic ideas into understandable operative actions. Although recent literature indicates diverse meaning and definitions of the word budget, budgeting has been around as long as money existed and is often attributed to the British monarchy in the 1700's. The parliament of the British monarchy was put in place to establish some form of check and balances although that time; budgeting was mainly self-serving. The first control was put on the military so that the King could not create a force to overthrow the parliament. However, much of the laws were rarely written down and there were no regular review or any auditing or reporting. The expansion of the budget introduced the idea of a true budget and hence brought about more accountability and control (Hanninen, (2013).

Budget reforms have been undertaken not only in Kenya but also in Ghana, Malawi and Mozambique but researchers have postulated the difficulties faced by government staff due to political governance and budget politics which affect the functioning and reform of public financial management systems. A fundamental problem in analyzing Fiscal policy is analyzed by determining the intended recurrent vs development budgets and comparing these to the actual expenditure pattern at both national and county levels.



(source: Institute of Economic Affairs)

Studies have indicated important gap between formal systems and informal practices, such as clientelism, patronage and rent-seeking. They further reveal that dysfunctions and distortions occur at all stages of the budget process. This paper underscores the importance of budgeting and undertakes to find out the influence of budget efficacy on household effects in Kenya

Household and Income Inequality:

A household may be defined as a unit consisting of one or more people who live in the same dwelling and also share meals or living accommodation, and may consist of a single family or some other grouping of people. A household effect therefore refers the basic unit of analysis in many social, microeconomic and government models, and is important to the fields of economics and inheritance . A County government with a high population of poor people largely contributes to the national poverty index. Kakamega County which was ranked the highest among poor counties in Kenya has an index of 4.77% and contributes to the national poverty index 25 times more than Lamu County which has a 0.19 poverty index (GOK 2014)

Households are the owners of the factors of production and are therefore likely to be affected by Fiscal policy shocks. The welfare of individuals can therefore be affected by fiscal decentralization which transfers the financial responsibilities from the national government to the county government. This agrees with the key economic rationales for decentralization advanced by Musgrave (1959) and Oates (1972), who argue that decentralization may improve governance in public service provision by improving the efficiency of resource allocation. In this vein, many developed countries have increased their degree of fiscal decentralization.

Europe is on top of the already federalized Austria, Germany, and Switzerland, Belgium, Italy, and Spain have recently introduced widespread reforms in order to enhance regional autonomy (Ezcurra and Rodriguez-Pose 2010).

Reforms that have taken place in Kenya includes the decentralization of Revenue and Expenditure which is anchored on the Constitution of Kenya 2010 and supported by various Acts of Parliament, which guides the implementation of the constitution. The provision of public goods and services is informed by Article 201 and regulated by the Public Finance Management Act 2012, which sets the principles of management of public service and emphasizes on public participation as a requirement in budget formulation (Wakiriba, J. W., Ngahu, S., & Wagoki, J. 2014)

1.2 Problem Statement

The importance of Fiscal Policy as a tool on income redistribution and resource allocation has been emphasized by a number of scholars such as (Bastagli, Coady, and Gupta, 2012) and subsequently broadened by International Organizations like the world Bank and IMF. Accordingly, Kenya has increased her annual budget and devolved her fiscal responsibilities from the national government to the 47 county governments and expanded revenue collections with a view to reduce household income inequalities and hence improve the living condition. Government spending has gone up by two-thirds, from Sh1.6 trillion in 2013/14 to Sh2.64 trillion in 2017/18. Government borrowing has also increased from Sh1.7 trillion in 2013 to Sh4.4 trillion in 2016/2017. Despite the above mentioned tremendous economic outturn, Poverty only declined marginally, from 56.5 % in 1990 to only 48.5 % in 2010 far below the 28.2 % target by 2015, according to the World Bank (Blanchard, O. J., Jaumotte, M. F., & Loungani, M. P. 2013).

This study therefore takes cognizance of the fact that all fiscal policy is important in income distribution and key to fiscal decentralization. Although devolution is still new in Kenya, five years is sufficient to notice a change in the welfare of people in a devolved unit and especially given the amount of money that has been disbursed to county government during the last four years. Fiscal Policy as a control tool is the ideal image to view the effects of decentralization by interrogating the government's fiscal policy in order to answer the study question whether Fiscal Policy influences household effects in Kenya

1.3 Objective of the Study

The general objective of this paper was to find out the influence of Fiscal Policy on Household Effects in Kenya.

2.0 Theoretical literature review

The Theory of fiscal federalism and the Agency Theory underpins this study. The section also explores the broad literature on fiscal decentralization, Revenue and expenditure responsibilities, size of government and service delivery and the views of various academicians and practitioners. It will be expedient to note that fiscal decentralization is viewed in this study in the context of fiscal autonomy and the extent to which it impels household effects of individuals in devolved governments

The Theory of fiscal federalism

The theory of fiscal federalism was propagated by Oates W (1956). It is associated with decentralization of expenditure responsibilities and centralization of revenue responsibilities for the purpose of achieving 'efficiency' and 'equity' in the federation, which is core to this study. The Theory emphasizes the importance of transfers for addressing the problems of vertical and horizontal imbalances. It is largely normative and assumes that federal and sub-national decision-makers are 'benevolent' and maximizes the social welfare in their operations.

The Theory is also intertwined to the second-generation theory (SGT), especially the theory of market-preserving federalism which assumes that public officials have goals induced by political institutions that often systematically diverge from maximizing citizen's welfare. However, unlike the FGT which emphasizes on the importance of transfers for mitigating vertical and horizontal imbalances, the SGT gives more importance to incentives generated by sub-national tax collection for fostering economic prosperity. The SGT has had significant implications for the design of transfer systems so that equalization goals can be achieved without diminishing the incentives of public officials to foster thriving sub-national economies. In brief, the SGT is in favor of decentralization of both expenditure and revenue responsibilities; and it gives minimal role to revenue-sharing and inter-governmental transfers. Moreover, it also posits that 'inter-jurisdictional competitions', a 'common market' and 'hard budget constraints', may provide protections against infringements to market operations. The SGT is an emerging theory. Though it approaches the fiscal federalism from different perspective, the SGT does not challenge but complements the FGT which informs this study.

Allocation of Resource Theory

The allocation of resource theory was propagated by Rubin (1990). It is asymmetrical in nature in that it posits normative and descriptive Theories. Financial policy is critical and therefore requires a normative approach in its policy formulation. The Theory also explains why some corporate perform better than others and why some budget items are given more priority compared to others. The normative theory, is generally accepted that it is associated with how nations decentralize expenditure responsibilities and centralization of revenue responsibilities for the purpose of achieving 'efficiency' and 'equity' in the federation, which is core to this study. The Theory emphasizes the importance of transfers for addressing the problems of vertical and horizontal imbalances. It is largely normative and assumes that federal and sub-national decision-makers are 'benevolent' and maximizes the social welfare in their operations. The World Bank (2012) recommends that guidelines and templates need to be developed to guide the formulation of county budgets. More so the World Bank advocate for a country-wide chart of accounts for preparing, executing and reporting the budget. In addition to this, the counties would be expected to develop adequate PFM, Human resource and service delivery capacity. Further the Bank postulates that this can only be realized if choices made are translated into spending hence the need to strengthen planning and the budget process. On the contrary, this is not being fully implemented as reflected in the 2013/14 national budget preparation process where only a few people from selected counties were consulted, which is far below the stipulations in the PFM (Mugambi, K. W., & Theuri, F. S. 2014).

Agency Theory

The Agency Theory arises from a working relationship where one party enters into an agreement to act in the place of a principal. The agent is often tempted to engage in personal interest without reference to the interest of the principle. Agency problem originates from the divergent of as advance by the principle and his agent. The Theory is an attempt to on how to mitigate this problem (Jensent and Meckling 1976). County governments in Kenya receive their allocation from the national government and also collect revenue from their locality, while incurring both recurrent and development expenditure. The public although they participate in the budget process do not have oversight authority, which is vested the elected leaders but unfortunately are also implementers of the county projects. The Kenya National Audit Office who are vested with the audit of county finance are also state agents, hence the principle does not directly involve in county treasury management, hence the choice of this theory in the study is paramount (Hearn, J. J., & Phaup, M. 2016).

Empirical literature review

Budget Efficacy.

Budgeting has been defined as the basis of the management control process in organizations (Hansen et al, 2003) and also traditionally described as a common accounting tool that organizations use for implementing strategies (Ostergren & Stensaker, 2011). The basic objective of budgeting is to give those targets and plans financial values, hence making an early progress in an easily measurable manner to transform the strategic ideas into understandable operative actions (Hanninen, (2013).

Olomola, (2009), postulate that a budget is not only used for mobilization and resource allocation but also the budget does not only function as a mechanism for resource mobilization and allocation, it also serves as a tool for economic management. This emphasized in the Government Integrated Financial Management Information System (Odago, M. O., & Mwajuma, A. A. 2013).

It will be very difficult for any government to realize its vision without having a comprehensive budget because a government's accounting system is cash based as opposed to the accrual basis of accounting. The budget document lays down the direction for the entire economy and determines who gets what and when, as well as a basis for the provision of funds to implement new initiatives/policies through legal, rational and acceptable means (Bengali, 2004).

A government budget is one of the accounting tools used to plan the government revenues for a specific future fiscal period. It is also considered as a general law which gets approved by the legislative authority represented by the parliament. This means that the government general budget depends mainly on estimation and approval. The promulgation of the Constitution of Kenya 2010 completely changed the way public budgets were previously done in Kenya. It introduced a new legal framework and institutions to ensure transparency, accountability and public participation in management of public finances by providing a way which involve ordinary Kenyans in the budget making process, a complete turnaround from the previous regime where the budget making process was the work of a select few (Adili 2015)

Comparison of the trends of tax revenue with those of expenditure, both as a percent of GDP over the last decade in Kenya reveals that expenditure has persistently been growing at a faster rate than tax revenue growth, for example. For 2015/16, out of an estimated budget of Ksh 2,247 billion and projected revenue of 1,358 billion, the expected fiscal deficit is Ksh 889 billion up from 740 billion in 2014/15 revised budget. A paucity of empirical literature attributes this escalation of budget deficit to devolution related expenditure, for example Pierre and Peters (2011) indicates that an effective budget must first of all be adopted by a duly constituted authority, and it must be adhered to. The government must also avail the information on budgets to the public, who must have been involved in its preparation and despite the fact that revenue is always limited; the available resources must be matched with the expenditure (Pierre and Peters 2011).

Lienert & Sarraf, (2001) also assert that lack of basic ingredients of sound budgeting in most African countries, which includes Kenya, has justified the description of their budgetary performances as disappointing, and underscores the need for reforms in public financial management in general and budget management in particular. In Nigeria for example, there was a lot of wasteful spending during a similar period of the stage of devolution like Kenya is now (Ben-Caleb & Agbude, 2013).

Abdullahi et al, (2012), posit that a national budget need to be well designed for it to be effective and efficiency in its implementation and to monitor the performance of government staff who are the managers of governments units and departments. Recent reforms in Kenya have seen budgeting move away from the previous days during the unitary system of governance where it was the preserve of the executive.

Kazeem O. F, Hakeem O. F, and Reuben O. O, (2014) posit that budgeting is a useful tool that can guide Devolved governments to evaluate whether governments policy and objectives are actualized especially poverty eradication which directly improves household effects which was the focal point of this study. ustapha, Rashid and Nasir (2011) also assert that there is a close relationship between expenditure and household income which is in continuum with this study focus. Further.

Previously in Kenya, budgeting, policy and planning have not been conducted in an entirely integrated and comprehensive manner which has resulted into inconsistencies and incoherencies in Kenya's development platforms. The MTEF model has now been adapted for use, which is designed to instill discipline in managing and planning national resources by establishing an explicit link between the policy framework and the budgetary process. It seeks to bring a better integration of policy reforms, budgeting and expenditure management and attempts to link sector objectives to national priorities and thereby achieve greater result from existing level of resources, otherwise the debate on the effect of budget deficit on private consumption has stimulated a burgeoning literature in macroeconomics (Niesner, J., Jecha, D., & Stehlík, P. 2013)

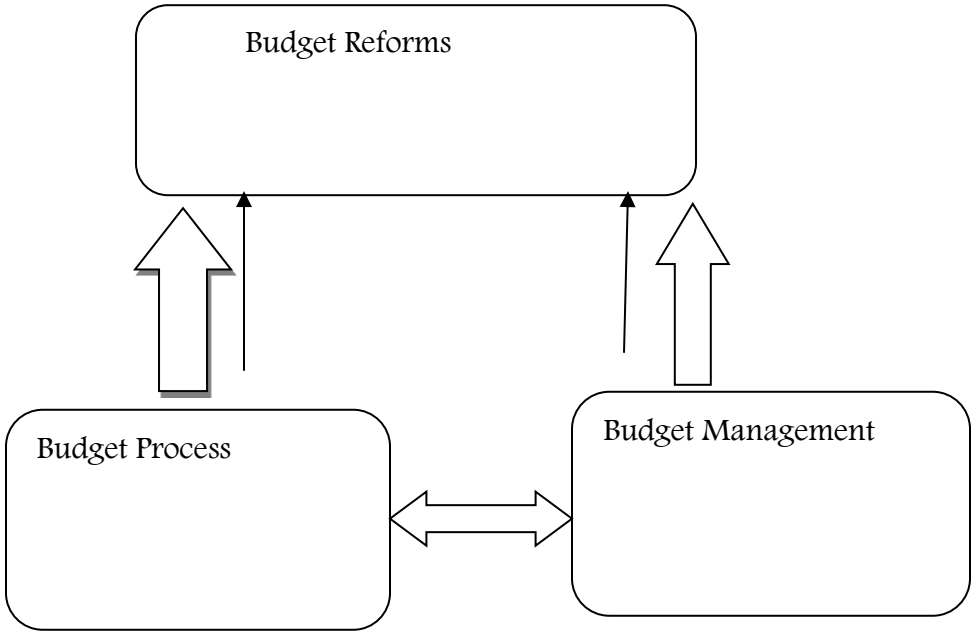


Figure 1: Budget Reforms, Budget Cycle and Budget Management Conceptual Relationship

Source: Journal of Accounting and Auditing: Research & Practice

Significance of the study

This study aims at analyzing the Impact of budget efficacy under a devolved system of governance on the household effects in Kenya. The study adopts a comparative manner for the last five years with a view to preempt any unforeseen negative impacts on the household effects through ignorance of the advantages of devolution or non-control of its weaknesses that there may be.

This study will be beneficial to both citizens and policy makers because citizens in spirit of the need to know principal need to be empowered through access of information on the real meaning and effects of budget efficacy under a devolved system of governance based on the fact that decentralization is a continuum and therefore a process which need to be appreciated by the citizens of a country experiencing this system of governance for the first time. The political class will also benefit from the findings of this study as the people's representatives endowed with legislative obligation because they will be able to make an analysis of the existing budgetary policy and therefore find out whether there is a tradeoff between the two systems of governance i.e. central and decentralized system and therefore come up with policy recommendations on the way forward based on the researcher's findings.

Critique of Existing Literature

The idea of devolving the budgetary function from the national government to the 47 County governments in Kenya was informed by a well thought Theory of Fiscal decentralization which postulates that locals have the knowledge of needs at grassroots and therefore best placed in the determination of the allocation of resources. This introduced the idea of a true budget and hence brought about more accountability and control (Hanninen, (2013). However there has been a lot interruption by the political class in both national and county governments which have

undermined the gains of fiscal decentralization contrary to Lienert & Sarraf, (2001) who assert that lack of basic ingredients of sound budgeting in most African countries which includes Kenya, has justified the description of their budgetary performances as disappointing. Kenya, s decentralization process was done in a dichotomous nature as opposed to a continuum manner which allow step by step devolvement of functions, The study by Ben-Caleb & Agbude, (2013) in Nigeria cannot therefore be generalized in Kenya who underscores the need for reforms in public financial management in general and budget management in particular. This is also because a study by Sabahi (2013) on budgeting efficacy in Kenya finds that more than 50% of Kenya's 47 counties did not face significant budget deficits. The conditions given by Donors also affect the fund management due to the conditions attached to the fund.

3.0 Research Methodology

The study adopted a positivist research philosophy in determining the research strategy and method of this strategy. A Census involving the 47 county governments was conducted based on population size, nature of the county i.e rural or urban set up and size of the annual budget support from the national government. The Study adopted the Survey and Evaluation Program (NASSEP V) frame that the Kenya Bureau of Statistics currently operates to conduct household-based surveys to also conduct a household survey in the county governments on household effects in Kenya. The study employed an inductive ex post facto cross sectional quantitative survey design. Secondary panel data was collected from County Treasuries. Primary data was collected through household surveys and Fiscal and Monetary Departments of county assemblies. Data for the period 2013-2017 was used to run univariate and multiple regressions using STATA software. Both descriptive and inferential statistics were generated and provided results for interpretation. These help to answer the question formulated in the study. The answers have agreed with our hypotheses. The study examines how budget efficacy can influence on the household effects in Kenya.

4.0 Data Presentation, Analysis and Discussion of Result

The data used for this study were presented, analyzed and discussed. The section also captures the testing of the only hypothesis of this study

4.1.1 Correlation Analysis

Table 1 presents results on association between budget efficacy and household income. The findings indicated that budget efficacy and household income have a strong positive and significant association. This was supported by a correlation value of 0.6163*. The association between the two variables was significant at 5% level of significance. The results implied that an increase in budget efficacy would increase household income.

Table 1: Correlation Matrix: Budget Efficacy

	Household Income	Budget Efficacy
Household Income	1.000	
Budget Efficacy	0.6163*	1.000

* Correlation is significant at the 0.05 level (2-tailed).

4.1.2 Regression Analysis

Table 2 present the regression results on the relationship between budget efficacy and household income.

The results indicated that there was a positive and significant relationship between budget efficacy and household income. This was indicated by a coefficient value of 0.9021 and a p value of 0.000. The results implied that for every one unit change in budget efficacy, household income would change by 0.9021 units holding all factors constant. The coefficient value had a positive sign, which indicated that there was a direct relationship between budget efficacy and household income. An increase in budget efficacy is expected to have a positive influence on household income.

Further, the F value of 85.14 indicated that the model was a good estimate. The p value of 0.000 supported the significance of the model at 5% significance level. The results implied that budget efficacy is a good predictor of household income.

In addition, the R^2 value of 0.379 indicated that budget efficacy explained 37.9% of the total variations in household income. The remaining 62.1% was explained by other factors that were not included in this study.

The Skewness/Kurtosis test indicated that the data was not normally distributed since the probability value was less than 0.05. However, normality was assumed since the number of observations was many.Breusch-Pagan test reported a p value of 0.6182, which was greater than 0.05 and hence the data was homoscedastic. Further, Wooldridge test reported a p value of 0.6758, which was greater than 0.05 and therefore, there was no autocorrelation.

Table 2: Regression Model: Budget Efficacy

	Coef.	Std. Err.	T	P>|t|
BudgetEfficacy	.9020752	.0977653	9.23	0.000
_cons	.3623576	.1221199	2.97	0.004
R squared	0.3798			
Adj. R squared	0.3754			
F (1, 139)	85.14			
Prob.>F	.00			
Skewness/Kurtosis test	Chi2=55.90, Prob> chi2=0.000			
Breusch-Pagan test	Chi2=0.25, Prob> chi2=0.6182			
Wooldridge test	F(1, 46) =0.177, Prob>F = 0.6758			

Specific model:

$Y=\alpha+\beta X$

Household Income= 0.3624+0.9021 Budget Efficacy

4.1.3 Hypothesis Testing

The hypothesis was tested by using the OLS regression.The acceptance/rejection criteria was that, if the p value is less than the conventional p value at 5% significance level, the null hypothesis is rejected, otherwise the null hypothesis is not rejected. The null hypothesis was that there is no significant association between County Budget Efficacy and Household Effects.

Based on results in Table 2, the null hypothesis was rejected since the p value of 0.000, was less than the conventional p value of 0.05. Therefore, the null hypothesis was rejected and this implied that there was a significant association between County budget efficacy and household effects.

5. Conclusions

The study concludes that there is a significant association between Budget Efficacy as indicated in hypothesis H_{01}. and also concludes that budgeting is a useful tool that can guide Devolved governments to evaluate whether governments policy and objectives are actualized especially poverty eradication which directly improves household effects in Kenya. This is also in continuum with Oate (1951) traditional Theory of Fiscal decentralization which emphasizes that locals are able to make better choices and therefore improves efficiency in the provision of Public Service.

5.2 Recommendations

The study recommends that budget efficacy is the ideal tool for reducing income inequalities and therefore improving household effects in Kenya. The Study recommends further studies on the influence of budgeting on household effects. The findings of this study will go a long way to inform the national Treasury on the best practice in the ongoing implementation of fiscal decentralization and assist future policy formulation. It will also be a good point of reference in the 47 County governments' budget formulation strategies in the provision of the Public Service and optimum utilization of the available resources for the benefits of household effects in Kenya. This study finds that there is need for a new budget culture in the public sector. Feedback is also an essential ingredient of the budgetary process, if budget efficacy is to be achieved.

References

Adili, B. (2019). Challenges and perspectives of intercultural education in macedonia. *ФИЛКО/FILKO*

Barasa, R. (2014). Influence of monitoring and evaluation tools on project completion in Kenya: a case of constituency development fund projects in Kakamega County, Kenya. *Unpublished master's thesis). University of Nairobi, Kenya.*

Bastagli, F., Coady, D., & Gupta, S. (2012). *Income inequality and fiscal policy. IMF Staff Discussion Note.* SDN/12/08.

Blanchard, O. J., Jaumotte, M. F., & Loungani, M. P. (2013). *Labor market policies and IMF advice in advanced economies during the Great Recession.* International Monetary Fund.

Cummings, S. R., Rubin, S. M., & Black, D. (1990). The future of hip fractures in the United States. Numbers, costs, and potential effects of postmenopausal estrogen. *Clinical orthopaedics and related research*, (252), 163-166.

Donaldson, J., Kawamura, N. A., Kearl, D. A., Milligan, D. J., Smith, J. D., Truninger, M. A., ... & Emery, T. R. (2004). *U.S. Patent No. 6,764,605*. Washington, DC: U.S. Patent and Trademark Office.13-20.

Hearn, J. J., & Phaup, M. (2016). Making better budget decisions easier: Some changes suggested by behavioral research.

Hansen, M. C., DeFries, R. S., Townshend, J. R., Carroll, M., DiMiceli, C., & Sohlberg, R. A. (2003). Global percent tree cover at a spatial resolution of 500 meters: First results of the MODIS vegetation continuous fields algorithm. *Earth Interactions*, *7*(10), 1-15.

Hänninen, V. (2013). Budgeting at a crossroads-The viability of traditional udgeting-A case study.

Egbide, B. C., & Agbude, G. (2014). Good budgeting and good governance: A comparative discourse. *Available at SSRN 2478725*

Faleti, K. O., Faleti, H. O., & Ojeleke, R. O. (2014). Budgetary and management control system for improved efficiency in Public Sector: The implications of "Babariga-Style" Budgeting approach. *Scholary Journal of Business Administration*, *4*(2), 44-52.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of financial economics*, *3*(4), 305-360.

Le Quéré, C., Andres, R. J., Boden, T., Conway, T., Houghton, R. A., House, J. I., ... & Andrew, R. M. (2012). The global carbon budget 1959–2011. *Earth System Science Data Discussions*, *5*(2), 1107-1157.

Lienert, M. I., & Sarraf, M. F. (2001). *Systemic weaknesses of budget management in Anglophone Africa* (No. 1-211). International Monetary Fund.

Mugambi, K. W., & Theuri, F. S. (2014). The challenges encountered by county governments in Kenya during budget preparation. *IOSR Journal of Business and Management*, *16*(2), 128-134.

Mohammed, B. S., Hossain, K. M. A., Swee, J. T. E., Wong, G., & Abdullahi, M. (2012). Properties of crumb rubber hollow concrete block. *Journal of Cleaner Production*, *23*(1), 57-67.

Oates, W. E. (2001). Fiscal competition and European Union: contrasting perspectives. *Regional Science and Urban Economics*, *31*(2-3), 133-145.

Niesner, J., Jecha, D., & Stehlík, P. (2013). Biogas upgrading technologies: state of art review in European region. *Chem. Eng. Trans*, *35*, 517-522

Odago, M. O., & Mwajuma, A. A. (2013). Factors affecting effective implementation of eprocurement in county governments: a case study of Kajiado County, Kenya. *International Journal of Business & Law Research*, *1*(1), 94-109.

Olomola, A. S. (2009). Strategies and consequences of budgetary reforms in Nigeria. In *Paper for Presentation at the 65th Annual Congress of the Institute of International Public Finance (IIPF), Cape Town, South Africa*.

Ongel, V., & Gok, M. S. (2014). The reflections of health spending on the community health: comparative analysis of emerging countries.

Ostergren, K., & Stensaker, I. (2011). Management control without budgets: a field study of 'beyond budgeting'in practice. *European Accounting Review*, *20*(1), 149-181

Rashid, N. K. A., Nasir, A., Mustapha, N. H. N., & Kamil, N. F. (2011). Analysis of income and expenditure of households in the east coast of Peninsular Malaysia. *Journal of Global Business and Economics*, *2*(1), 59-72.

Rodríguez-Pose, A., & Ezcurra, R. (2010). Is fiscal decentralization harmful for economic growth. *Evidence from the OECD countries*.

Wakiriba, J. W., Ngahu, S., & Wagoki, J. (2014). Effects of financial controls on financial management in Kenya's public sector: A case of National Government departments in Mirangine Sub-County, Nyandarua County. *Journal of Business and Management*, *16*(10), 105-115.

An Assesment of Health System in Kenya: Towards The Achievement Of Universal Health Coverage

By

1234

Evans Geoffrey Mogeni

Gideon Nyabando Masese

Pollyene Mutunga Mbithe

Abstract

Crude death rates and mortality rates have been high in most of the developing countries due to inaccessibility to health care facilities. For this reason the Kenyan Government, in its bid to realize the universal health care, it has made many changes in the health sector. This study was therefore carried out to assess Kenya's health system so as to determine its role in the achievement of universal health coverage. While using the desk review approach, the study was carried out between September and December 2018. The main key indicators which were used include; Leadership and Governance, Health Financing, Health Workforce, Medicines and Vaccines, Information Systems and Service Delivery. It was found out that that Kenya has real made a great milestone in most of the key aspects in its journey to realize universal health coverage. Transformational leadership skills have been put into practice and many policies have been formulated and implemented. The number of qualified workforce with necessary skills and experience is increasing and proper guidelines on the use of medicines have been given. It is also worth noting that most of the systems in health facilities have been integrated and this has eased information tracking for patients.

The study recommended that if the realization of universal health coverage is going to be a reality, the following need to be done; Increase health budget allocation from the current 7% to 15% as per the Abuja declaration, Align NHIF to UHC which includes; redefinition of NHIF to include Multi- Tier benefit packages, Improve terms of service for medical doctors and Equip public health facilities so that it becomes the best option as opposed to private (Health financing to improve health infrastructure) health facilities.

Introduction

Kenya became independent in 1963 when it gained independence from the British. Among the first proposals of a newly formed Government was to offer free health care to all Kenyans with an aim of accelerating economic development. A free health care for all was finalized in 1965 and any form of fees was done away with in all public clinics that were managed locally. The health system was nationalized by the health ministry in 1970 and a free health care system was extended to all Government health facilities. That continued for a short period of about three years until 1973 when it became impossible for the Government to continue offering free health service to its citizens due to economy stagnation. As a result user fees were reinstated in 1989 by the ministry of health.

The process of reformation took place in 1992 and this led to the realization of management boards at the district levels to ensure that funds are available for all health services more especially in the peripheral areas as well as facilitating cost-sharing between the central government and the local government. More financial restraints continued to an extent of carrying out massive restructuring of all health systems which were implemented in the midst of the 1990s. The Kenya Health Policy Framework Paper was published by the Government of Kenya in 1994; giving a long term vision of the sector from 2010 onwards with an emphasis

that quality health care should be affordable, acceptable and accessible to all members of the public.

The policy was used as a guiding strategy and was implemented through two five year plans, one from 1999 to 2004 and another one from 2005 to 2010. The health system was organized in an hierarchical pyramid with dispensaries in the villages being of the highest number but at lowest level of care. Higher on the pyramid are the provincial hospitals and district health centers and at the top most is Kenyatta National Hospital which is the largest Government hospital. When the new constitution took effect in 2010, the primary as well as the secondary health services was devolved to the 47 counties of the republic of Kenya. The ministry of health at national level continued to provide support in matters of policy making and technical guidance to all prioritized national programs as well as being in charge of human resource for health in all medical schools, public universities and teaching hospitals of the universities. It is also in charge of all referral hospitals in the republic.

When the constitution of 2010 came into force fully in 2013, change in roles was implemented and as a result most of the responsibilities of the national government were devolved to the counties. This form of devolution was to ensure that health resources are equitably distributed so as to improve delivery of service to all Kenyans, more especially those in the rural areas and in the long run realize universal health coverage in the entire republic of Kenya.

Health is a devolved function that is offered at National and county levels. Policy directions guides both County and National Governments on the operational priorities they need to focus on in Health. The current national transformation agenda revolves around the big four namely: Universal Health Coverage; Food Security; Affordable housing; and manufacturing.

Health Systems in Kenya

The health systems in Kenya uses the following health indicators Health Financing,Health workforce(HRM) and Service delivery entail all the labour force directly involved in the delivery of health services Health financing includes the budgetary allocation to health sectors.Access to essential medicines, where Access is measured in terms of the availability, affordability and quality of essential medicines. Quality is represented by the absence of expired stock on pharmacy shelves and adequate handling and conservation conditions. Rational use is measured by examining prescribing and dispensing practices and the implementation of strategies that have been shown to support rational use, such as standard treatment guidelines and the essential medicines list.Health information systems, include the storage and dissemination of health records. While Leadership/Governance entails how the entire sector is organized and managed.

Universal Health Coverage in Kenya (UHC)

UHC is defined as a means of providing all people with access to affordable, quality health care services in order to ensure that they obtain the health services they need without suffering financial hardship when paying for them (WHO, 2012)

As per vision 2030, Kenya's health system is focused towards attainment of the highest possible health standards in a manner responsive to the population needs. This is in line with the World Health Organization (WHO),sustainable development goals and Africa agenda 2063.Several key policy documents have been drafted to support this realization. For instance, Kenya health policy framework 2014-2030, The Kenya Health Sector Strategic and Investment Plan – KHSSP, Constitution of Kenya-2010). Kenya's healthcare system is structured in a hierarchical manner with six levels of care: Level 1: Community; Level 2: Dispensaries; Level 3: Health centres; Level 4: Primary referral facilities, Level 5: Secondary referral facilities and Level 6: Tertiary referral facilities.

According to WHO (1948), Universal health coverage (UHC) implies that all persons as well as communities can use the curative, promotive, preventive, palliative and rehabilitative health services they require, of assured quality so as to be effective and at the same time ensuring that the employment of these services does not expose the user to financial challenges. Health being among the big four in Kenya's agenda, its universal coverage can be realized through emphasis of various indicators such as: Health Financing, Health Financing, Health workforce (Human Resource Management), Service Delivery, Access to Essential Medicines, Health Information Systems and Leadership or Governance.

Towards achieving UHC in Kenya,It is projected that by 2022, Kenya will achieve 100 percent universal health coverage with an estimated total population of 51,572, 636. Journey to that realization is as given in Figure 1.1

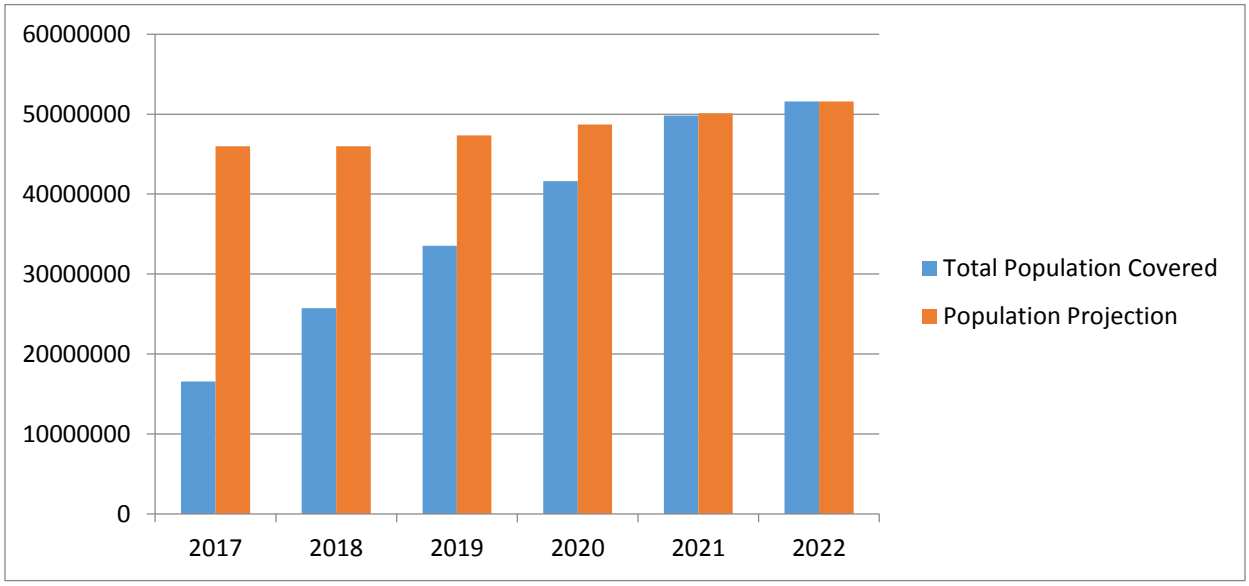


Figure 1: Universal Health Coverage in Kenya and its Projected Population

Source: WHO (2019)

Figure 1 shows that in 2017, Kenya had an estimated total population of 46,000,000 but only an estimated population of 16,538,982 had access to universal health care. By 2018 it increased to 25,740,788 with a total projected population of 46,000,000. By 2019, it is estimated that it will increase to 33,517,183 as the projected population increases to 47,334,000. The total

national population is projected to increase to 48,706,686, 50,119,180 and 51,572,636 in 2020, 2021 and 2022 respectively. Within these periods, universal health care coverage is expected to increase by 85 percent in 2020, 99 percent in 2021 to 100 percent in 2022 where a total population of 51,572,636 will be covered.

Literature Review

According to English, (2004), the district hospital is considered essential for delivering basic, cost-effective health care to children in resource poor countries. The study aimed at investigating the performance of these facilities in Kenya. Government hospitals providing first referral level care were prospectively sampled from 13 Kenyan districts. Workload statistics and data documenting the management and care of admitted children were obtained by specially trained health workers. Data from 14 hospitals were surveyed with routine statistics showing considerable variation in inpatient paediatric mortality (range 4–15%) and specific case fatality rates (like, anaemia 3–46%). The value of these routine data is seriously undermined by missing data, apparent avoidance of a diagnosis of HIV/AIDS, and absence of standard definitions. Case management practices are often not in line with national or international guidelines. For malaria, signs defining severity such as the level of consciousness and degree of respiratory distress are often not documented (range per hospital 0–100% and 9–77%, respectively), loading doses of quinine are rarely given (3% of cases) and dose errors are not uncommon. Resource constraints such as a lack of nutritional supplements for malnourished children also restrict the provision of basic, effective care. The study recommends that even crude performance measures suggest there is a great need to improve care and data quality, and to identify and tackle key health system constraints at the first referral level in Kenya. Appropriate intervention might lead to more effective use of health workers' efforts in such hospitals.

Another study by Mathauer (2008) contributed to this analysis by analyzing and understanding the demand for (social) health insurance of informal sector workers in Kenya by assessing their perceptions and knowledge of and concerns regarding health insurance and the Kenyan National Hospital Insurance Fund (NHIF). It serves to explore how informal sector workers could be integrated into the NHIF.To collect data, focus group discussions were held with organized groups of informal sector workers of different types across the country, backed up by a self-administered questionnaire completed by heads of NHIF area branch offices. It was found that the most critical barrier to NHIF enrolment is the lack of knowledge of informal sector workers about the NHIF, its enrolment option and procedures for informal sector workers. Inability to pay is a critical factor for some, but people were, in principle, interested in health insurance, and thus willing to pay for it. In sum, the mix of demand-side determinants for enrolling in the NHIF is not as complex as expected. This is good news, as these demand-side determinants can be addressed with a well-designed strategy, focusing on awareness raising and information, improvement of insurance design features and setting differentiated and affordable contribution rates.

According to Kihuba et al. (2014), Hospital management information systems (HMIS) is a key component of national health information systems (HIS), and actions required of hospital management to support information generation in Kenya are articulated in specific policy documents. The study evaluated core functions of data generation and reporting within hospitals in Kenya to facilitate interpretation of national reports and to provide guidance on key areas requiring improvement to support data use in decision making. The survey was a cross-sectional, cluster sample study conducted in 22 hospitals in Kenya. The statistical analysis was descriptive

with adjustment for clustering. It was found out that Most of the HMIS departments complied with formal guidance to develop departmental plans. However, only a few (3/22) had carried out a data quality audit in the 12 months prior to the survey. On average 3% (range 1–8%) of the total hospital income was allocated to the HMIS departments. About half of the records officer positions were filled and about half (13/22) of hospitals had implemented some form of electronic health record largely focused on improving patient billing and not linked to the district HIS. Completeness of manual patient registers varied, being 90% (95% CI 80.1–99.3%), 75.8% (95% CI 68.7–82.8%), and 58% (95% CI 50.4–65.1%) in maternal child health clinic, maternity, and pediatric wards, respectively. Vital events notification rates were low with 25.7, 42.6, and 71.3% of neonatal deaths, infant deaths, and live births recorded, respectively. Routine hospital reports suggested slight over-reporting of live births and under-reporting of fresh stillbirths and neonatal deaths. Study findings indicate that the HMIS does not deliver quality data. Significant constraints exist in data quality assurance, supervisory support, data infrastructure in respect to information and communications technology application, human resources, financial resources, and integration.

Methodology

Systematic desk review of the literature on health systems was performed between the months September and December 2018 in the republic of Kenya. The review was based on the available health sector reports which were in the public domain and data from the United Nations on millennium development goal indicators as well as World Bank. These sources were complemented by literature search in various electronic databases.

Situation Analysis of Health Systems in Kenya

As given in Table 1.1 Various indicators were used to measure universal health coverage in Kenya, that is, Leadership and Governance whereby attributes such as accountability, collaboration and availability of sector strategies were considered. Health financing was another indicator which was considered and in this case attributes such as adequacy for health funding and out of pocket expenditure payments were analyzed

Quantity available as well as their distribution of the work force was analyzed while considering the aspect of human resource available in the health sector. On the same note, availability of medicines and vaccines was also considered as well as the extent to which health facilities are using the integrated information system. Service delivery also formed part of the key measuring indicator and in this case attributes such as coverage and the package of integrated services were considered. The information can be summarized as in Table 1 below:

Table 1: Assessment Criteria Using Six Key Indicators

Health Key Indicator	Reviewed Attribute
Leadership and Governance	Accountability Collaboration

	Availability of sector strategies
Health Financing	Expenditure payments Adequacy of funding for health
Health Human Resource	Quantity of workforce Distribution of workforce
Medicines and Vaccines	Availability of medicines and vaccines
Information System	Facility based data utilization and reporting
Service Delivery	Package of integrated services Coverage

Findings

Leadership and Governance

Most of the African countries have incorporated the millennium development goals. In Kenya they have been implemented through the national MDG planning process. Kenya also has formulated the National Health Sector Strategic Programs or Plans of work which will enhance the achievement of universal health coverage. Many plans have therefore been formulated in Kenya such as reproductive health strategy, communication strategy, child health and immunization.

Other programs include; up-to-date national health strategy linked to national needs and priorities, a published national medicines policy, existence of policies on medicines procurement that specify the most cost-effective medicines in the right quantities, existence of a national strategic plan for tuberculosis, existence of a national malaria strategy or policy that includes drug efficacy monitoring, vector control and insecticide resistance monitoring, existence of a comprehensive reproductive health policy consistent with the ICPD action plan, existence of an updated comprehensive, multiyear plan for child immunization, existence of mechanisms for obtaining opportune client input on appropriate, timely and effective access to health services.

It was also found out that Kenya have a formal collaborating arrangement with development

partners through the sector wide approach (SWAp) whose objective is to have all

significant health sector funding supporting a single policy and expenditure program. Since inception of SWAp in Kenya, the country holds annual joint review meetings with stakeholders as one form of accountability;

Health Financing

The health sector budgetary allocation was considered and it was found to increase as given in Figure 2. In the realization of universal health coverage, the Government of Kenya has increased

its budgetary allocation to health from the lowest 5 percent of total Government Expenditure in 2000 to 10 percent of total Government Expenditure by the year 2022.

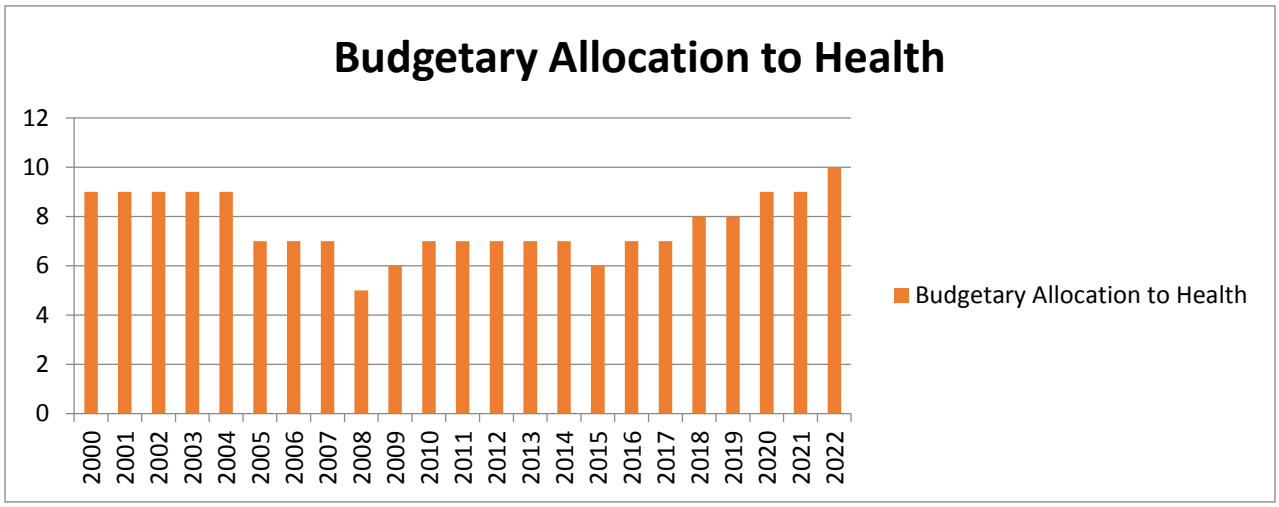


Figure 2: Budgetary Allocation

Figure 2 shows health financing from 2000 to how it is projected to be in 2022. It is evident that the Government of Kenya expects to achieve a 10 percent budgetary allocation in 2022. This will ensure that services beyond the reach of the poor are made accessible to them thus contributing positively towards the achievement of the universal healthcare coverage.

Health Workforce

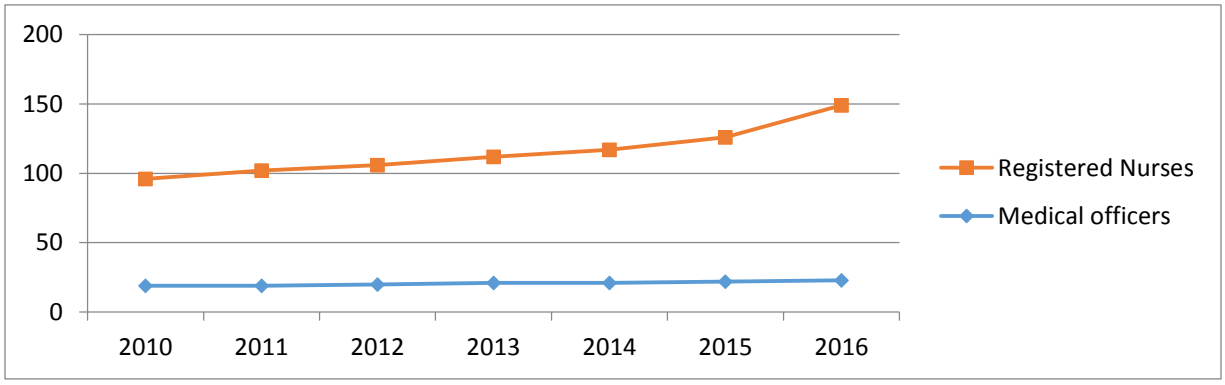


Figure 3: Health Workforce in Kenya

Health Workforce in this case includes medical doctors and registered nurses with necessary skills, qualifications and experience. Figure 3 shows the increase of Kenya registered nurses and medical officers from 2010 to 2016. As can be observed from the trends above, the number of doctors per 100,000 rose from 19 in 2010 to 21 in 2014 and to 23 in 2016. The WHO recommended minimum is 20 per 100,000 people. On the other hand, the number of nurses rose from 77 to 96 per 100,000 people in 2010 and 2014 respectively to 126 per 100,000 people in 2017. However, with the advent of devolution, there are many doctors and nurses in

administrative positions in both public and private sectors in addition to those who dropped out of the service through attrition.

Medicines and Vaccines

Ease of access to essential medicines is also another key indicator of universal health care and it was measured in terms of the availability, affordability and quality of essential medicines. Quality was represented by the absence of expired stock on pharmacy shelves and adequate handling and conservation conditions. Rational use is measured by examining prescribing and dispensing practices and the implementation of strategies that have been shown to support rational use, such as standard treatment guidelines and the essential medicines list.

It was found out that most of the medicines are not found in the public facility chemist but even though are available in the private chemists. It was also found that all medicines have guidelines on how they are supposed to be used with an expiry date, whereby they are discarded at the expiry date. It was found out that in Kenya 33 percent of health facilities were without national tracer drugs for a period of more than two weeks in the same fiscal year. A national survey in Kenya in 2004 established that first line medicines that included antimalarial drugs and antibiotics for the treatment of children's conditions were available in 83% of facilities and pre-referral medicines were available in 25% of the facilities; it further reported that 40% of the facilities had all components for providing quality child immunization.

Integrated Information Systems

Universal health coverage in Kenya will be achieved if the information system is well integrated and automated. Many countries have established health information systems (HIS) to be used as the main source of routine health data. In Kenya, the key output is a national database and county databases of health facilities. Kenya designed and developed an electronic medical records (EMR) system to support the treatment and care of HIV/AIDS. This system is built on an open platform which has supported and implemented Kenya EMR in over 300 health facilities throughout Kenya—one of the largest open source EMR rollouts in Africa. The Basic Laboratory Information System (BLIS) was designed, developed and implemented in 2014. Starting in 2016, Palladium sub awarded to I-TECH to support the CDC Ke-HMIS II project and specifically lead the capacity building and evaluation activities, across Kenya EMR and IQ Care sites.

Service Delivery

It was found out that Kenya is among many African countries which have implemented health services based on essential health package by level of health services. In measuring the level of health care delivery at county level an index was constructed comprising seven key components: availability of medical drugs, public participation, citizen satisfaction, availability of medical equipment, access to basic amenities including water and sanitation, infrastructure and equipment and human resources for health. The findings indicate that recent government initiatives towards promoting universal health care have contributed to improved health care service delivery in the country. However, there is need for county governments to address challenges contributing to unavailability of medical officers across facilities and counties and support public participation on health policy making. Finally, it is important for counties to regularly monitor the performance of the health sector under devolution and address any

emerging gaps to meet the high expectations among citizens given that universal health is enshrined in the bill of rights in the constitution.

As a result of the steps which have been taken to achieve the universal health coverage, crude death rate, infant mortality rate, less than five mortality rate and neonatal mortality rate have decreased in the recent past as the life expectancy at birth increases.

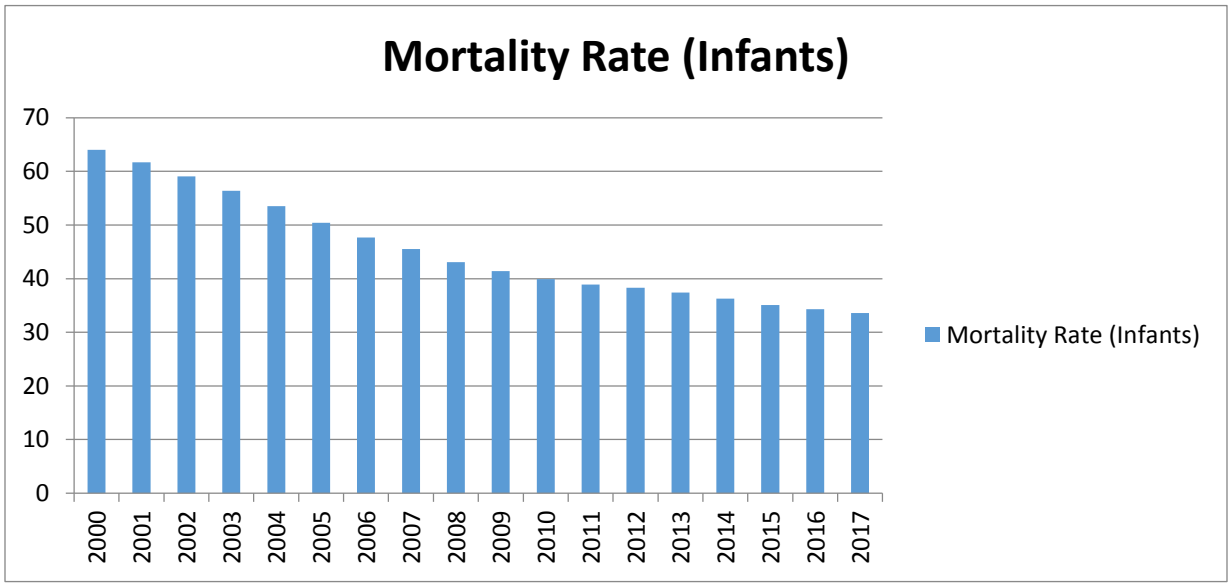


Figure 4: Infant Mortality rate

Source: World Bank (2019)

It is evident from Figure 4 that the infant mortality rate is decreasing from 2000 when it was 64 per 1000 live births to 33.6 per 1000 live births in 2017. This is a big step towards universal health coverage which aims at reducing infant mortality rate in Kenya.

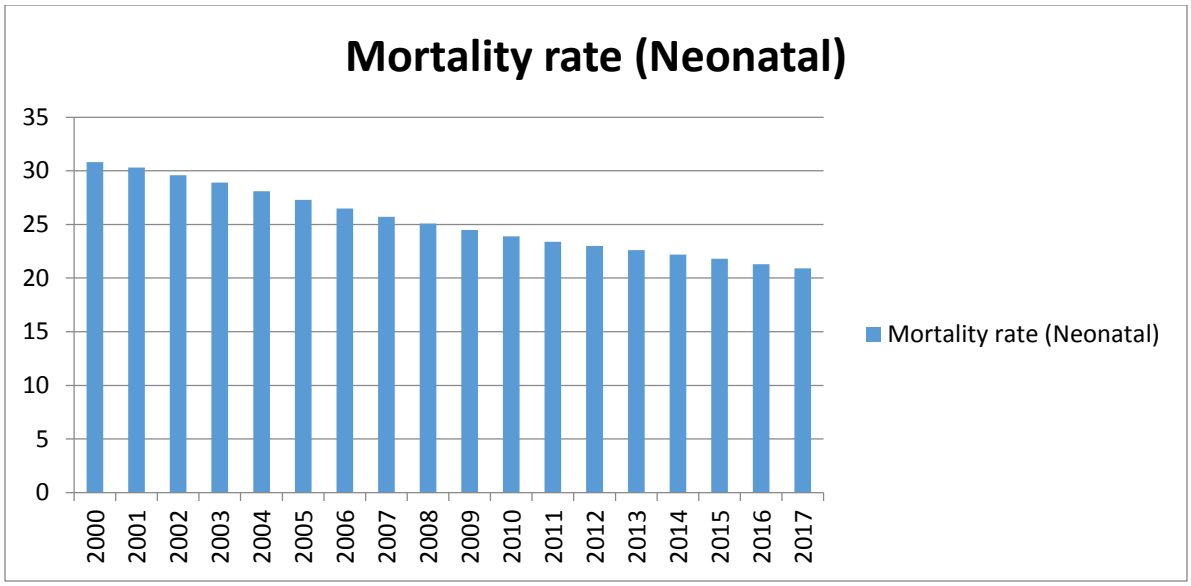


Figure 5: Neonatal Mortality Rate

Source: World Bank (2019)

Figure 5 shows the neonatal mortality rate from 2000 to 2017. It is evident that it has also decreased from 30.8 per 1000 live births to 20 per 1000 live births.

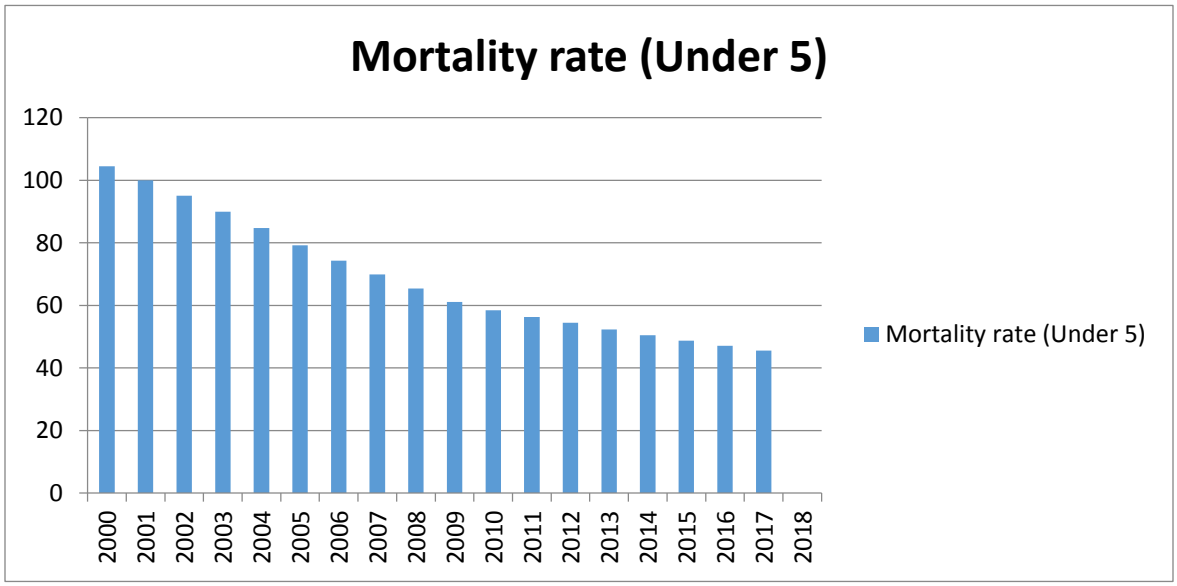


Figure 6: Under Five Mortality Rate

Source: World Bank (2019)

Figure 6 shows the under-five mortality rate from 2000 to 2017. It is evident that it has also decreased from 104.5 per 1000 live births to 45.6 per 1000 live births.

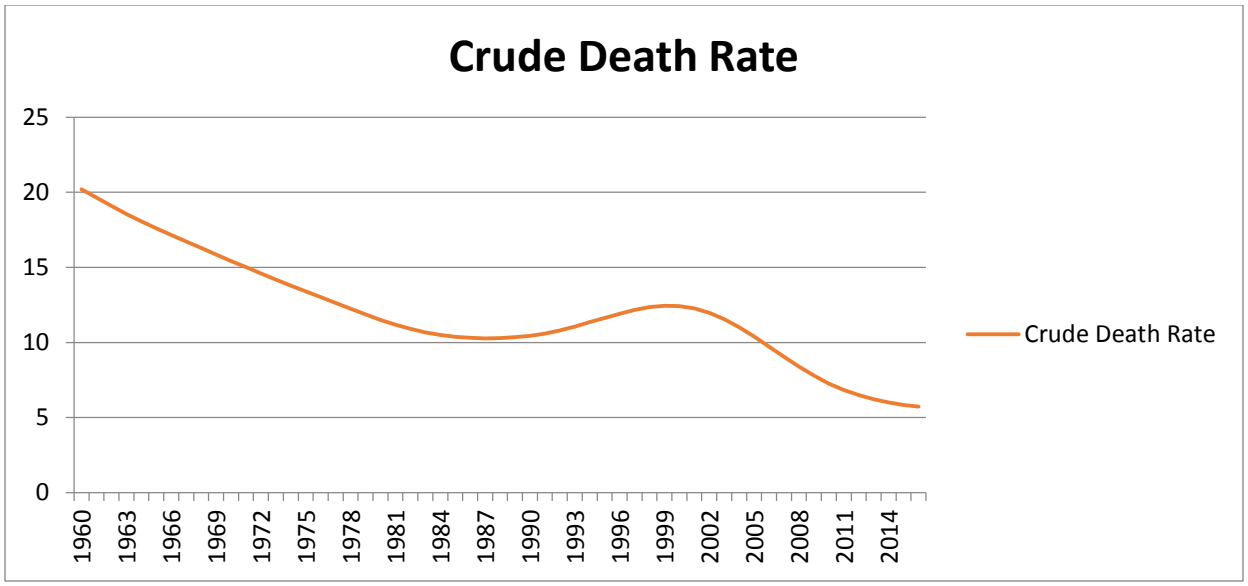


Figure 7: Crude Death Rate

Source: World Bank (2019)

Figure 7 shows the crude death rate from 1960 to 2016. It is a clear indication that as Kenya makes positive moves towards the realization of universal health coverage, the crude rate is decreasing. It is evident that it has decreased from 11.063 per 1000 population to 5.732 per 1000 population.

The life expectancy has also increased as evident in Figure 8 below:

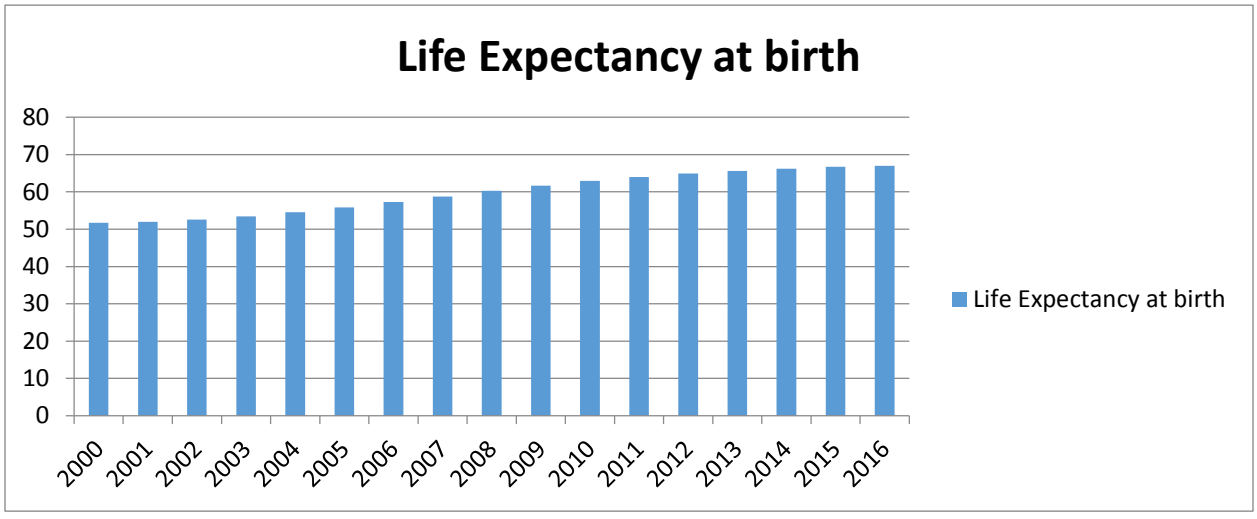


Figure 8: Life Expectancy

Source: World Bank (2019)

Summary, Conclusion and Recommendations

Summary of findings

This study intended to assess the health systems in Kenya so as to realize their roles in the achievement of universal health coverage. The study used various key indicators such as leadership and governance, health financing, health workforce, medicines and vaccines, integrated information systems and service delivery. Some of the most recent empirical studies on the same were also reviewed.

Conclusion

It was found out that Kenya has made a milestone in most of the key aspects in its journey to realize universal health coverage which depends on how it has made significant changes in its systems. Transformational leadership skills have been put into practice and many policies have been formulated and implemented. The number of qualified workforce with necessary skills and experience is increasing and proper guidelines on the use of medicines have been given. It is also worth noting that most of the systems in health facilities have been integrated and this has made tracking of information easy for patients.

Recommendations

The following are the recommendations for the study:

Increase health budget allocation (7% -15%) as per Abuja declaration. Currently it stands at 7 percent and it is expected to increase to 10 percent in 2021. It is therefore recommended that this budget allocation be increased to 15 percent as per the Abuja declaration. This will make the realization of the universal health coverage a reality within the shortest period of time.

Align NHIF to UHC which includes; Redefinition NHIF to include Multi- Tier benefit packages (Governance). Good governance and adoption of transformational leadership style plays a big role in the success of any organization.

To improve terms of service for medical doctors especially at County level so that it becomes more attractive and retain them at the county health facilities. It was found out the working conditions in terms of payments to doctors is not such attractive and it is therefore highly recommended that their terms of service be improved.

Equip public health facilities so that it becomes the best option as opposed to private (Health financing to improve health infrastructure). Private facilities are well equipped than public facilities but they are expensive than the public ones. It is therefore recommended if the universal health coverage is to be realized, it is advisable that public facilities be well equipped.

References

Carrin, G., James, C., Adelhardt, M., Doetinchem, O., Eriki, P., Hassan, M., ... & Krech, R. (2007). Health financing reform in Kenya-assessing the social health insurance proposal. *South African medical journal*, *97*(2), 130-135.

English, M., Esamai, F., Wasunna, A., Were, F., Ogutu, B., Wamae, A., ... & Peshu, N. (2004). Assessment of inpatient paediatric care in first referral level hospitals in 13 districts in Kenya. *The Lancet*, *363*(9425), 1948-1953.

Kihuba, E., Gathara, D., Mwinga, S., Mulaku, M., Kosgei, R., Mogoa, W., ... & English, M. (2014). Assessing the ability of health information systems in hospitals to support evidence-informed decisions in Kenya. *Global health action*, *7*(1), 24859.

Mathauer, I., Schmidt, J. O., & Wenyaa, M. (2008). Extending social health insurance to the informal sector in Kenya. An assessment of factors affecting demand. *The International journal of health planning and management*, *23*(1), 51-68.

World Health Organization. (2006). *Health financing reform in Kenya: assessing the social health insurance proposal* (No. EIP/HSF/DP. 06.1). World Health Organization.

Appendices

Appendix 1: Crude date rate data

Year	Crude Death Rate	Year	Crude Death Rate	Year	Crude Death Rate
1960	20.207	1981	11.191	2002	11.967
1961	19.646	1982	10.909	2003	11.541
1962	19.096	1983	10.675	2004	11.008
1963	18.568	1984	10.495	2005	10.392
1964	18.069	1985	10.371	2006	9.725
1965	17.599	1986	10.301	2007	9.046
1966	17.153	1987	10.277	2008	8.393
1967	16.719	1988	10.293	2009	7.794
1968	16.289	1989	10.346	2010	7.273
1969	15.861	1990	10.445	2011	6.843
1970	15.435	1991	10.599	2012	6.494
1971	15.011	1992	10.808	2013	6.213
1972	14.594	1993	11.063	2014	5.998
1973	14.187	1994	11.346	2015	5.841
1974	13.791	1995	11.637	2016	5.732
1975	13.401	1996	11.918		
1976	13.013	1997	12.163		
1977	12.626	1998	12.347		
1978	12.242	1999	12.445		
1979	11.869	2000	12.427		
1980	11.515	2001	12.267		

Source: World Bank (2019)

Appendix 2: Mortality Rates Data

Year	Mortality Rate (Infants)	Mortality rate (Neonatal)	Mortality rate (Under 5)	Life Expectancy at birth
2000	64	30.8	104.5	51.751
2001	61.7	30.3	100	52.004
2002	59.1	29.6	95.1	52.565
2003	56.4	28.9	89.9	53.413
2004	53.5	28.1	84.7	54.513
2005	50.4	27.3	79.2	55.819
2006	47.7	26.5	74.3	57.271
2007	45.5	25.7	69.9	58.784
2008	43.1	25.1	65.4	60.275
2009	41.4	24.5	61.1	61.68
2010	39.9	23.9	58.4	62.936
2011	38.9	23.4	56.3	64.008
2012	38.3	23	54.4	64.907
2013	37.4	22.6	52.3	65.651
2014	36.3	22.2	50.5	66.242
2015	35.1	21.8	48.7	66.695
2016	34.3	21.3	47.1	67.032
2017	33.6	20.9	45.6	

Source: World Bank (2019)

Service Quality Delivery And Customers' Satisfaction In Nigeria Banking Industry

BY

Hammanjoda, Kabiru

Department of Business Management, Adamawa State Polytechnic Yola Nigeria

Email: kabiruhamman@gmail.com

ABSTRACT

The paper assesses the service quality delivery and Customer's satisfaction in some selected Banks in Nigeria. Primary data is used where (600) respondents were selected through convenient Sampling. The study uses gap analysis where the difference between the Banks customers' expectations and perception of service quality dimensions are analyzed to obtain the mean score. The result revealed that the mean score of the net perception is negative indicating that the customer's expectation is higher than the perceived service quality at the Banks. Similarly, the individual dimension average scores are all negative meaning that there is service failure in all the facet of service quality dimensions of Tangible, Assurance, Empathy, Reliability and Responsiveness in Nigeria banks. Thus, it is an indication that the service deliveries in Nigerian Banks do not meet customer satisfactions. Banks is required by this revelation to consider repackaging and redesigning of its service operations to match up with customer expectations.

Keywords: Service quality, Customers satisfaction, Banks, Nigerian.

1.1 Introduction

Banking system is the engine of growth in any economy, given its function of financial intermediation. Through this function, banks facilitate capital formation, and promote economic growth. However, banks' ability to engender economic growth and development depends on the health, soundness and stability of the system. And it is not surprising that, the banking industry is one of the most regulated sectors in any economy. Therefore, Customer's satisfaction and service quality are critical components in strategic planning processes. The most central factor to sustainable competitive advantage is to provide the best service quality which will result in improved customer satisfaction. Banks service delivery systems in developing countries especially in Nigeria call for an efficient management to increase its effectiveness. Increasing the demand for customer satisfaction requires banking services to be customer-oriented and comply with standard and efficient protocols. Thus, recommendation from family or friends becomes an important source of information for selecting a bank. Recommendation as well as satisfaction is based on personal experience concerning the services that one has received from one financial institution or another. Customer's choice of a bank over another is based on several factors such as the interest rates, location, quality of service delivery and the banks reputation. Analyzing customer's satisfaction and understanding weaknesses, opportunities, and threats associated with banking services, can enhance the ability of banks to attract customers.

(Ramsaran, Fowdar, 2008). Customer experience affects business performance, including, productivity, reduce costs, profitability and market share. Several efforts were made to improve the quality of services, and to increase customer's satisfaction by banks innovative measures were introduced like ATM network, internet banking, improved banking hall facilities among others, all in the interest of enhancing customers" comfort. These efforts which aim at bringing satisfaction to the customers seem to be futile. Customers" preferences and expectations seem not to match up with the banks initiatives. There is incessant complaint of long waiting at the banking hall, failure of network system and Automatic Teller Machines and defection to other banks

More also, research on customers satisfaction in banking services, has been largely on developed countries (Karim , Chowdhury 2014), (Phan , Nham 2015), Rehman (2012), (Abdul Kadir, Rahmani, Masinaei 2011). There is inadequate empirical evidence investigating customers' Satisfaction on banking services in developing countries especially Nigeria. It is against this background that this paper assesses the service quality delivery and customer's satisfaction in Nigerian banking industry. The main objective of this study is to assess the quality of service delivery and customer's satisfaction the specific objective of the study is to examine the Gap between customer's expectation and customer's perception of service quality dimensions (Tangibles, Reliability, Responsiveness, Assurance and Empathy) in Nigerian banks.

The work is structured in to five sections. With introductory section one, section two dwelled on the literature review of the study. Section three outline the study methodology and data presentation, analysis and discussions of findings are presented in section four. Section five concludes the work.

2.0 Literature review

2.1 Theoretical Literature:

In literature it has been widely accepted quality is multidimensional concept with many interrelated dimensions Cronin, Taylor (1992); Carmen,(2000); Choi et al (2005;). For many decades the pursuit, for most accurately determining these factors has led to different models and theories are being developed. Most models falls in the parameters of Donabedians (1988) work where services is investigated as concept which can be studied at any level of care.

Attribution Theory: Attribution Theory focuses on the way people identify causes of actions (Folkes et al, 1984). In addition, the Attribution-Based Affective Feelings of Westbrook, (1987) deals with the affective feelings associated with the product or service after purchase that can influence the level of satisfaction and states that both positive and negative feelings can exist simultaneously about a purchase.

The Gap Analysis Theory

This Theory recognized that a key set of discrepancies or gaps exist regarding executive perceptions of service quality and the tasks associated with service delivery to consumers; these gaps can be major hurdles in attempting to deliver a service which consumers would perceive as being of high quality. Al-Hamdan (2006).

Gap 1: This gap is the customer expectations - manager perceptions gap. This gap presents itself as the difference in expectations and perceptions regarding security and privacy. The lack of interaction between executive management and patients results in misunderstanding of both the demands and the needs required to be fulfilled to improved customers satisfactions ratings.

Gap 2: Banks facilities also face problems in reacting to the services expected from customers. This gap is the difference between the management perceptions of customer's expectations and service quality specifications. The construct which govern this gap include aspect of management commitment to service quality, goal setting, tax standardization and perception of feasibility. Zeinthaml etal(1988).

Gap 3: Is the difference between service quality specifications and the actual service delivered. This is particularly difficult aspect due to inconsistency of customer's behavior.

Gap 4: This is the service delivery and external communication Banks do not always succeed in informing its customers of their endeavors to meet their expectations and deliver on promises. As a result customer's expectations are not aligned to the goals and strategies of the banks.

Gap 5: This Gap is described as the level of service expected form the provider versus perceived service. Expectations are viewed as the standards the bank customer applies to the service experience, while the perceptions are the subjective analysis of the experience. Thus, the most widely accepted measure of service quality remains the expectancy disconfirmation theory. Rahman, Haque, Kahn (2012).

2.2 Theoretical frame work

This study relies on Attribution Theories and Gap Perspective theory. The two are assumed to be the most appropriate in the assessment of Service quality delivery and customer satisfaction in banks. Attribution Theory focuses on the way people identify causes of actions (Folkes et al, 1984). In addition, the Attribution-Based Affective Feelings of Westbrook, (1987) deals with the affective feelings associated with the product or service after purchase that can influence the level of satisfaction and states that both positive and negative feelings can exist simultaneously about a purchase. However, Gap perspective Theory, recognized that a key set of discrepancies or gaps exist regarding executing satisfaction of service quality and the tasks associated with service delivery to consumers; these gaps can be major hurdles in attempting to deliver a service which consumers would perceive as being of high quality or low quality.

2.3 Conceptual Issues

2.3.1 Perceived service quality

It is argued that perceived service quality involves a comparison of expectations with actual performance and is determined by the size and direction of so-called internal gaps: between customer expectations and management perceptions of those expectations; between management perceptions of customer expectations and the firm's service quality specifications; between service quality specifications and actual service delivery; and between actual service delivery and external communications about the service Other studies defined it as the extent to which a service meets customers' needs or expectations. Service is assumed to be quality when it consistently conforms to customer expectations. Quality is one of the things that consumers

look for in an offer, which service happens to be one Solomon (2009) Quality can also be defined as the totality of features and characteristics of a product or services that bear on its ability to satisfy stated or implied needs Kotler et al.,(2002,) .

2.3.2 Service Quality Attributes:

The instrument that is most often used for measuring perceived quality of service in the marketing literature is SERVQUAL (Parasuraman et al., 1988). It consists of five service dimensions which are tangibles (physical facilities, equipment, and appearance of personnel), reliability (ability to perform the promised service dependably and accurately), responsiveness (willingness to help customers and provide prompt service), assurance (knowledge and courtesy of employees and their ability to inspire trust and confidence) and empathy (caring, individualized attention the firm provides its customers). Lee, Johnson (1997), Zeithaml, Bitner (2003).

The service quality construct is mostly conceptualized in the context of service marketing literature Lee; Yoo (2000). Therefore it deals with the concept of perceived service quality. According to Zeithaml ; Parasuraman ; Berry (1990), perceived service quality is the extent to which a firm successfully serves the purpose of customers. Customers determine the perceived or cognitive value of service based on their experience with the service delivered.

2.3.3 Service quality and customer satisfaction

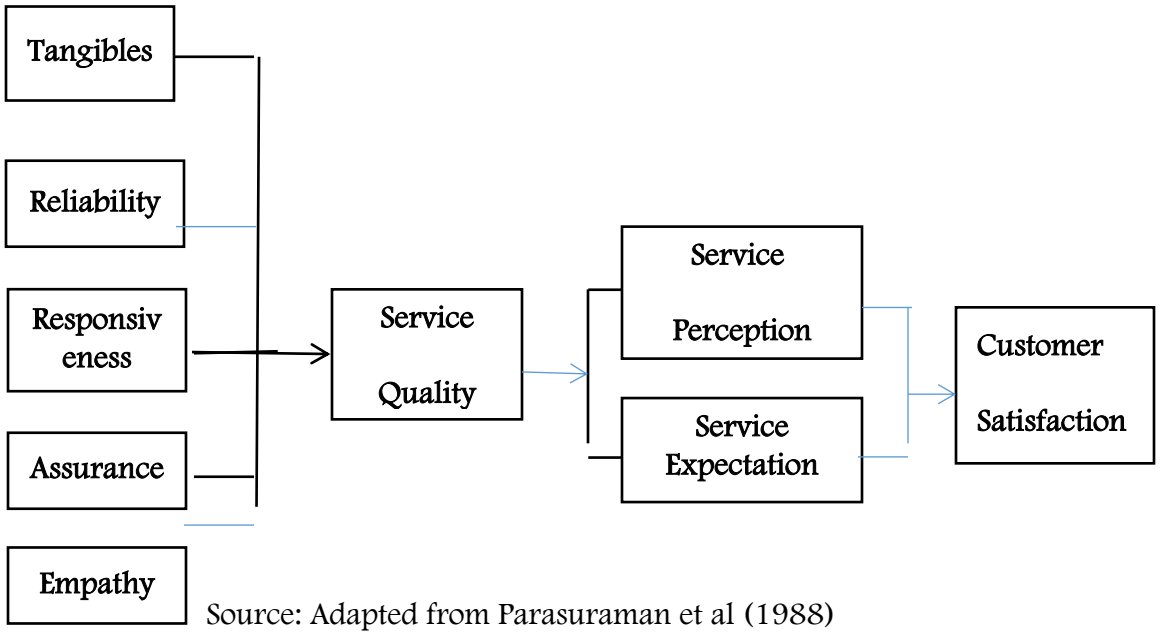
Customer satisfaction with a company's products or services is often seen as the key to a company's success and long-term competitiveness. Generally, there are two general conceptualizations of satisfaction, namely, transaction specific satisfaction and cumulative satisfaction (Jones and Suh, 2000; Yi and La, 2004). Transaction-specific satisfaction is a customer's evaluation of his or her experience and reactions to a particular service encounter (Boshoff and Gray, 2004), and cumulative satisfaction refers to the customer's overall evaluation of the consumption experience to date (Cook, 2008).One of the main elements of determining customer satisfaction is the customer's perception of service quality. Customer satisfaction is described as the result of a comparison of the customers' expectations and his or her subsequent perceived performance of service quality (Herington, Weaven, 2009).

2.3.4 Customers Expectations:

In service delivery process, customers are looking forward to service encounters with eager anticipation. In other words, what Customers expect to acquire from service providers can define their diverse expectations. Moreover, customers' expectations are regarded as their desires or wants i.e. what they feel a service provider should offer more than what would offer. Parasuraman et al. (1991) proposed that understanding customer expectations of a service played an important role for delivering satisfactory services. Previous researches had presented that how customers assess the performance of a service provider was based on the single level of expectation standard, which meant customer felt a service provider.

2.3.5 Conceptual Research Model

The model below shows five service Quality dimention often used for measuring the Gap between customers" expectation and customers perception of quality service. The quality gap according to Parasuraman et al (1988) is the difference between perception (P) and expectation (E). (Q= P-E). When Q is positive it implies customers are satisfied and when negative they are dissatisfied.



Source: Adapted from Parasuraman et al (1988)

2.4 Empirical Literature

Numerous studies of service quality and its consequences have been done since it is a way to create a competitive advantage for a company (Ladhari, (2008) Suhartanto, (2011). Banks as an institution begin to recognize that quality should be assessed for survival. Factors such as new incentive structures, declining reimbursement and increasing competition have placed a pressure on financial institutions to deliver efficiently and effectively. On the other hand, managers hope to decrease operating costs, expand access and improve service quality. Andaleeb,(2001).

Studies have not only identified the service quality measurements but also investigated the consequences of service quality especially the emotional aspect such as customer satisfaction. Bebko (2000) Examines the cause of service problems from service providers based on service intangibility within law firms, hair stylists, film processors and retail stores. It was revealed that customers have higher expectations for services which are more intangible than for services with more tangible features.

Satisfaction is becoming one of the most essential objectives which any firm seeking for long-term relationship with customer considers as the top priority. In retail banking context where the contacts with customers are one of the most core business processes, customer satisfaction is

becoming the key for successful (Belas & Gabcova, 2014; Belas, Cipovova & Demjan, 2014; Chavan & Ahmad, 2013). One of the main elements determining customer satisfaction is the customer's perception of service quality. Customer satisfaction is described as the result of a comparison of the customers' expectations and his or her subsequent perceived performance of service quality .

Karim RA, Chowdhury T (2014) studied the dimensions such as sympathy, tangibility, trustworthiness, receptiveness and assurance are essential for the satisfaction of customers towards the services provided by the private banking sector in Bangladesh. Abdul Kadir H, Rahmani N, Masinaei R (2011) studied the dimensions with regard to responsiveness, customization and flexibility for E-SERVQUAL model, found unable to respond the customer's need in Malaysia banks. Phan CA, Nham PT (2015) studied the service quality's dimension - assurance and tangible at private commercial joint stock bank in Vietnam have found a greater impact on the satisfaction of customers. Empathy and tangible dimensions demonstrates the highest positive correlation and least positive correlation respectively towards customer satisfaction Rehman AA (2012) studied the customers of Islamic banks (U.K and Pakistan) considered assurance dimension as an important factor for customer satisfaction followed by reliability and empathy.

The above empirical literatures have shown numerous studies on service quality and customer satisfaction. However, despite the importance of quality service to customer satisfaction, few studies can be found for developing countries. This can be considered a limitation to adequate understanding on the effect of service quality delivery on customer satisfaction especially on banking service. The study was able to establish a research gap of inadequate Empirical literature investigating service quality in banking industry in developing countries especially Nigeria.

3.1 Methodology

The purpose of this study is to assess Service Quality delivery and customer's satisfaction in selected Nigerian banks. This may shape confidence and subsequent behaviors of customers with regard to choice of banks. This section intends to describe methods of data collection, analysis and the population, methods to get the sample size, the research instrument.

3.2 Research Design

This is concerned with the overall plan and its approaches, strategies and related methods of inquiry Creswell (2004). The research design used for this study includes Survey, where questionnaires were employed on (600) banks customers through convenience sampling techniques, a technique in which a sample is drawn from that part of the population that is close to hand or readily available and The area of the study covers some selected banks in Nigeria..

The method of data collection that is used for this work is primary data collection. Questionnaire was administered. The effects of independent variables on the dependable variable were assessed by the 5-point Likert attitude scale because it can be analyzed effectively as interval scale. (Allen; Seaman, 1997). This study adopt five dimensions of SERVQUAL as proposed by Parasuraman et al. (1988), (Othman; Owen, 2001, 2002), (Jabnoun; Al-Tamimi, 2003). The instrument poses a set of 22 structured and paired questions based on a five- point Likert-type scale ranging from 1 (strongly satisfied) to 5(strongly dissatisfied).

3.3 Data Analysis Technique

The performance of the services delivered was measured by the customers" expectation and perception of the SERVQUAL dimensions, a descriptive statistics on the responds of the patients were used to undertake the needed measurements. The quality gap according to Parasuraman et al (1988) is the difference between perception (P) and expectation (E). (Q= P-E). When Q is positive it implies customers are satisfied and when negative they are dissatisfied

$$Q= \sum_{X=1}^{22}(Px - Ex)$$

Where: Q represents consumer's perceived service quality, P and E the ratings corresponding to perception and expectations of "x" statement, respectively. Using a 5point Likert scale, with ends anchored by the labels "Strongly Disagree" (value 1) and "Strongly Agree" (value5).

4.1: Data Presentation, Analysis and Interpretation

Tangibility Dimension

Table 4.1 the average scores (mean) expectation is so high in relation to the scale of measurement. With tangibles, the mean results of the items on perception of the respondents are low. Irrespective of the various means of the factors for both expectation and perception, mean score for the expectation were found to be relatively higher than its perception for each of the factors considered signifying that, Service Quality is Negative and is dissatisfied. This means that customers consider visually appealing physical facilities, efficient equipment and good-looking workers. Out of the items, customers are very much interested in the equipment used to deliver the services

Table 4.1: Descriptive Statistics on Tangibility Dimension

Tangibility Expectation		Tangibility Perception		
Items	Mean	Items	Mean	Gap
The appearance of bank staff should be neat and professional.	3.62	The appearance of bank staff is neat and professional.	3.15	-0.4667
The physical facilities (e.g., building and furniture) should be attractive and visually appealing.	3.71	The physical facilities (e.g., building and furniture) are attractive and visually appealing.	3.254	-0.4542
Equipment's in the bank should be Adequate	3.63	Equipment's in the bank are adequate.	3.192	-0.4375
Equipment's should be Modern.	3.55	Equipment's are Modern.	3.167	-0.3875
Average	14.51	Average	12.761	

Clearly, it has been shown from Figure 4.1 that, in terms of tangibility, as the customers were expecting the bank to provide a service quality level of 14.51 representing 53%, the bank are

rather providing a service quality level of 12.761 representing 47% with a gap of -1.749 (6%) lower than the expectation of the customers. The falling of perception short of the expectation can be attributed to the fact that, the banks could not be provide the required tangible services enough to meet or satisfy the customers

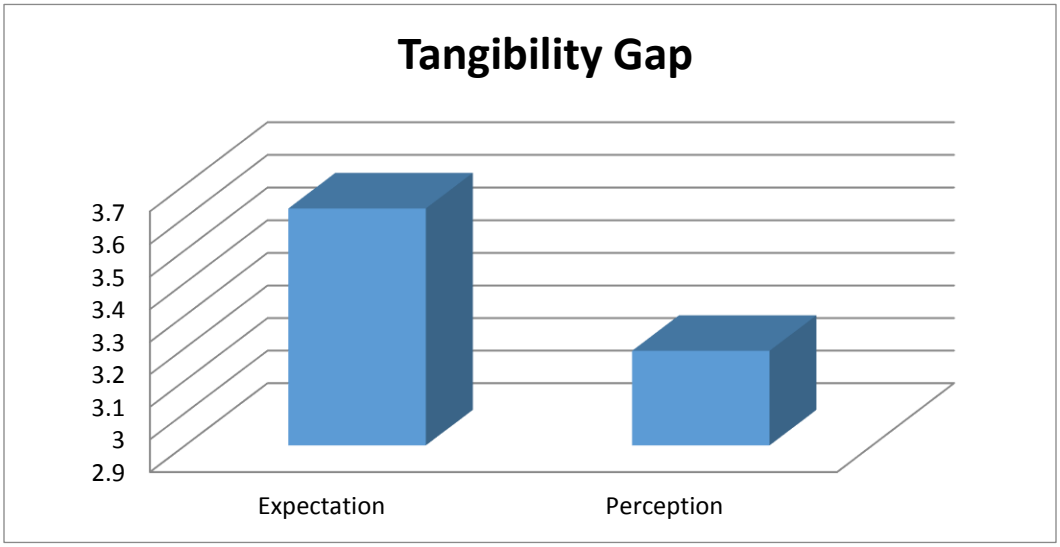


Figure 4.1: Histogram on the difference between Perception and Expectation for Tangibles Source: Field Survey 2017

Table 4.2 Shows that both cumulative and individual averages indicate negative values of the gap analysis meaning that expectation of reliability service quality delivery in the banks is beyond the perceived values. The services provided to the customer are not up to their expectation. Irrespective of the various means of the factors for both expectation and perception, mean score for the expectation were found to be relatively higher than its perception for each of the factors considered signifying that, there was no satisfaction.

Table 4.2: Descriptive Statistics on Reliability Dimension

Reliability Expectation		Reliability Perception		
Items	Mean	Items	Mean	Gap
When banking services are promised are to be done.	3.65	When banking services are promised it is done.	3.242	-0.4083
Sincere interest should be shown in solving customer's problem.	3.81	Show sincere interest in solving customer's problem.	3.346	-0.4625
Provision of banks services should be done at the time promised.	3.64	Provision of banks services at the time promised.	3.333	-0.3042
Keeping banks records should be done correctly.	3.9	Keeping banks records correctly.	3.496	-0.4083
Average	15	Average	13.417	

As shown in Figure 4.2 as customers were expecting a service quality level of 15 (53%), the banks were rather delivering a service quality level of13.417 (47%) with a service gap of -1.583 (6%) falling short of the expectations of the customers. This indicates that, service delivery was unsatisfactory.

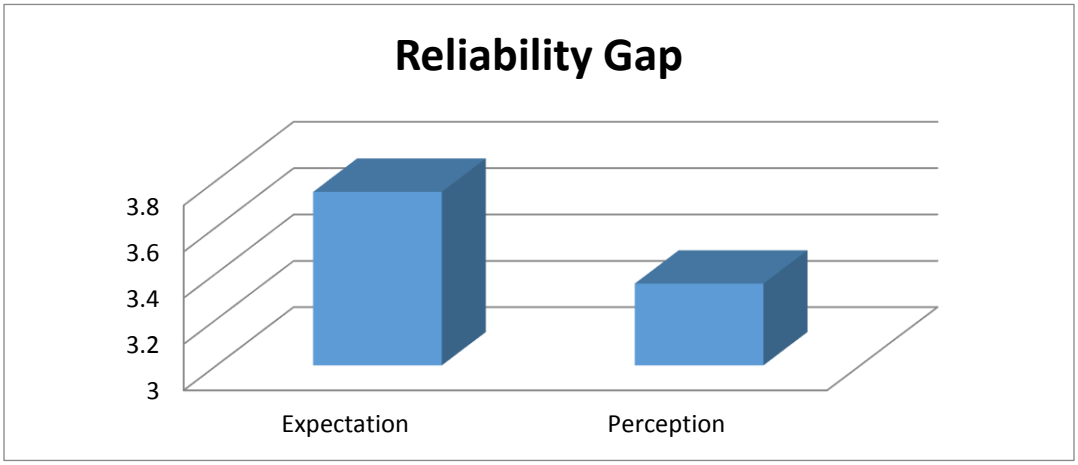


Figure 4.2: Histogram on the difference between Perception and Expectation for Reliability. Source: Field Survey 2017

Table 4.3 shows that the average scores (mean) expectation is so high. This means that customers consider information, prompt services; staff help and access to services. Irrespective of the various means of the factors for both expectation and perception, mean score for the expectation were found to be relatively higher than its perception for each of the factors considered this means that, Service Quality is Negative and is dissatisfied.

Table 4.3: Descriptive Statistics on Responsiveness Dimension

Responsiveness Expectation		Responsiveness Perception		
Items	Mean	Items	Mean	Gap
Information should be provided when service will be performed.	3.78	Information is provided when service will be performed.	3.521	-0.254
Provisions of services should be prompt.	3.68	Provisions of prompt services.	3.400	-0.279
Staffs should be willing to help customers	3.82	Staffs are willing to help customers	3.504	-0.317
It should be easy to access services when needed.	3.55	It is easy to access services when needed.	3.271	-0.275
Average	14.83	Average	13.696	

Figure 4.3 shown that, the total service quality level of the responsiveness fails to meet the perception of the customers as they were expecting a service quality level of 14.83 (52%), the banks was delivering a service quality level of 13.696 (48%) which falls short of -1.134 (4%) on the expectation of the customers represents an unsatisfactory level of service delivery for the dimension

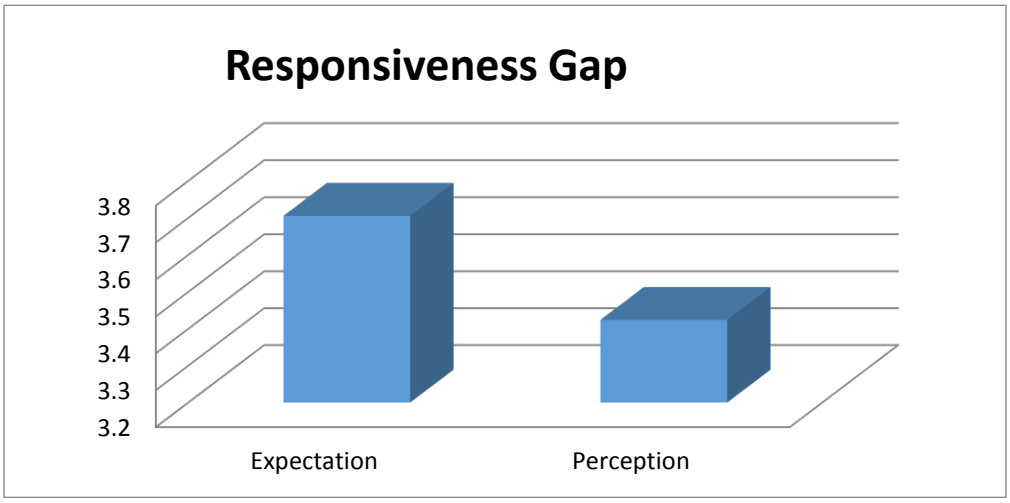


Figure 4.3: Histogram on the difference between Perception and Expectation for Responsiveness Source: Field Survey 2017.

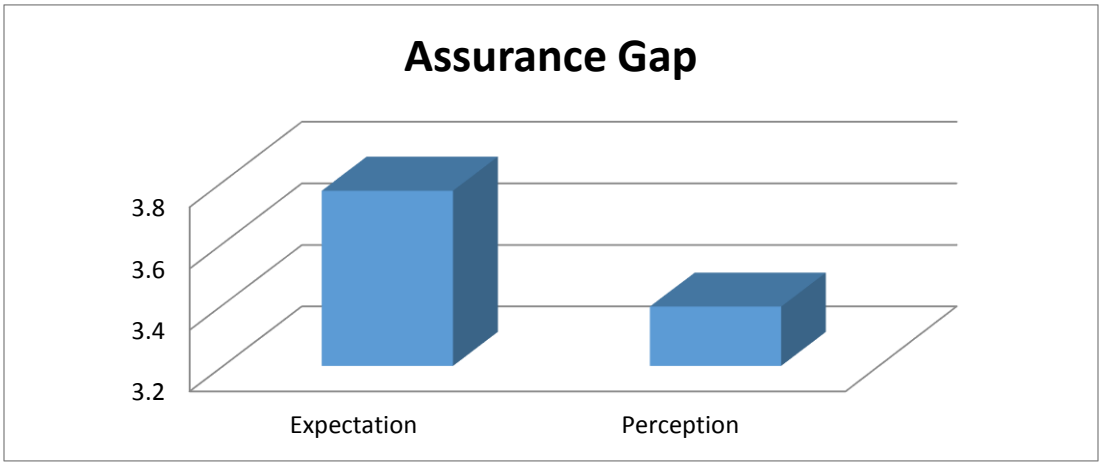
Table 4.4 Shows that, the expectation of the customers are higher than the perceived service quality generally, the individual averages indicate negative values of the gap analysis meaning that expectation of reliability service quality delivery in the banks is beyond the perceived values. This means that services provided to the customer are not up to their expectation.

Table 4.4: Descriptive Statistics on Assurance Dimension

Assurance Expectation		Assurance Perception		
Items	Mean	Items	Mean	Gap
Customers should feel secured in receiving services in the banks.	3.75	Customers feel secured in receiving services in the banks.	3.442	-0.304
Adequate explanation should be giving to banks related problems.	3.85	Adequate explanation is giving to banks related problems.	3.479	-0.371
Staff should have knowledge to answer customers' questions.	3.81	Staffs have knowledge to answer customers' questions.	3.454	-0.354
Staff should be courteous and polite towards customers.	3.73	Staffs are courteous and polite towards customers.	3.333	-0.392
Staff behavior should instills confidence to customers	3.72	Staffs behavior instills confidence to customers	3.258	-0.463
Average	18.86	Average	16.966	

Figure 4.4 shown that, the total service quality level of the assurance fails to meet the perception of the customers as they were expecting a service quality level of 18.86 (53%); and they were

receiving a service quality of 16.966 (47%), a service quality gap of -1.894 (6%) lower than their expectation. This shows a general dissatisfaction on the assurance dimension.



Source: Field Survey 2017

Figure 4.4: Histogram on the difference between Perception and Expectation for Assurance

Table 4.5 Generally, The individual averages indicate negative values of the gap analysis meaning that expectation of reliability service quality delivery in the banks is beyond the perceived values. This means that services provided to the customer are not up to their expectation. Irrespective of the various means of the factors for both expectation and perception, mean score for the expectation were found to be relatively higher than its perception for each of the factors considered this means that, Service Quality is Negative and is dissatisfied.

Table 4.5: Descriptive Statistics on Empathy Dimension

Empathy Expectation		Empathy Perception		
Items	Mean	Items	Mean	Gap
Staff should give individual attention to customers.	3.75	Staff gives individual attention to customers.	3.429	-0.325
Operating hours should be convenient to all customers	3.7	Operating hours is convenient to all customers	3.338	-0.358
Staff should have customer's best interest at heart.	3.73	Staff has customer's best interest at heart.	3.325	-0.408
Staff should give personal attention to customers.	3.79	Staff gives personal attention to customers.	3.421	-0.367
Staff should understand the need of the customers.	3.91	Staff understands the need of the customers	3.571	-0.338
Average	18.88	Average	17.084	

Figure 4.5, Shows that customers were expecting a service quality level of 18.88 (53%), the banks were rather giving a service quality level of 17.084 (47%), falling short of -1.796 (6%) of their expectations. Therefore, customers were not satisfied with the services.

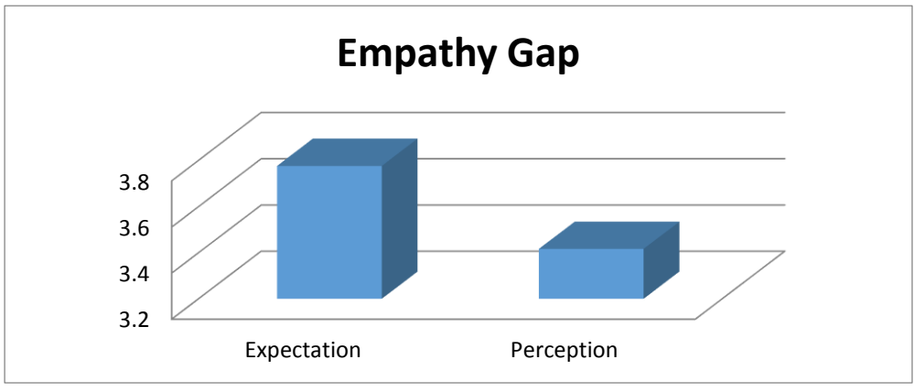


Figure 4.5: Histogram on the difference between Perception and Expectation for Empathy. Source Field Survey 2017

4.2 Result of findings

The objective of the study was to determine the Gap between patients' expectations and 'perceptions of the service quality dimensions of Tangibles, Reliability, Responsiveness, Assurance and Empathy in cottage banks and finds that the overall expectation is high and implies that patients expect a lot from the banks. Looking at the individual dimensions, the expectations are higher than the perceptions. The negative scores indicate that patients are dissatisfied because they expect more than what actually offered in terms of the quality of services. In its strict sense customers perceive service quality in all the banks to be poor since it is lower than expectations and hence they are not satisfied. This attributed to poor facilities.

In this regard, customers are not satisfied with any dimension of service quality. All the dimensions show a gap between expected service and perceived service where expectation is higher than perception this means that our banks need to make improvements in all dimensions in order to close gaps that could lead to increased customer satisfaction.

Summary, conclusion and Recommendation

5.1 Introduction

This chapter gives a summary of key findings of the study presented according to the objectives of the study. Conclusions are drawn from the findings and recommendations are given to help improve the quality of the services delivered by Nigerian banks.

5.2 Summary

Specifically, the paper examines the Gap between customer's expectation and perception of service quality dimensions (Tangibles, Reliability, Responsiveness, Assurance and Empathy) in Nigerian banks gap analysis was used to measure the difference between customers" expectation and perception of the SERVQUAL dimensions, Six hundred respondents (600) were obtained using convenience sampling. The result on the gap analysis shows that the overall expectation is high and implies that customers expect a lot from the banks. Looking at the individual dimensions, the expectations are higher than the perceptions. The negative scores indicate that customers are dissatisfied because they expect more than what actually offered in terms of the quality of services. In its strict sense customers perceive service quality in all the banks to be poor since it is lower than expectations and hence they are not satisfied. This attributed to poor facilities.

5.3 Conclusion

The study assessed the quality of service delivery on customer satisfaction in Nigerian banks. Generally, the responses to service quality dimensions used for measurement provided by the banks established that the banking services are very poor this is because the banking sector in Nigeria is neglected for a long period of time; that leads to the poor services. All items measuring

the service quality dimensions gave negative scores. Comparing the average scores to the scale of measurement shows that there is a Gap between expectation and perception of customers from the services provided by the banks.

5.4 Recommendation

A comparison between expectation and perception indicate a gap. Thus, customer expectations scores are higher than the scores of customer perceptions. Banks is required by this revelation to consider repackaging and redesigning of its service operations to match up with customer expectation. This can be done by finding out from customers what they expect from the Bank and provide accordingly. Banks needs to revisit customer check on the general behavior of its employees and their knowledge level to answer questions of customers, in order to identify the flaws and address them. However, management should keep an eye on the efficiency of the machines used such as the tracking of the intranet used for transactions. By this customers will be compelled by virtue of superior service to stay than switching to a competitor.

References

Abdul Kadir H, Rahmani N, Masinaei R (2011) Impacts of service quality on customer satisfaction: Study of Online banking and ATM services in Malaysia. International Journal of Trade, Economics and Finance 2: 1-9

Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A

Review and recommended two-step approach. *Psychological Bulletin*, 103(3),

Belás, J., & Gabčová, L. (2016). The relationship among customer satisfaction, loyalty and

Financial performance of commercial banks. *E&M Economics and Management,* 19 (1)

Belás, J., Cipovová, E., & Demjan, V. (2014). Current trends in area of satisfaction of banks´

` Clients in the Czech Republic and Slovakia. *Transformation in Business & Economics,* 13.3(33),

Cronin, J.J., and Taylor, S.A., (1992), "Measuring Service Quality: A Re- examination and Extension", Journal of Marketing, 56 (3), 55-68.

Douglas, L. & Connor, R. (2003). Attitudes to service quality- the expectation gap, *Nutrition & Food Science*, Vol. 33 Number 4, 165-172.

Edvardsson, B. (2005) "GURU'S VIEW, Service quality: beyond cognitive assessment", Managing Service quality, 15 (2), 127-131

Gronroos, C. (1984), "A service quality model and its implications", European Journal of Marketing, Vol 18, No 4, 36-44

Gronroos & Christian. (2001). the perceived service quality concept a mistake? *Journal of Managing Service Quality*, *11*(3), 150-152

Hair, J.F., Ralph, E.A., Ronald, L.I. and William C.B., (2003), Multivariate Data Analysis, 4th Edition, Prentice Hall, New Jersey

Hamer (2006) A confirmation perspective on perceived service quality Journal of Services Marketing, 20 (4) (2006), 219–23

Harun, W.M. W. and F. Ibrahim (2008). Human-Environment Relationship Study Of Waiting Areas In Hospitals.1st. International Conference On Built. Environment In Developing Counties (ICBED 2008), Pulau Pinang.

Heskett, J.L., Jones, T.O., Loveman, G.W., Sasser Jr., W.E. Schlesinger, L.A., (1994,March-April). Putting the service profit chain to work. *Harvard Business Review,* 105–111

Kim and Jin. (2002), "Service quality in the Thai telecommunication industry: a tool for achieving a sustainable competitive advantage", Management Decision, Vol. 40 No. 7, 693.

Karim RA, Chowdhury T (2014) Customer satisfaction on service quality in private commercial banking sector in Bangladesh. British Journal of Marketing Studies 2: 1-11

Kotler, Philip and John A Caslione. 2009. How Marketers Can Respond to Recession and Turbulence. *Journal of Consumer Behavior*. 8: 187-191.

Ladhari, R. (2009). A review of twenty years of SERVQUAL research. *International Journal of Quality and Service Sciences*, *1*(2), 172–198. http://dx.doi.org/10.1108/17566690910971445

Lehtinen, J.R., & Lehtinen, U. (1991). Two approaches to service quality dimensions. The Service Industries Journal, 11(3), 287-303.

Lim, P. and Tang, N., (2000), "Study of patients expectations and satisfaction in Singapore Hospitals", International Journal of Health Care Quality Assurance, 13 (7),290-9.

Mehta et al. (2000), "A service quality model based on ideal value standard", International Journal of Service Industry Management, Vol. 3 No. 3, 18-33.

Newman, K. (2001), "Interrogating SERVQUAL: a critical assessment of service quality measurement in a high street retail bank", International Journal of Bank Marketing, Vol. 19 No.3, 126-39.

Parasuraman, A., Zeithaml, Valarie .A., & Berry, Leonard. L. (1985). A Conceptual Model of Service Quality and its Implication for Future Research. Journal of Marketing, 49, 41-50.

Phan CA, Nham PT (2015) Impact of service quality on customer satisfaction of automated teller machine service: Case study of a private commercial joint stock bank in Vietnam. Business: Theory and Practice 16: 280-289

Rehman AA (2012) Customer satisfaction and service quality in Islamic banking: A comparative study in Pakistan, United Arab Emirates and United Kingdom. Qualitative Research in Financial Markets 4: 165-175

Shahin, A. (2005). SERVQUAL and Model of Service Quality Gaps: A framework for determining and prioritizing critical factors in delivering quality services, *Department of Management, University of Isfahan, Iran*, 1-10.Available on http://www.proserv.nu/Docs/Servqual.

Tam, J. L. M.,(2004) Customer satisfaction, service quality and perceived value: an integrative model. *Journal of Marketing Management, 20*(7-8), 897917.

Tucker,J.L.& Adams,S.R.(2001).Incorporating patients' assessments of satisfaction and quality: an integrative model of patients' evaluations of their care. *Managing Service Quality, 11*(4), 272-287.

Wisniewski M. (2001): Using SERVQUAL to assess customer satisfaction with public sector services, Managing service quality, Vol. 11, No. 6, 380-388.

Zeithaml, V. A., Parasuraman, A., 2003.*Service Quality*.Massachusetts Marketing Science Institute

Creating Favorable Macroeconomic Environment for Manufacturing Industry in Kenya

James Murunga, MA

Department of Economics, Machakos University.

Purity Mugambi, MA

Kenya Institute for Public Policy Research and Analysis (KIPPRA)

Abstract

Kenya's vision 2030 which is a development blue print seeks to transform Kenya into a newly industrialized middle-income country that offers high quality life to all its citizens. To achieve its goal, it recognizes the role of manufacturing sector in creation of employment and wealth as well as its vital contribution to the economy's GDP. The big four agenda launched by the president of the republic of Kenya in 2017 identified manufacturing as a key pillar to propel Kenyan economy and aims to raise the sector's contributions to the GDP from 9 percent to 15 percent by 2022. The agenda seeks to concentrate on improving specific sectors in the manufacturing industry; textile and apparel, food and beverages, leather, timber, cement, automotive, chemicals, and pharmaceutical. Creating a favorable macroeconomic environment is a key enabler to achieve the manufacturing sector goals. According to Dunning, J.H. (2004), among the macroeconomic factors that affect manufacturing are economic development and growth, level of inflation, exchange rate, interest rate and foreign direct investment. This paper seeks to look deeper into macro-economic factors and to analyze their impact on the manufacturing sector. Augmented Dickey Fuller, Phillips Perron and Zivot- Andrews test are used to test for presence of unit root among the variables. The results reveal that variables are integrated of order zero, one and two. In this regard, the study adopts ARDL bounds test. The results reveal that inflation, exchange rate and gross domestic product as the determinants of manufacturing sector in Kenya. The study therefore recommends that Kenyan government should stabilize the flow of foreign exchange through diversifying revenue base of the economy, provision of incentives to encourage the consumption of locally produced goods and ensure that the proceeds of corrupt practices are not domiciled in foreign accounts. The government should achieve prudent management of national financial resources as well as borrowings from abroad, initiate policies to minimize capital flight through repatriation of earnings or outright withdrawal by foreign interests. With regard to negative effect of rise in GDP to manufacturing sector, Kenyan government should pursue policies and programmes aimed at controlling the underground economy. Such policies may include improvement of cross-sectoral cooperation involving customs, national police, Kenya Defence Forces.

Key Words: Kenya, Manufacturing, GDP.

1.1 Introduction

Economic recovery of any country requires increase in productive inputs for instance labour, land, capital and technology. The productivity of these inputs can be enhanced by ensuring their stability in the face of global meltdown (Alao, 2010). However, dynamism in macroeconomic policy has become progressively important within the productivity sector as the manufacturing has become more capitalized and mostly dependent on international markets. As a result of this the sector is vulnerable to changes in interest rate, foreign direct investment, exchange rate and the size of country's GDP(Odior, n.d.)

Studies show that increased industrial productivity is a sure way of boosting economic growth thus improving living standards of people in any given country. Formulation and implementation of good productive schemes have succeeded in pulling many countries out of global financial crisis and placed path of economic growth and development. This implies that countries that are not doing well economically should resort to increasing their productivity through formulation and implementation of good productive policies. For instance, Japan from the end of second World War and USA from 1970s adopted policies that ensure increased productivity and the results have turned out to be good (Alao, 2010).

In Kenya, agriculture is the backbone of the economy contributing about 32.6 percent of GDP. The sector also provides livelihoods in terms of employment, income and food security to more than 80 percent of the Kenyan population. Among the crops produced for export are tea, coffee and pyrethrum for exports. The reliance on these primary commodity exports whose prices are prone to fluctuations has led to persistent unfavourable terms of trade and a weak balance of payments position. One strategy frequently mentioned with regard to reducing this dependence is industrialization. The Kenyan government has continuously put emphasis on industrialization not only as a way of diversifying the economy but also as economic growth engine (*KER-2017-Popular-Version-1 pp14.pdf*, n.d.).

In the year 2018, manufacturing sector's output in Kenya declined by 1.1 percent. This contraction was attributed to to decrease in food products, tobacco, beverages, leather and related products, plastics and non-metallic subsectors. This decline can also be linked to uncertainty that was caused by general elections, high inflation, high cost of production and competition from imported products and. The ban on production and use of plastics may also have contributed to the adverse effects on the capacity of output of the sector. Further, the decline in 10.8 percent in food subsector as a result of inadequate raw material for some key agro-based industries may have contributed to dismal performance of the manufacturing sector (Republic of Kenya, 2018). The manufacturing sector for the last decade witnessed a decrease in number of projects approved by Kenya Industrial Estate (KIE) from 543 in 2014 to 280 in 2017. The number of manufacturing projects registered by Kenya investment authority decreased to 40 in 2017 as compared to 43 that were registered in 2016. Although manufacturing sector is recommended as the one that can solve problems associated with overreliance on export of

primary agricultural products it only contributes 8.4 percent of GDP. The sector's contribution in GDP has been fluctuating since 1980. The trend in the contribution of the manufacturing sector in GDP is shown in Figure 1.

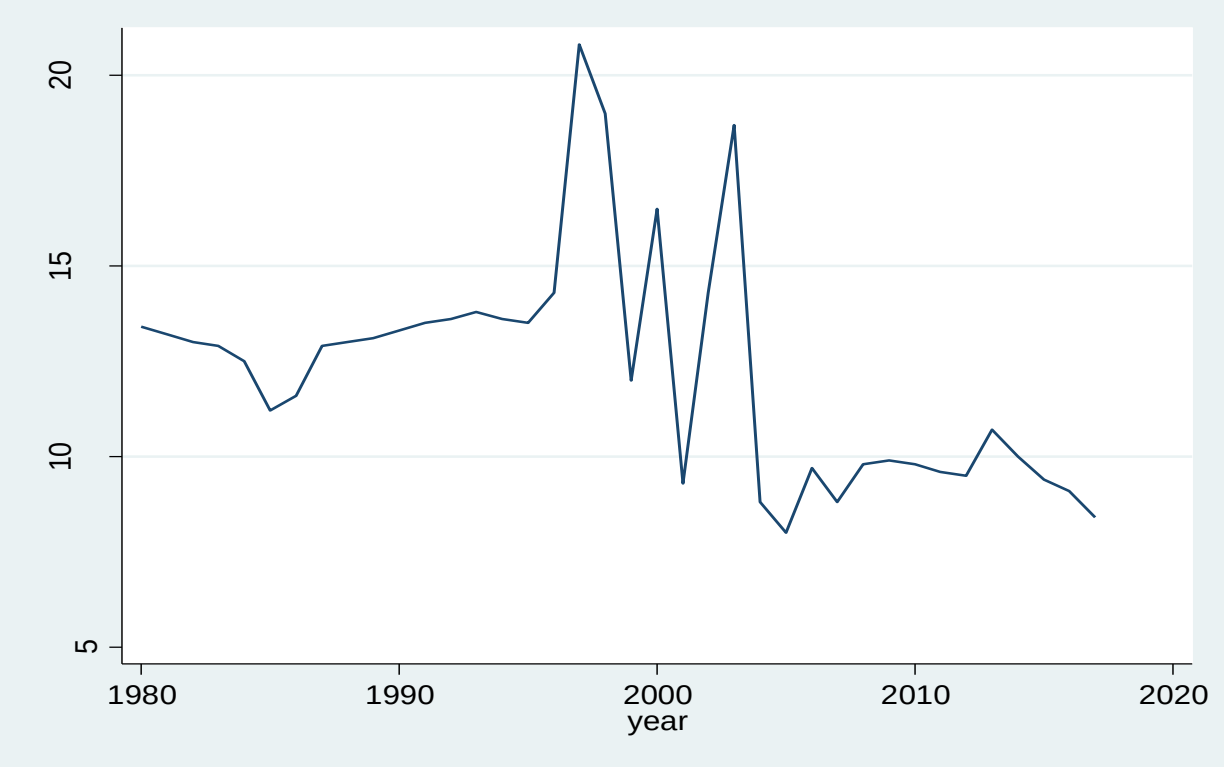


Figure 1: Share of Manufacturing Sector in GDP. Data obtained from Republic of Kenya; Economic Survey (various issues).

From Figure 1, it is observed that between 1980 and 2007, highest share of manufacturing in GDP of 20.8 percent was recorded in 1997. Thereafter there were fluctuations but from 2013 to 2017 there has been a negative trend in the portion of manufacturing share in GDP.

Comparing both growth in agricultural share in GDP and manufacturing share in GDP, it is revealed that for the last five years, the latter has been growing slowly than the former. The trends in these growth are illustrated in Figure 1.

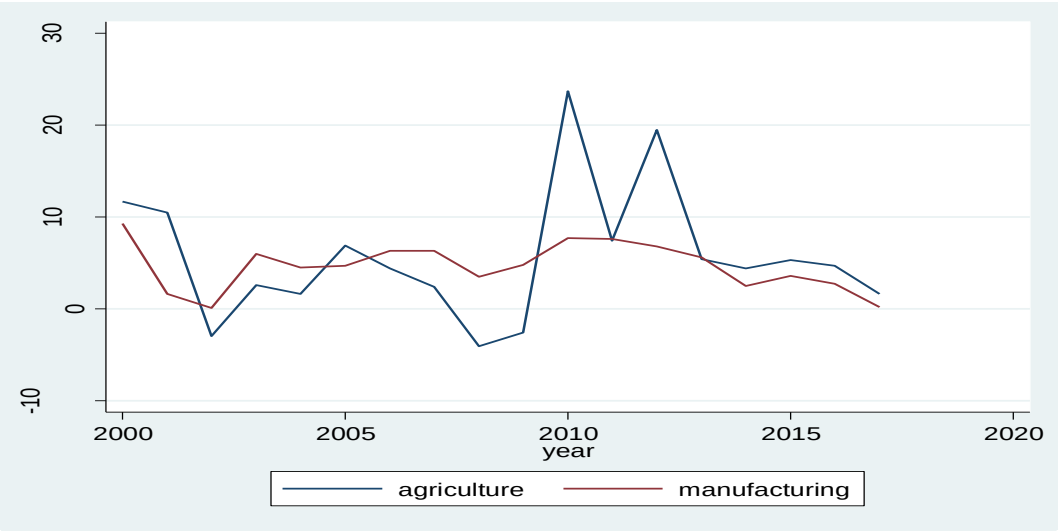


Figure 2: Agriculture and Manufacturing Growth Rates (% increase in GDP). Data obtained from **Republic of Kenya; Statistical Abstract, Economic Survey (various issues).**

From Figure 2, it is evident that both agriculture and manufacturing growth as a percentage of GDP has been fluctuating since 2000. From 2002 to 2004, 2006 to 2009 manufacturing sector grew faster than agricultural sector. From 2010 to 2017, manufacturing sector growth decreased as compared to that of agriculture.

Most developing countries would prefer manufacturing sector to grow faster than agricultural sector. The reason behind this is that despite the fact that both sectors may compete for scarce resources for instance skilled labour and raw material, they complement each other. First, manufacturing sector relies on agriculture sector as source of raw material, food for their workers. The agricultural exports also generate foreign exchange which is used to import capital goods for the manufacturing sector and importation of other raw material not available in the country. It can therefore be argued that growth in the manufacturing sector results to increase in the agricultural sector (Todaro and Smith, 2012). Second, expansion of the manufacturing sector alienates the problem of balance of payment by producing import substitues thus reducing imports. In the short run the problem may not be solved since there will be importation of capital goods for the sector. Further, the problem of balance of payment can be resolved if the sector enhance country's export oriented strategy (Abor and Quartey, 2010). Third, expansion of manufacturing sector is good since it create job opportunities. As the manufacturing sector expand, it is generally expected that more labour will be absorbed (Kianian, Tavassoli and Larsson, 2015). Lastly, the sector relieves fluctuations in prices thus encouraging stability in

incomes. Manufacturing output is stable unlike agricultural output that is affected by non-economic factors for example drought, floods and other climatic factors (Abor and Quartey, 2010).

1.2 Macroeconomic Variables that affect Manufacturing Sector

Capital formation has a great role in the manufacturing sector. Economists for instance Rosentein-Rodan postulates that investment ratio to GDP of between 12 and 15 percent is good to diversify and thus resulting into economic growth in a country. If a country maintains such level of investment and especially in manufacturing sector, an economy can be allowed into a take off stage. This is however possible if this share of investment in GDP is accompanied by other factors for instance quality of the people in the country and their desire to learn and acquire new skills of production. Nevertheless, capital formation remain a key determinant of the manufacturing sector and can be treated as a catalyst in presence of other factors (Todaro and Smith, 2012) Exchange rate is another factor which affect manufacturing sector. High exchange rate discourages imports thus expanding the manufacturing sector since its output act as import substitutes (Enekwe, Ordu and Nwoha, 2013). McKinnon (1973) and Shaw (1973) argued that financial deepening due interest rate deregulation has a direct influence on factor productivity through higher real rates of interest. The interest rate is seen important determinant of the manufacturing sector through the provision of capital it commands in the finance of manufacturing sector. In addition, McKinnon (1973) and Shaw (1973) emphasize the role of internal and external finances in the expansion of manufacturing sector in developing countries. While McKinnon emphasizes the role of internal finance where investors have to accumulate savings before obtaining capital goods, Shaw stresses on the role of external finance and development of the financial institutions in the capital accumulation.

The above factors influence manufacturing sector from the supply side. From the demand side, there are three factors that influence the manufacturing sector namely income and import substitution. Rising income is important because it influences the demand for manufacturing output. There is a positive relationship between demand for manufacturing output and the level of income. When incomes increases, consumption of manufactured goods rises too, in most cases more rapidly than income. The rise in incomes therefore provides an ample opportunity for the expansion of the manufacturing output to meet domestic demand. However, this may not be true for all manufacturing products as a result of different income elasticities (Nicholson and Snyder, 2012). According Todaro and Smith (2012), manufacturing sector and import substitution have a positive relationship. Import substitution strategy aims at making economic agents in country to switch from consumption of foreign goods to domestic goods.

1.3 The Statement of the Problem

Kenya's vision 2030 which is a development blue print seeks to transform Kenya into a newly industrialized middle-income country that offers high quality life to all its citizens. To achieve

its goal, it recognizes the role of manufacturing sector in creation of employment and wealth as well as its vital contribution to the economy's GDP. The contribution of manufacturing sector in GDP has been fluctuating since 1980. However, in 1980s and 1990s, manufacturing sector provided a substantial share of the country's GDP but this dwindled in 2000s. For instance in 1980, the manufacturing sector contributed 13.4 percent of GDP but decreased to 11.2 in 1985. The sector grew after twelve years later to 20.8 percent of GDP in 1997. Since then, the portion of manufacturing sector in GDP declined reaching 8.4 percent of GDP in 2017. The big four agenda launched by the president of the republic of Kenya in 2017 identified manufacturing as a key pillar to propel Kenyan economy and aims to raise the sector's contributions to the GDP from current level of about 8 percent of GDP to 15 percent by 2022. The agenda seeks to concentrate on improving specific sectors in the manufacturing industry; textile and apparel, food and beverages, leather, timber, cement, automotive, chemicals, and pharmaceutical. Creating a favorable macroeconomic environment is a key enabler to achieve the manufacturing sector goals. According to Dunning, J.H. (2004), among the macroeconomic factors that affect manufacturing are; economic development and growth, a consumption possibility of a society, a level of inflation, a possible current account balance, and a state of public finances. Currently, there is no conclusive study touching on the effect of macroeconomic variables on manufacturing sector in Kenya. Odhiambo (1991) investigated the effect of macroeconomic variable on Kenya's manufacturing sector but the study is deficient in terms of econometric methodology. For instance, the study failed to carry out unit root testing, a critical test for time series study. The paper seeks to use time series data running from 1980 to 2017 to estimate the effect of macroeconomic variables on the manufacturing sector in Kenya.

2.0 Literature Review

The manufacturing sector being one of the traditional sectors that exists in a macroeconomic environment is most likely to be affected by changes in macroeconomic conditions. According to solow (1956) macroeconomic conditions can affect manufacturing sector positively or negatively thus making it a pertinent issue to policy makers to pay attention to macroeconomic changes and how they affect the manufacturing sector. Various macro-economic variables that are likely to affect the sector are: private sector credit, consumer price index, infrastructure, labor force, real exchange rate and fixed capital formation.

Imoughele and Ismaila (2014) investigated the effect of monetary policy on manufacturing sector in Nigeria using econometrics tests procedures. The findings were that money supply had a positive effect on performance of manufacturing sector while company lending rate, income tax rate, inflation rate and exchange rate negatively affect the performance of the sector. Eze, Onyekachi and Ogiji (2013), using an error correction model sought to find out how fiscal policy affects the sector and the study identified that there is a long run relationship between fiscal policy and manufacturing sector output, government tax revenue having a significant negative impact on the sector. Government expenditure had a significant and positive impact on

the manufacturing sector. The study recommended that the expansionary fiscal policies should be encouraged as they play a key role in improving manufacturing sector output in Nigeria

Investigating the impact of micro-economic policies on manufacturing sector in Croatia, Tkalec and Vizek 2009, used Multiple Regression to assess how personal consumption, investment and interest rates, the real effective exchange rate, government consumption, fiscal deficit and foreign demand. The findings were that changes in fiscal conditions, the real effective exchange rate, government consumption, fiscal deficit, and foreign demand affected the performance of the manufacturing sector.

3.0 Methodology

3.1 Theoretical Framework

The study methodology is anchored on Augmented Solow growth model and the endogenous growth theory. Solow model put emphasize on investment in human capital as the determinant of economic growth. This investment can be achieved through capital formation. Accumulation of capital however depends on interest rate. A reduction of interest rate in an economy triggers inflation which leads to increase in investment since economic agents have capital to buy goods and services. With regard to endogenous growth theory, capital accumulation is important for economic growth but emphasize is placed on technological progress.

3.2 Empirical Model

The study adopts Odior (2013) model to estimate the effect of macroeconomic variables on manufacturing sector in Kenya. Odior (2013) model borrows from Augmented and endogenous growth theories. The adopted model incorporates informal sector GDP to take care of the informal sector which is substantially high in Kenya. Mathematically, the relationship between manufacturing sector and macroeconomic variables is shown in equation 3.1.

$$lnManu_t = \beta_0 + \beta_1 lngdp_t + \beta_2 fdi_t + \beta_3 intrate_t + \beta_4 exchrate_t + \beta_5 lninfl_t + \mu_t \quad \ldots\ldots 3.1$$

Where $lnmanu$ is natural logarithm of monetary value of manufacturing output measured Kenyan shillings , $lngdp$ is natural logarithm of GDP measured Kenyan shillings, fdi is natural logarithm of FDI measured Kenyan shillings, $lnintrate$ is natural logarithm of lending interest rate ,$lnxchrate$is natural logarithm of exchange rate, $lninfl$ is natural logarithm of inflation rate, while β_0 , β_1, β_2 , β_3 , β_4 , and β_5 are parameters. μ is the white noise error term and t is time trend.

3.3 Variable Definition and Data Source

In the empirical analysis, time series data running from 1980 to 2017 was used. The monetary value of the manufacturing output, inflation rate, lending interest rate, exchange rate and FDI were obtained from World Bank data base. GDP was obtained from KNBS economic surveys. The monetary value of the manufacturing output, FDI, GDP are measured in Kenyan shillings. Lending interest rate, inflation rate are measured in percentages while exchange rate is a ratio.

3.4 Diagnostic Tests

Stationarity is key attribute of time series data. Presence of a stationary series avoids the problems of spurious regression and inconsistent estimates (Verbeek, 2004). Presence of a unit root signify presence of a non-stationary series. Equation 3.2 is the starting point in testing for presence of unit root.

$$y_t = \alpha + \rho y_{t-1} + \mu_t \quad \ldots\ldots 3.2$$

Where y_t represent variable whose stationarity status is to be checked, y_{t-1} represent the lag one of the variable of interest while μ_t is error term that is independent and identically distributed. Equation 3.2 can be manipulated further by subtracting y_{t-1} from both sides to give;

$$\Delta y_t = \alpha + \delta y_{t-1} + \mu_t \quad \ldots\ldots 3.3$$

Where $\delta = \rho - 1$ ……..3.4

Dickey fuller test is used to test for presence of a unit root. To test for presence of a unit root, equation 3.2 is estimated the coefficient of the explanatory variable (δ) examined. If it is found to be equal to zero the given variable is said to be non-stationary. If it's negative, then it is said to be stationary (Dickey and Fuller, 1979). The shortcoming of the dickey fuller is that the error term is not serially correlated. If this assumption is violated, then Augmented Dickey Fuller is the most appropriate where lags of the dependent variable shown in equation 3.4 is introduced as explanatory variables as a remedy for serial correlation among the error terms. This is shown in equation 3.5.

$$\Delta y_t = \alpha + \delta y_{t-1} + \sum_{n=1}^{n} \alpha_k \Delta y_{t-k} + \mu_t \quad \ldots\ldots 3.5.$$

Where n in the equation is chosen so that it's large enough to ensure absence of serial dependence of the error term.

Another alternative to ADF test is Phillips-Perron (PP) unit root test. Unlike ADF test which includes lags of the dependent variable as a remedy to the problem of serial correlation, PP test estimate equation 3.3 but use some form of t statistic to correct the problem of serial correlation.

The idea behind the PP test is that it's a non-parametric statistical method which makes it robust in presence of serial correlation (Gujarati, 2003).

The drawback of both ADF and PP unit root tests is that if there is structural break, the two tests tend to bias unit root test in favour of accepting null hypothesis implying presence of unit root. To correct this Zivot-Andrews test is the most preferred.

4.0 Empirical Results and Data Analysis4.1 Descriptive Statistics

Descriptive statistics deals with measures of central location and measures of spread. Table 4.1 shows the descriptive statistics of all the variables considered in the model.

Table 4.1: Descriptive Statistics

Variable	Observation	Mean	Standard Deviation	Minimum	Maximum
Manufacturing output	38	6428.41	1577.86	4207.18	10938.68
Inflation	38	10.55	7.38	0.93	41.99
Interest rate	38	18.40	6.41	10.58	36.24
Exchange rate	38	55.71	30.55	7.42	103.41
GDP	38	1603222	2103506	52589.8	7749426
FDI	38	18989.84	34538.98	7	128817.8

Source: *Author's Computation based on data from various sources*

Table 4.1 shows that a total of 38 observations were considered in the study. Standard deviation shows how the values are spread from their mean and is useful for comparison purposes. For example, the data shows that inflation deviates from the mean of 10.55 by 7.45. The minimum value of inflation within the period of study was 0.93 while the highest is 41.9. Generally, descriptive statistics are important in helping to point out presence of outliers.

4.2 Diagnostic Tests

To ensure validity of the results, the study had to investigate whether assumptions of OLS hold. Among the assumptions of OLS that were investigated include serial correlation, multicollinearity and normality of the error term.

4.2.1 Serial correlation

To test whether there was correlation among the error terms, Breusch Godfrey test was adopted. The test results are as shown in Table 4.2.

Table 4.2: Serial correlation

Breusch-Godfrey LM test for autocorrelation H0: no serial correlation			
lags(p)	Chi2	Degrees of freedom	Prob> chi2
1	0.007	1	0.9315

Source: *Author's Computation based on data from various sources*

From Table 4.2 it was evident that serial correlation was absent since the p-value was insignificant leading to the acceptance of the above null hypothesis.

4.2.2 Multicollinearity

To test for relationship among the variables on the right hand side of the equation, the study adopted a Variance Inflation Factors (VIF) test. Presence of multicollinearity is revealed by a VIF index of greater than 10 (Nachtscheim, 2004). VIF is calculated from the coefficient of determination as shown below.

$$VIF = \frac{1}{1 - R^2}$$

Where; R^2 is the coefficient of determination. The VIF indices are shown in Table 4.3.

Table 4.3: VIF Test for Multicollinearity

Variable	VIF	1/VIF
GDP	3.99	0.25
Echange rate	2.87	0.35
FDI	2.20	0.45
Interest rate	1.63	0.61
Inflation	1.35	0.74
Mean VIF	2.41	

Source: *Author's Computation based on data from various sources*

The variance Inflating factors revealed absence of multicollinearity since all variables considered in the study had a VIF of less than 10.

4.2.3 Normality Test

Shapiro wilk test was used to check for normality of the error term. The results are presented in Table 4.4

Variable	Obs	W	V	z	Prob>z
Res	38	0.97203	1.063	0.128	0.45

The null hypothesis of this test shows that the error term is normally distributed. The P value of 0.45 implies that we do not reject the null hypothesis pointing to presence of a normally distributed error term.

4.3 Stationary Test

Augmented Dickey Fuller (ADF), Phillips Perron (PP) and Zivot-Andrews (Z-A) test were applied on each variable to test for presence of a unit root. The results are illustrated in Tables 4.4 and 4.5.

Table 4.4: Augmented Dickey Fuller and Phillips-Perron Tests

Augmented Dickey Fuller					Phillips-Perron		
		Statistic	Critical value (5%)	Order of Integration	Statistic	Critical value (5%)	Order of Integration
Value of manufacturing output	Level 1st D	-3.247	-2.966	zero	-17.891	-12.884	zero
GDP	Level 1st D 2nd D	8.077 (-2.458) (-9.459)	-2.966 (-2.969) (-2.972)	Two	4.885 (-11.44) (-52.05)	-12.884 (-12.85) (-12.82)	two
Inflation rate	Level 1st D	-4.613	-2.966	Zero	-28.002	-12.884	zero
Lending interest rate	Level 1st D	-1.663 (-5.833)	-2.966 (-2.969)	One	-4.874 (-36.31)	-12.884 (-12.85)	one
Exchange rate	Level 1st D	-0.571 (-5.702)	-2.966 (-2.969)	one	-0.648 (-35.19)	-12.884 (-12.85)	one
FDI	Level 1st D	-1.900 (-6.454)	-2.966 (-2.969)	one	-7.813 (-40.37)	-12.884 (-12.85)	one

Results in Table 4.4 suggest that variables considered in the study are integrated of different orders. The value of manufacturing output and inflation are stationary at levels. Lending interest rate, exchange rate and FDI are integrated of oder 1 while GDP is integrated of order 2. However, due to shortcomings of the above two unit root tests, the study investgated for presence of unit root using Z-A test. The results are shown in Table 4.5.

Table 4.5: Zivot Andrews Unit Root Test

Trend and intercept						
Variables	Year of structural break	Level		First difference (Second difference)		Order of integration
		t-statistics	5% critical value	t-statistics	5% critical value	
Value of manufacturing output	1998	3.680	-4.42	-7.301	-4.42	one
GDP	2008	-2.873	-4.42	-4.866	-4.42	One
Inflation rate	1994	-4.906	-4.42	-	-	zero
Deposit interest rate	1994	-2.633	-4.42	-6.067	-4.42	One
Exchange rate	2000	-2.656	-4.42	-5.698	-4.42	one
FDI	2003	-3.712	-4.42	-5.910	-4.42	One

From Table 4.5, value of manufacturing output is revealed to be integrated of order one when ZA test is used contrary to the first two tests. However, inflation remains to be integrated of order zero in line with both Augmented Dickey Fuller and Phillips Perron. Z-A test reveal presence of structural break for each variable at different periods. According to Murunga (2014), the established structural breaks of most macroeconomic variables in Kenya coincide with identifiable poor and erratic climatic conditions, trade liberalization, economic and political shocks.

4.4 Regression Results and Discussion

Since all the unit root test revealed variables that are integrated of different orders, the study adopted Pesaran ARDL Bounds Test model. This model can be applied regardless of the order of integration among the variables. The model is also the most efficient in small sized data, a common characteristic among the developing countries (Pesaran and Pesaran, 1997). Further, Pesaran ARDL model also yields estimates that are consistent and asymptotically normal (Pesaran

and Shin, 1998). The study therefore adopted ARDL Bounds Test model. The model involves estimation of conditional error correction model (ECM) and use of lag selection criteria to establish ARDL Specification for the short run. Presence of long run relationship between variables imply presence of an error correction representation. The error correction term illustrates the speed at which long run equilibrium is restored once there is short term shock. The general error correction model formulated from equation 2.1 is as shown in equation .3.6.

$$\Delta lnmanu_t = \beta_0 + \sum_{i-1}^{n} \beta_i \Delta \ln(gdp)_t + \sum_{i-1}^{n} \alpha_i \Delta \ln(fdi)_t + \sum_{i-1}^{n} \gamma_i \Delta \ln(ntrate)_t + \sum_{i-1}^{n} \rho_i \Delta \ln(exchrate)_t + \sum_{i-1}^{n} \delta_i \Delta \ln(\mathrm{in}fl)_t + \eta(ECT)_t + \varepsilon_t \dots\dots\dots\dots\dots\dots 3.6$$

Where η measures the speed of adjustment. Having subjected the data to pre-estimation tests, minimum Akaike information Criteria (AIC) was used to determine optimal lag length in estimation of equation 3.6. The results obtained are shown in Table 4.6.

Regression results in Table 4.6 suggest that the explanatory variables considered in the model explain about 85 percent variation in value manufacturing output in Kenya. The coefficient of error correction term (ECT) is negative and statistically significant implying presence of long run relationship among the variables running from the explanatory variables to value manufacturing output. The ECT implies that it takes a period of 3.5 years for long term equilibrium in the value of manufacturing output to be restored when there is a short term shock.

The results revealed that a one percent increase in GDP results to 1.125 units decrease in value of manufacturing output on average holding other factors constant. Its coefficient is statistically significant meaning GDP is an important determinant of the manufacturing output in Kenya. This outcome contradicts Onakoya (2018) study while studying macroeconomic dynamics and manufacturing output in Nigeria. This finding may be true for Kenya given a large size of the informal sector. The country's GDP may be rising but this may be due to smuggling of goods in the country thus negatively affecting manufacturing sector.

Table 4.6: ARDL Bounds Test Regression Results

D.Manufacturing	Coefficient	Standaard Error	T	P value
ECT	-3.495478	.5808834	-6.02	0.001
Long Run				
Lninflation	-457.3221	101.6031	-4.50	0.003
Lninterest rate	3440.804	427.4362	8.05	0.000
Lnexchange rate	501.0673	206.2005	2.43	0.015
lnGDP	-1125.049	349.17	-3.22	0.015
LnFDI	242.431	211.021	1.15	0.288
Short Run				
Manufacturing				
LD.	1.729296	.4301549	4.02	0.005
L2D.	.8727887	.3265285	2.67	0.032
L3D.	.6535358	.3542005	1.85	0.108
Lninflation				
D1.	1946.285	411.9909	4.72	0.002
LD.	984.7898	322.134	3.06	0.018
Lninflation				
D1.	-15273.1	4229.639	-3.61	0.009
LD.	-5534.791	3415.855	-1.62	0.149
L2D.	2432.633	2227.862	1.09	0.311
L3D.	-2935.007	1835.483	-1.60	0.154
Lnexchange rate				
D1.	2875.072	1943.091	1.48	0.183
LD.	366.3546	1952.157	0.19	0.856
L2D.	-6797.101	1967.537	-3.45	0.011
L3D.	-7655.662	2185.289	-3.50	0.010
LnGDP				
D1.	2362.902	6226.916	0.38	0.716
LD.	-1925.687	6278.29	-0.31	0.768
L2D.	-10064.05	4013.89	-2.51	0.041
L3D.	-6835.095	2758.474	-2.48	0.042
LnFDI				
D1.	-896.7069	560.8251	-1.60	0.154
LD.	-634.3782	362.2838	-1.75	0.123
L2D.	-321.5437	183.3566	-1.75	0.123
Constant	34306.75	11018.17	3.11	0.017
$^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$				
R-squared = 0.9672				
Adj R-squared = 0.8452				
Sample Size : 1984-2017				

This study finds that in Kenya inflation negatively affect manufacturing sector in the long run. The coefficient of inflation is statically significant implying inflation is important determinant of manufacturing sector in Kenya. This finding is in agreement to that Nwakoby and Uchenna (2015) while investigating the influence of finance and macroeconomic variables on manufacturing capacity utilization in Nigeria.

This study reveals a positive relationship between interest rate and manufacturing sector in Kenya in the long run. The coefficient of interest rate is significant implying interest rate is important in influencing manufacturing sector in Kenya. This finding contradicts economic theory which shows that increase in lending interest rate discourages borrowing of loans thus leading to a fall in manufacturing sector output. The study finding contradicts a study by Nwakoby and Uchenna (2015).

This study finds that in Kenya, the high exchange rate although positive, its coefficient is statistically significant. This means exchange rate influence the manufacturing sectoral growth. The result of this study is in line with the Keynesian absorption approach which postulates that currency devaluation increases exports and reduces imports. The finding is also in line with a study by Onakoya (2018). Lastly, the study finds that in Kenya, FDI although positive, is not statistically significant in influencing the manufacturing sectoral growth.

4.5 Conclusion

From the findings of the study it's revealed that movements in the value of manufacturing sector of the Kenyan economy are explained partly, by its own shocks as well as by variations in GDP, exchange rate and interest rate. Upward movements in GDP and inflation contract manufacturing sector while upward movement in interest rate expands the manufacturing sector. A major implication of the findings is that the value of manufacturing sector output in the Kenya is very sensitive to input prices as determined by variations in exchange rate. In addition, growth in Kenya's GDP shrinks its manufacturing sector.

4.6 Recommendations

Based on the findings of this study, it is strongly recommended that the Kenyan government should take drastic economic measures to stabilize the flow of foreign exchange. In this regard, government should diversify the revenue base of the economy, provide incentives to encourage the consumption of locally produced goods, ensure that the proceeds of corrupt practices are not domiciled in foreign accounts, achieve prudent management of national financial resources as well as borrowings from abroad, initiate policies to minimize capital flight through repatriation of earnings or outright withdrawal by foreign interests, etc.

Government should also pursue policies and programmes aimed at controlling the undergroung economy. Country's GDP may be growing but individuals could be involved in smuggling of

cheap Kenya's manufactruring sector substitutes. Such policies may include improvement of cross-sectoral cooperation involving customs, national police, Kenya Defence Forces.

References

Abor, J., & Quartey, P. (2010). Issues in SME development in Ghana and South Africa. *International research journal of finance and economics*, *39*(6): 215-228.

Alao R. O. (2010), 'Productivity in the Nigerian Manufacturing Sub-Sector Error Correction Model (ECM*) European Journal of Economics, Finance and Administrative Sciences* ISSN 1450-2275 Issue 20.

Enekwe, C. I., Ordu, M. M., & Nwoha, C. (2013). Effect of exchange rate fluctuations on manufacturing sector in Nigeria. European Journal of Business and Management, 5(22): 67-73.

Eze, Onyekachi Richard and Ogiji, Festus O. (2013), Impact of Fiscal Policy on the Manufacturing Sector Output in Nigeria: An Error Correction Analysis, International Journal of Business and Management Review, Vol. 1, No. 3, pp. 35 – 55.

Imoughele, L. E. and Ismaila, M. (2014). Investigating the Performance of Monetary Policy on Manufacturing Sector in Nigeria. Arabian Journal of Business and Management Review, 2(1): 1 – 20

Kianian, B., Tavassoli, S., & Larsson, T. C. (2015). The Role of Additive Manufacturing Technology in job creation: an exploratory case study of suppliers of Additive Manufacturing in Sweden. *Procedia CIRP*, *26*: 93-98.

McKinnon, R.I. (1973), Money and Capital in Economic Development Washington D.C, The Brookings Institute.

Murunga, J. (2014). An empirical investigation of factors influencing tax effort in Kenya. MA Research Paper.

Nachtscheim, C.J. and Neter, J. (2004). Applied Linear Regression Models, 4th edition. Boston: McGraw-Hill Irwin.

Nicholson, W., & Snyder, C. M. (2012). Microeconomic theory: Basic principles and extensions. Nelson Education.

Odhiambo, W. (1991). The Manufacturing Sector in Kenya. An Empirical Analysis. Unpublished University of NNairobi MA Research Project.

Odior, E. S. (n.d.). *Macroeconomic Variables and the Productivity of the Manufacturing Sector in Nigeria: A Static Analysis Approach*. *1*, 19.

Pesaran, M.H; Shin, Y. and Smith, R.J. (2001): "Bounds Testing Approaches to the Analysis of level relationships." *Journal of Applied Econometrics,* 16: 289-326.

Pesaran, M. H., & Pesaran, B. (1997). Interactive econometric analysis. Oxford University Press.

Republic of Kenya (2018). Economic Survey, Kenya National Bureau of Statistics, Nairobi: Government Printer.

Republic of Kenya (2013). Economic Survey, Kenya National Bureau of Statistics, Nairobi: Government Printer.

Shaw E. (1973), "Financial Deepening In Economic Development", Oxford University Press London.

Schatz, S.P. (1964), 'Development Bank Lending," The Federal Loan Board, Oxford University Press Ibadan.

Solow, R. M. (1956). A Contribution to the Theory of Economic Growth. Quarterly Journal of Economics, No. 70. Pp 65 94

Tkalec, M. and Vizek, M. (2009). The Impact of Macroeconomic Policies on Manufacturing Production in Croatia. Privredna kretanja i ekonomska politika 121/2009.

Todaro, M. P., & Smith, S. C. (2012). Economic Development. Boston: Addison Wesley.

Determinants of tax compliance by small and medium businesses in Embu County, Kenya

Kariuki, Samuel Nduati [a*] and Zachary, John Mukundi Njeru[b]

a and b, University of Embu, P.O. Box 6, 60100 Embu

Corresponding author's email contact: kariuki.samuel@embuni.ac.ke

Abstract

Small and medium enterprises are a key engine of economic growth in both developing and developed countries. Small and medium businesses being profit making institutions are expected to pay taxes to the government. Therefore, tax compliance is critical in all economies which recognize the role played by revenue collected from tax in national development. Nonetheless, developing countries are dominated by low tax compliance levels, in the face of the frequent appeal from tax collectors for voluntary compliance. As a result, identification of tax evasion approaches and ways to diminish it is one of the central aims of many governments' agenda with the view of achieving higher levels of compliance. As such, many governments have embraced administrative measures such as fines, penalties, rates and tax audits to enforce tax compliance. Interestingly, despite the phenomenal growth of small and medium businesses, the tax collection from the sector is still low. This study therefore, sought to establish the determinants of tax compliance among small and medium businesses in Embu County, Kenya. The study sampled 185 enterprises in Embu County using stratified random technique. The findings show that fines and penalties, tax compliance costs and tax knowledge and education significantly influence tax compliance among small and medium businesses in Embu County. The study recommends that the Kenya Revenue Authority should prepare education and training programs to ensure that small and medium businesses embrace voluntary compliance with all the tax requirements. Further, the study recommends that Kenya Revenue Authority should also evolve policies to decrease tax compliance cost incurred by small and medium businesses to avoid curtailing their growth potential and inspire voluntary tax compliance.

Keywords: tax, tax compliance, tax payment, tax collectors, tax audits, tax penalties

Introduction

In spite of branding SMEs as the engine of growth in many developing countries, the small and medium scale sector still remain fluid as there is no concrete regulatory policy in place to monitor its activities thereby making it almost difficult to tax if not difficult to tax (Antwi,

Inusah,& Hamza, 2015). SMEs are less tax compliant in comparison to large businesses and are considered the hard to tax group from the informal sector (Akinboade, 2015). Many SMEs either deliberately evade tax payment or are not captured by the net of the revenue authority (Antwi *et al.*, 2015). Moreover, greatest number of SME fail to willingly enlist with tax authorities, whereas the few which list regularly miss to maintain sufficient records, file tax returns, and honour tax obligations punctually (Terkper, 2003). In diverse studies carried by Nahida *et al.* (2014); Osebe (2013); Chebusit *et al.* (2014); Tusubira and Nkote (2013), several factors have been hypothesized to influence tax compliance by SMEs.

These factors include tax compliance costs, fines and penalties, tax knowledge and the tax system. A tax compliance cost is expenditure incurred by a firm in conforming to government's tax legislation requirements (Nahida *et al.*, 2014). For individuals, these costs would include the financial and time costs of acquiring fiscal knowledge to meet their legal obligations; the costs in the form of time lost in filing up the tax returns, obtaining, filing and storing the data to facilitate the completion of returns (Chattopadhyay & Das-Gupta, 2002).

Fines and penalties act as tax deterrence sanctions, which many governments have adopted as tax compliance administrative measures (Tusubira & Nkote, 2013). The goal of fines and penalties is to foster voluntary tax compliance hence efficient tax administration (Palil, Akir & Ahmad, 2013). The economic deterrence serves as the theoretical foundation, which support the imposition of fines and penalties (Ali, Fjeldstad & Sjursen, 2013).) Similarly, punishment and sanctions influence individuals' tax compliance behavior. For instance, Sapiei, Kasipillai and Eze, (2014) observe that an upsurge in the proportion of penalty charged and a larger likelihood of detection reduces the level of non-compliance.

Tax knowledge could be one of the important factors influencing individual's tax attitudes. Importance of this issue stems from the fact that tax law is generally considered as difficult, complicated and beyond one's depth (Kołodziej, 2012). Consequently, taxpayers appropriately assess their tax obligation and submit tax returns promptly (Palil *et al.*, 2013). By means of taxpayer education and taxpayer service, citizens can be informed and educated about the tax system and be assisted in their attempts to comply with the tax system (International Tax Compact, 2010).

The tax system comprises of the laws, rules and regulations guiding the collection, administration of taxes in a particular country (Lumumba *et al.*, 2010). Tax laws become complex because of the complexity of the underlying tax base, deductions and concessions, since simple tax systems cannot cater for special cases (Chattopadhyay & Das-Gupta, 2002). The tax laws in many developing countries are amended regularly quickly hence creating uncertainty and little transparency of the tax code. Consequently, complex tax regulation and continuing alterations of the tax code complicate taxpayers and tax administrators similarly (ITC, 2010).

1.3 General Objective

The study sought to establish the determinants of tax compliance by Small and Medium Enterprises in Embu County, Kenya

1.3.1 Research Questions

The following were the research questions of the study:

What is the influence of tax compliance costs have on tax compliance by SMEs in Embu County, Kenya?

How do fines and penalties influence tax compliance by SMEs in Embu County, Kenya?

What is the effect of tax knowledge and education on tax compliance by SMEs in Embu County, Kenya?

How does tax system affect tax compliance by SMEs in Embu County, Kenya?

2.1 Theoretical review

2.1.1 Fiscal Exchange Theory

The main proposition of the fiscal exchange approach is that bargaining over taxes is central to building relations of accountability between state and society grounded on shared rights and duties, instead of compulsion and patronage (Cobham, 2005). Accordingly, based on the theory taxpayers compliance behavior is presumed to be influenced by satisfaction or lack of satisfaction with terms of trade with the government (Ali *et al.*, 2013). Torgler (2007) also posited that taxpayers' willingness to cooperate with the tax authority increases, if the authority sees itself as a service institution, provides quality services, and treats the taxpayers as partners. Further, Organization for Economic Co-operation and Development (2007) emphasized that the delivery of quality services to taxpayers will strengthen their willingness to comply with tax rules and regulations voluntarily and, as a result will contribute to the overall level of tax compliance.

2.1.2 Social Psychology Theory

The social-psychology theory postulates that tax compliance by taxpayers depends on psychological factors. By and large, the theory underscores taxpayers' morals and ethics determine tax compliance level regardless of the likelihood of detection (Atawodi & Ojeka, 2012). Atawodi and Ojeka (2012) further stress that the theory's main focus is the taxpayers' morals and ethics. A common proposition is that individuals form their behavioral intentions on the bases of two basic determinants – personal factors and social influences (McKerchar & Evans, 2009). Personal norms reflect the taxpayers' values, tax ethics, tax mentality, and tax morale,

all of which influences attitudes towards tax compliance (Fjeldstad *et al.*, 2012). The proponents of social-psychology theory argue tax compliance behavior is determined by social interactions. Compliance behaviour and attitudes towards the tax system is therefore affected by the behaviour of an individual taxpayer network of friends, neighbors and relatives (Loureiro, 2014).

3.0 Methodology

3.2 Research Design

The study employed a quantitative cross-sectional study design.

3.3 Target Population and Sampling

The target population comprised of 615 SMEs in Embu County. The study sampled 185 enterprises in Embu County using stratified random technique.

3.5 Data Collection Instrument

This study collected primary data using a questionnaire which had both open and close-ended questions. Secondary data was collected using a survey sheet.

3.6 Data Collection Procedure

Primary data was collected using questionnaires. The questionnaires were dropped to the sampled respondents and then picked after two days. The drop and pick method was considered suitable since it gave the respondents adequate time to discuss, understand and respond to the questions therein. Secondary data on tax compliance amongst SMEs on the other hand, was gathered from research reports, KRA revenue reports, Embu County records and reports.

3.7 Pretesting

Pretesting was conducted to ensure that all kinds of errors, which may range from questionnaire construction, ambiguity of words, misinterpretation of questions by respondents, inability to answer a question, presence of sensitive questions in the questionnaire were reduced. This improves the quality of data significantly. Participants for pretesting were selected from a small sample of respondents from the target population, where the feedback by the selected respondents was used to improve the questionnaire.

3.7.1 Validity

To ensure the instruments validity, a draft questionnaire was developed and the views of experts.

3.7.2 Reliability

The study used the Cronbach alpha coefficient to establish the reliability of the study instrument. The study yielded a Cronbach alpha coefficient of 0.845, which was considered appropriate for the study since it was above the recommended alpha value 0.7.

3.8 Data Analysis

Binary logistic regression model was used to determine the link between the dependent and the independent variables. The binary logistic regression model took the following form

$$f(z) = \frac{1}{1+e^{-z}} = \frac{1}{1+\ e^{-(\alpha+\sum\beta_1 X_1)}} = \ for\ i\ ranging\ from\ 1\ to\ n$$

Equation 3.1

Where;

$P(z) = f(z)$ is the probability of tax compliance where 1 indicates compliance; 0 otherwise; Z, random variable that can take on one of two possible values; α represents a constant; e represents Euler's number; β represents estimated coefficients and Xi 's represents independent variables.

Research Findings and Discussions

The findings indicated that 69.8% of the SMEs in Embu County were tax compliant. The study results further reveal that the logistic regression model was statistically significant explaining 36.1% of the tax compliance. Table 1 presents the coefficients of various determinants of tax compliance in the regression equation. From the regression coefficient results in table 1 it can be seen that compliance costs (p = 0.0125), fines and penalties (p = 0.0089), tax knowledge and skills (p = 0.0460) shows a significant positive relationship with tax compliance among SMEs in Embu County. In contrast, tax systems (p = 0.295) had an insignificant positive relationship with the tax compliance among SMEs in Embu County. The table also indicates compliance costs have the highest effect on tax compliance (Exp(B)=1.1265) followed by tax knowledge and skills (Exp(B)=1.155) then tax systems (Exp(B)=1.147) with fines and penalties trailing in the list (Exp(B)=0.996).

Table 1: Model coefficients of determinants

	B	S.E.	Wald	Sig.	Exp(B)
Compliance costs	.535	.153	2.356	.0125	1.265
Fines and penalties	-.904	.280	.000	.0089	.996
Tax knowledge and skills	.144	.024	.339	.0460	1.155
Tax system	.137	.131	1.095	.295	1.147
Constant	-2.350	1.058	4.933	.026	.095

Conclusions and Recommendations

The study also found that fines and penalties foster voluntary tax compliance by SMEs and that increase in the penalty rates and the probability of detection result in lower non-compliance. The study found a significant relationship between fines and penalties and tax compliance by SMEs. Thus, the study recommends that the Kenyan tax authority and the government should carry out continuous training on taxation to ensure that SMEs operators can comply with all tax requirements.

The binary logit regression results show a significant positive relationship between tax knowledge and education tax compliance by SMEs. Most SMEs operators do not have formal taxation training or education hence they do not have good tax knowledge and education. The study found that continuous training can provide good and reasonable tax knowledge and that lack of a combination of tax skills hinders SMEs from complying with various taxes and that taxation knowledge enhances SMEs ability to understand tax laws. This finding concurs with that of Mutascu and Danuletiu (2013) observation that a very low tax literacy level is associated with reduced tax revenues.

It was established that the most paid taxes by SMEs are county government levies and VAT and that the Kenyan tax system was complex to most SMEs operators and one would require training and education to understand the system. The study also found that use of technology, online tax filing makes tax compliance more complicated to SME operators and high tax rates and fixed tax payment dates increase the chances of non-compliance by SMEs. The regression results indicate an insignificant association among the tax system and tax compliance by SMEs.

However, the conclusion was based on the fact that most SMEs in Embu county were not fined or charged for tax non-compliance. Therefore, this study recommends that the Kenyan tax authority should enforce it compliance department and charge all the non-compliance fines and penalties to SMEs in Embu County as this would deter them from non-compliance. Finally, the study concluded that there was no significant relationship between tax system and tax compliance by SMEs in Embu County. The conclusion was based on the fact that most SME operators had a little understanding of the Kenyan tax system. Therefore, the study recommends that the Kenyan tax authority should develop education and training programs to ensure that SME operators comply with all the tax requirements.

REFERENCES

Akinboade, O. A. (2015). Correlates of Tax Compliance of Small and Medium Size Businesses in Cameroon. *Managing Global Transitions, 13* (4), 389–413.

Ali, M., Fjeldstad, O., & Sjursen, O. I. (2013). To Pay or Not To Pay? Citizens' Attitudes towards Taxation in Kenya, Tanzania, Uganda and South Africa. *Working Paper No. 143.*Afrobarometer Working Papers.

Atawodi, O. W., & Ojeka, S. A. (2012). Factors That Affect Tax Compliance among Small and Medium Enterprises (SMEs) in North Central Nigeria. *International Journal of Business and Management, 7*(12), 87- 96.

Chattopadhyay, S. & Das-Gupta, A. (2002) The Compliance Cost of the Personal Income Tax and Its Determinants. *Report to the National Institute of Public Finance and Policy*, New Delhi.

Chebusit, C., Namusonge, G. S., Biraori, O. E., & Kipkoech, E. C. (2014). Factors Affecting Tax Compliance among Small and Medium Enterprises in Kitale Town Trans-Nzoia County, Kenya. *International Journal of Recent Research in Commerce Economics and Management, 1*(3), 60-75

Cobham, A. (2005). Tax Evasion, Tax Avoidance and Development Finance: QEH Working Paper 129. (Online). Available at http://www.qeh.ox ac.uk.

Fjeldstad, O., Herzenberg, C. S. & Sjursen, I. H. (2012). Peoples' Views of Taxation in Africa: A Review of Research on Determinants of Tax Compliance. *CMI Working Paper 2012:7.* International Centre for Tax and Development.

International Tax Compact. (2010). Addressing Tax Evasion and Tax Avoidance in Developing Countries. Eschborn, International Tax Compact.

International Tax Dialogue. (2007). Taxation of Small and Medium Enterprises, Background paper for the International Tax Dialogue Conference, Bueons Aires.

Loureiro, J. N. (2014). Behavioural Economics and Tax Compliance: The Role of Identifiability, Geographical Distance and Social Norms on Tax Compliance: An Experimental Study. *Dissertation Proposal*. University of Porto, Portugal.

Lumumba, O. M., Wanjoli, M. S., Maguta, P. O. & Mokoro, J. M. (2010): Taxpayers' attitudes and tax compliance behavior in Kenya: How the taxpayers' attitudes influence compliance behavior among SMEs Business income earners in Kerugoya Town, Kirinyaga District. *African Journal of Business and Management*, 1.

McKerchar, M. & Evans C. (2009). Sustaining Growth in Developing Economies through Improved Taxpayer Compliance: Challenges for Policy Makers and Revenue Authorities. *e-Journal of Tax Research,* 7, 171–201.

Mutascu, M. &Danuletiu, D. (2013). The Literacy Impact on Tax Revenues. Economics Discussion Papers, No 2013-63, Kiel Institute for the World Economy. http://www.economics-ejournal.org/economics/discussionpapers/2013-63

Nahida, F., Copp. R., Freudenberg, B. & Sarker, T. (2014). Complexity, Compliance Costs and Non-Compliance with VAT by Small and Medium Enterprises (SMEs) in Bangladesh: Is there a Relationship? Griffith University.

Osebe R. P. (2013). An Analysis of Factors Affecting Tax Compliance in the Real Estate Sector in Kenya: A Case Study of Real Estate Owners in Nakuru Town. *Unpublished Project* Report. Kabarak University, Kenya.

Palil, M. R., Akir, M. R. & Ahmad, W. F. (2013). The Perception of Tax Payers on Tax Knowledge and Tax Education with Level of Tax Compliance: A Study the Influences of Religiosity. *ASEAN Journal of Economics, Management and Accounting, 1*(1), 118-129.

Torgler, B. (2007). Tax Morale, Trust and Corruption: Empirical Evidence from Transition Countries. *Working Paper No. 2004 – 05.* Center for Research in Economics, Management and the Arts.

Tusubira, F. N. & Nkote, I. N. (2013). Income Tax Compliance among SMEs in Uganda: Taxpayers' Proficiencies Perspective. *International Journal of Business and Social Science, 4*(11), 133-143.

Effect Of Risk Retention Techniques On Theft In Saccos In Embu County, Kenya

Kariuki, Samuel. N.[A*] And Mutugi, John.[B]

a and b, University of Embu, P.O. Box 6, 60100 Embu

Corresponding author's email contact: kariuki.samuel@embuni.ac.ke

Abstract

Majority of Kenyans receive financial services from SACCO's. As a result, there is a need then to ensure that personal and SACCO properties are fully protected from theft. To guarantee this protection, SACCO's have adopted risk retention techniques aimed at reducing the severity of theft incidences. Unfortunately theft in SACCO's has become a common problem with statistics showing that theft stands at 61% compared to other crimes in Kenya. The study sought to determine the effect of risk retention techniques on theft in SACCO's in Embu County, Kenya. The study adopted a descriptive research design. The target population of the study comprised of the 65 SACCOs in Embu County, Kenya that were operationally active. Data was collected using questionnaires. Validity of the research instruments was ensured through opinions and expert judgments. A pre-test study was done in Sacco's operating in Tharaka Nithi County and reliability of the instruments tested using split half technique. The pre-test results yielded a correlation coefficient of 0.766 implying the instrument was good. Data was analyzed using frequencies and percentages and the results presented in cross tabulations. Chi-square was used to test the hypothesis. The results revealed that most SACCO's had adopted various techniques aimed at reducing theft severity. The results further revealed that there was a significant association of risk retention technique with theft in SACCO's since results obtained had a p-value of 0.046<0.05 and chi-square value of 20.00 at 5% significance level. The study forms a basis of policy formulation on risk retention and theft matters in SACCO's in Kenya and provides a basis for further research in the field of retention techniques on theft in SACCO's cooperatives.

Keywords: Risk, Loss, Risk Retention, Captive, Risk Transfer

INTRODUCTION

Theft is a worldwide phenomenon that appears to have defied efforts to contain it across the globe. Theft causes damage and fear that affects the life and well-being of people. Theft in Sacco's is common with property and patients falling victim. The scale of theft to personal possessions and property going missing in Sacco's is depressing, and losses run into millions every year (Ministry of Health Report, 2014). When theft occurs it disrupts co-existence and results to poor delivery of health services (Kimama, 2011). Theft is a threat to people's health, government budget, revenues and competition within legal industries (Lindstrom, 2007). Ignoring theft will not make the risk to go away but limits institutions from achieving their set objectives. Risk

retention techniques are recommended by Fischer & Green (2004) as the preferred risk financing method when the loss values are relatively low .This implies that the consequences of a loss will be borne by the party exposed to the chance of loss, often a deliberate risk management decision (Dorfman, 2005).

Organization assume risk when loss cost are small and can be funded from the current cash flow, Loss exposure are retained and funded with a cash reserve. An important advantage of using retention is that it encourages institution to adopt loss prevention projects, thus reducing the total cost of risk. It's important to note that risk retention techniques ensures there is continuity in organization operations. Kallman (2009) observes that to set up a reserve, institutions places an appropriate amount usually the expected value of loss plus a certain multiple of the standard deviation on the right-hand side of the managerial balance sheet. With an unfunded reserve the claim can be paid for by liquidating any of its assets. Many institutions also have a special fund set aside to pay for small cost or claims (current expense funds). The expense of these losses is taken as a tax-deductible expense on the income statement and the system is known as current expensing (Peshawar, 2014). Other retention techniques utilized to cope with risk include borrowing and maintaining captives.

The story of the savings and credit co-operative movement in Kenya is of unique social and economic interest. It has at its core, the message of inspiration and emancipation of the individual economic wellbeing, community development and strengthening the fundamental economic foundations of the country Kobia (2001). While most of the principles, ideas and values of the co-operative enterprise have remained unchanged over the decades, new technological and corporate challenges are demanding a paradigm shift out of sheer necessity. The co-operative business model and structure has not changed much, but the content and social dynamics are changing fast. The Kenyan SACCO experience is marching towards maturing, calling for any urgent need to provide the literate and development to reflect this growth and aspirations. In Kenya, different types of co-operative societies are in existence. There are categorized as follows, agricultural and marketing co-operatives, consumer co-operatives, housing co-operatives, savings and credit co-operatives, service co-operatives and multipurpose co-operatives Ouma (1987).

A SACCO is a co-operative society, whose objective is to encourage its members to save, thereby creating or accumulating capital, which can then be lent to members at a reasonable rate of interest Davis and Donaldson (1998). As a source of credit facilities, these co-operatives have generally achieved their objectives. Access to credit is undoubtedly a major incentive to save. The introduction of thrift and savings co-operatives, were initiated late in the 1950"s and a few such co-operatives were then formed. Since the introduction of SACCOs based on employment

as a common bond and allowing for a check off systems, SACCOs have made a breakthrough and succeeded in a big way. It is in this way (check off) that regular savings are accumulated and it is from this that loans are given. The Motto for success in SACCOs is "save regularly, borrow wisely and repay promptly".

The government of Kenya recognized the growing threat of theft in SACCOss in early 2014 after ation of a national wide information report by the Kenya police which stated that 73% of theft incidents were reported institutions, followed by city street theft at 20%. Although adoption of risk retention techniques is on the rise, institutions are experiencing complex theft risks with leading to loss of millions and this is threatening the safety environment in those institution. The risk retention techniques are designed to detect, prevent, and identify theft thereby minimizing the risk and loss to an organization. They are expected to offer a safe environment for employees, customers, visitors and property. However risk retention tools can be in an organization but be not effective when they are not properly developed and administered. For this reason, the researcher therefore sought to evaluate the effect of risk retention techniques on theft in Saccos.

Specific objective of the study

To establish the association of risk retention techniques with theft in SACCOs in Embu County,

Hypothesis of the study

The study was guided by the following hypothesis which was tested at 0.05 level of significance.

H_o1: Risk retention techniques have no significant association with theft in SACCOs in Embu County.

Assumptions of the Study

This study assumed that the respondents were open and sincere with the information they gave and that the information was correct and free of bias. The study also assumed that all the sampled Sacco's had adopted similar risk retention techniques.

METHODS

Research Design

Research design refers to a set of decisions that make up the master plan indicating methods and procedures for collecting and analyzing needed information (Kothari, 2004). This study employed a descriptive research design that described the state of affairs at the time of data collection. It involved assessing attitudes or opinions and thoughts about effectiveness of risk control techniques on theft severity and frequency. The research design was able to reveal and measure the strength of the target group's opinion, attitude, and behavior with regards to theft in Saccos.

Location of the Study

This study was carried out in Embu County which is on the eastern slopes of Mount Kenya. The choice of Embu County was because its easily accessible to the researcher and that the researcher is able to create rapport with the respondents. An ideal location of any study should be easily accessible to the researcher and should be that which permits rapport with the informants (Singleton, 2003).

Population of the Study

All items of interest in an inquiry constitute a population (Kothari, 2004). This study targets a population of 65 Sacco's in Embu County. A complete census was done on the entire population

Data Collection

An introduction letter and research permit were obtained from the National commission for science, technology and innovation to enable the researcher disclose his motives The researcher explained the nature of the study to the respondents and will point out was expected of them. The researcher assured them of the confidentiality in handling the information provided. Primary data was collected through questionnaires which were distributed to the respondents by the researcher and filled questionnaires were collected two weeks after. Data was collected from the senior staff who were believed to be policy makers and from junior staff who implemented those policies.

Data Analysis and Presentation

Data analysis is the process of systematically arranging filed notes, data and other materials obtained from the field with the aim of increasing one's own understanding and to enable one to present them to others (Orodho, 2013).Data was cleaned by being checked for logical consistency and any unnecessary data removed. It was then refined and processed using

statistical package for social sciences (SPSS) version 23 for windows. Martin and Acuna (2002) observe, SPSS is able to handle large amount of data given its wide spectrum of statistical procedures purposefully designed for social sciences, it is also quite efficient. Quantitative analysis that entailed analyzing numbers about a situation by choosing specific aspects of that situation was used. The results of data analysis have been presented in frequency tables and percentages. Chi-square test was used to show the association between variables and test hypothesis. A 5% level of significance was considered.

RESULTS AND DISCUSSION

Adoption of Risk Retention Techniques by Sacco's

The risk control techniques in a sacco are responsible for protection against all manner of risk through reducing the risk frequency and its severity if it occurs. Thus, they are responsible for ensuring a safe environment to the sacco and the people. This study sought to find out the risk retention techniques adopted by Sacco's in Embu County. Descriptive statistics of frequencies and percentages were used to analyse the data.

Table 1: Senior staff response on adoption of risk retention techniques

Adoption of risk control techniques	Fully adopted		Partially adopted		Not adopted		Mean	Standard deviation
	F	%	F	%	F	%		
Reserves	30	20.3	81	54.7	37	25.0	2.0473	.67345
Captives	15	10.1	17	11.5	116	78.4	2.6824	.64983
Current expensing	44	29.7	84	56.8	20	13.5	1.8378	.63945
Borrowing	40	27.0	94	63.0	14	9.5	1.4595	.66372

The results further indicated that risk retention techniques were partially adopted with majority of the senior staffs (66.7%) current expensing and (82.4%) reserves indicating that minor losses could not be taken care by the Sacco's independently.

Table 2: Junior staff response on adoption of risk retention techniques

The junior staff indicated that risk retention techniques were partially adopted represented by a majority (63.0%) borrowing, (56.8%) current expensing and (54.7%) reserves. Senior staff response on adoption of the risk control techniques was similar to that of the junior staff hence

these results indicated a true account of risk control techniques adoption in Sacco's .

Employment of Risk Control Techniques by Sacco's

The possibility and outcome of any theft incident is highly dependent on the nature of risk control techniques present in an institution. The 2004 edition of American national standards report indicates that effective employment of risk prevention; retention and transfer techniques

Adoption of risk retention technique	Fully adopted		Partially adopted		Not Adopted		Mean	Standard deviation
	F	%	F	%	F	%		
Reserves	10	19.6	32	62.7	9	17.6	1.9804	.6161
Captives	12	23.5	10	19.6	29	56.9	2.3725	.7990
Current expensing	14	27.5	34	66.7	3	5.9	1.7843	.5408
Borrowing	15	29.4	29	56.9	7	13.7	1.8431	.6441

will address the protection, mitigation, preparedness, response and recovery from theft incidents. This study therefore sought to find out the level of employment of risk retention techniques by Sacco's. Data gathered was analysed using percentages and the results presented in closed tabulations by table 3 for junior staff and table 4 for senior staff.

Table 3: Junior staff response on level of employment of risk retention techniques

Employment risk retention technique	Very low Low	low	Moderate	high	very high	mean	standard deviation
	%	%	%	%	%		
Reserves	21.6	31.1	25.0	20.3	2.0	2.5608	1.1018
Captives	54.1	16.2	12.1	11.5	6.1	1.9932	1.2962
Current expensing	27.0	44.6	18.9	8.1	1.4	1.9932	1.2962
Borrowing	18.9	28.4	25.7	24.3	2.7	2.4730	1.2146

Most of the junior staff indicated that risk retention techniques were also not fully employed indicated by a majority (31.1%) reserves, (44.6%) current expensing and (28.4%) borrowing. Captives were rated very low by a majority 54.1% of the junior staffs.

Table 4; Senior staff response on level of employment of risk retention techniques

Employment of risk retention techniques	Very low Low	low	moderate	high	very high	mean	standard deviation
	%	%	%	%	%		
Reserves	9.8	27.5	23.5	31.4	7.8	2.4706	1.1891
Captives	23.5	31.4	17.6	13.7	13.7	2.8235	1.2760
Current expensing	31.4	19.6	13.7	15.7	19.6	3.0784	1.3090
Borrowing	13.7	43.1	3.9	33.3	5.9	3.2353	.9074

Majority of the senior staff also indicated that Sacco's lacked the capacity to retain theft risks indicated by majority (43.1%) borrowing and (31.4%) current expensing who felt Sacco's had low employment of risk retention techniques. The senior staff responses were similar to those of the junior staff.

Effectiveness of Risk Retention Techniques

Young (2014) in his research on security risk noted that most organizations including Sacco's already have risk retention techniques that aim to minimize the destruction of property and loss of life. However, these risk retention techniques can be in an organization but also may not be effective. It's for this reason that this study sought to find the effectiveness of risk control techniques in reducing theft frequency and severity. Descriptive statistics of frequencies and percentages were used to analyse the data collected and the results presented in tables 5 for senior staff and table 6 for junior staffs.

Table 5: Senior staff response on effectiveness of risk retention techniques

Effectiveness of risk retention techniques	Very effective		Fairly effective		Not effective		Mean	Standard deviation
	F	%	F	%	F	%		
Reserves	9	17.6	14	27.5	28	54.9	1.6275	.7735
Captives	12	23.5	14	27.5	25	49.0	2.2549	.8208
Current expensing	11	21.6	12	23.5	28	54.9	2.2549	.8208
Borrowing	28	54.9	12	23.5	11	21.6	1.6667	.8165

Risk retention techniques were also rated not effective by a majority (54.9%) current expensing, (54.9%) reserves and a 49.0% captives. Borrowing was considered to be the most effective risk retention technique in reducing theft severity by a majority 54.9 %. Responses from the senior staffs were considered to be more reliable therefore it was concluded that risk retention techniques were not effective in reducing theft severity therefore the working environment was not conducive for coexistence.

Table 6: Junior staff response on effectiveness of risk retention techniques

Effectiveness of risk retention technique	very effective		Fairly effective		Not effective		Mean	Standard deviation
	F	%	F	%	F	%		
Reserves	28	18.9	48	32.4	72	48.6	2.2973	.7689
Captives	8	5.4	20	13.5	120	81.1	2.7568	.5423
Current expensing	32	21.6	49	33.1	67	45.3	2.2365	.7856
Borrowing	30	20.3	40	27.0	78	52.7	2.3243	.7929

Risk retention techniques were rated not effective in minimizing theft severity as indicated by majority (48.6%) reserves, (81.1%) captives and (52.7%) borrowing. Findings from the junior staff were similar when compared to those of senior staff indicating Sacco's need to review their implementation levels if effectiveness of risk retention techniques has to be improved.

Severity of Theft in Sacco's

Most Sacco's learn how to respond to theft incidents only after suffering severe attacks that result to significant losses. Risk retention and risk transfer techniques are meant to reduce severity of losses. When theft severity is high, risk retention and transfer techniques are considered not effective and vice versa is true. This study therefore sought to determine the severity of theft incidents in Sacco's. Descriptive statistics of frequencies and percentages were used to analyse the data and results presented in table 7 for senior staff and table 8 for junior staff

Table 7: Senior staff responses on theft severity

Theft Severity	very severe		Severe		not severe		No incident		Mean	Standard deviation
	F	%	F	%	F	%	F	%		
Burglary	12	23.5	24	47.1	10	19.6	5	9.8	1.9216	1.0362
Larceny	18	35.3	19	37.1	11	21.6	3	5.9	2.2549	.8681
Shoplifting	3	5.9	20	39.2	26	51.0	2	3.9	1.6275	.7735
Medical identity theft	18	25.3	22	43.1	10	19.6	1	2.0	1.8824	.7911
Robbery	12	23.5	28	54.9	8	15.7	3	5.9	1.7255	.9397

From the findings in table 15, theft severity was rated to be highly severe. This is because most of the senior staff (47.1%) burglary, (37.1%) larceny, (43.1%) medical identity theft and robbery (54.9%) indicated that when theft occurred it resulted to severe losses. Severity of shoplifting was classified not severe by a majority 51.0%.

Table 8: Junior staff response on theft severity

Theft severity	very severe		Severe		not severe		no incident		Mean	Standard deviation
	F	%	F	%	F	%	F	%		
Burglary	56	37.8	64	43.2	23	15.5	5	3.4	1.7905	.82687
Larceny	24	16.2	88	59.5	30	20.3	6	4.1	1.6892	.93205
Shoplifting	28	18.9	36	24.3	74	50.0	10	6.8	2.4459	.87508
Medical identity theft	48	32.4	74	50.0	23	15.5	3	2.0	1.8716	.74029
Robbery	33	22.3	99	66.9	15	10.1	1	.7	1.4459	.70261

Results presented in table 16 shows that majority of the junior staff (43.2%) burglary,(59.5%)larceny,(50.0%) medical identity theft and (66.9%) robbery indicated that theft incidents were severe when they occurred. Half of the junior staff (50.0%) indicated that shoplifting incidences were not severe. These results were similar with those of the senior staffs. This implied that risk transfer and risk retention were not effective in reducing theft severity in

Sacco's. Sacco's should therefore focus on employment levels of these techniques if they are to be effective in reducing theft severity. These results on theft frequency and severity were consistent with Henrich triangle that puts forth if the frequency of theft incident is high, the severity is low and vice versa is true (Dorfman, 2005).

Association of Risk Retention Technique with Theft Severity.

Risk retention techniques are designed to lessen the severity of theft incidents once they occur. This study sought to find out the association of risk retention techniques with theft severity . To measure the association of risk retention techniques with theft severity a retention index (RI) was computed. The retention index comprised of four (4) variables representing the four most adopted retention techniques as given by (Dorfman, 2005). The variables were borrowing, current expensing, captives and reserving. These variables were scored on a likert scale of 1-4

with 4 representing the highest scores implying theft had never occurred and 1 representing the lowest score meaning theft losses were very severe.

$$RI = \frac{BT+CT+CET+RT}{4}$$

With BT= borrowing technique, CT= captives technique, CET= current expensing techniques and RT= reserve technique. The results were presented in Table 9

Table 9: Association of risk retention techniques with theft severity

	23.62%	68.34%	8.04%	0%	100%

Chisquare =11.932, df =12, p=0.167

The findings in table 19 presents that majority (53.77%) indicated that risk retention techniques were not effective in reducing theft severity. Among them majority (35.68%) indicated that theft was severe when retention techniques were not effective. 16.08% rated theft to be very severe when risk control techniques were not effective. Those respondents who indicated that theft in Sacco's was severe (25.13%) also indicated that retention techniques were moderately effective. It's worth noting that none of the respondents indicated that theft had never occurred in the Sacco's .Only (1.00%) of the respondents indicated that risk prevention techniques were very effective when theft was severe.

	Theft Severity				
	very severe	Severe	Not severe	No incident	Totals
Not sure	2.01%	4.02%	0.50%	0%	6.53%
Not effective	16.08%	35.68%	2.01%	0%	53.77%
Moderate effective	3.52%	25.13%	3.52%	0%	32.16%
Effective	2.01%	2.51%	2.01%	0%	6.53%
Very effective	0%	1.00%	0%	0%	1.00%

These findings were further statistically tested for significance using chi-square test at 5% significant level. The computed chi-square value of11.932 and a p value= 0.167implied that risk retention techniques had no significant association with theft severity in Sacco's. This study thus failed to reject the null hypothesis (ho_3) which stated that there was no significant association of risk retention techniques with theft in Sacco's in Embu County.

This study therefore concluded that risk retention techniques were not effective in reducing theft severity in Sacco's. The findings were consistent with Mwenda (2015) findings that risk control techniques may be in a SACCOs and be not effective when matters of theft are taken casually.

CONCLUSION

This study evaluated the effect of risk retention techniques on theft in Sacco's in Embu County. The main focus of this study was on Reserves, Captives, Current expensing, Borrowing and their effect on theft severity.

Results on risk retention techniques studied revealed that borrowing, reserves, and current expensing were adopted by the Sacco's. It emerged that captive were not adopted by the Sacco's. Further the findings revealed that employment of risk retention techniques by SACCOss was very low. Risk retention techniques were also found not to be effective in reducing theft severity. When tested for significance through a chi-square test at a 5% level of significance, the results revealed that risk retention techniques had no significant association with theft in Sacco's with a chi-square value of 11.932 and a p-value of 0.167>0.05.

The study therefore concluded that risk retention techniques had no significant association with theft in Sacco's therefore this study failed to reject at a 5% level of significance the null hypothesis that risk retention techniques had no significant association with theft in Sacco's. It was therefore concluded that Sacco's that had not adopted and fully employed risk retention techniques were vulnerable to high levels of theft severity.

The study recommended that Sacco's should also adopt and fully employ risk retention techniques like captives, borrowing, current expensing and maintaining reserves thus minor losses resulting from theft can be borne by the Sacco's without having to interrupt the daily activities. This will therefore reduce the severity of theft in Sacco's

REFERENCES

Dorfman,M.S..(2005) *Introduction to Risk Management and Insurance*(8th edtn).AsokeK.Ghosh.MUMBAI

Kathuri, N. J., & Pals, D. A. (1993*).Introduction to educational research.*Educational Media Centre.Egerton University.

Kimama,F.M. (2011).*Risk factors affecting SACCOs performance in Kenya*. Retrieved from eropository.uonbi.ac.ke

Kothari, C. (2004). *Research Methodology: Methords and Techniques* (2nd ed.). New Delhi: Age International (p) Ltd

Kallman ,j. 2009 .The2009 *Supplement to The Tools & Techniques of Risk Management*

& Insurance

Lindstrom, P. (1997). Patterns of school crime: A Replication and empirical extension. *British Journal of Criminology*, 37, 121-130.

Ministry of Health.(2014). *Kenya health assessment system.* Nairobi: United States Agency for International Development.

Ministry of Health. (2014).Kenya Health Policy 2014-2030. Nairobi.

Mugenda, O.M., &Mugenda, A.G. (2003).*Research Methods Quantitative and Qualitative Approaches*.Nairobi: Acts Press

Mwenda,T. M (2015) *effects of security control programmes on safety in universities in Tharaka Nithi and Meru County*(unpublished M.B.A Propasal.Chuka University.)

Orodho, J. (2013). Techniques of writing research proposals and reports in education and social sciences. *Nairobi: Masola Publishers*.

Peshawar, N. (2014). Management of Security: sources, methods, and channels. *Insecurity and Political Violence, 15*(4), 59-82.

Singleton, R. (2003). *Approaches to social research*: Oxford University Press.

Vander.Belan,T.(2014).*The Kenyan pharmaceutical sector and crime vulnerabilities.*Antwerp:maklu publishers.

Young, R. (2014). Defining security risk: The Evolution of Insecurity, control, Its Influence on Definitions in Domestic Legislation-united states. *BC Int'l & Comp. L. Rev., 29*, 2

Merger Strategy and Its Effects On Profitability for Commercial Banks Listed in The Nse in Kenya

Dr. Stephen Kamau Warui

Mount Kenya University

Email: stephen.warui@yahoo.com

(Corresponding Author)

Dr. Phelista Njeru

Mount Kenya University

Prof. George Gongera

The Co-operative University of Kenya

Dr. Julius Bichanga

Jomo Kenyatta University of Agriculture and Technology

Abstract

For some of the commercial banks that are listed in the NSE in Kenya, merger strategy has been previously used, more-so to grow their profit margins. But for the past two decades, these commercial banks have been experiencing a lot of economic turbulence. The business environment has changed, which has led to an influx of banks in the country, the result of which is increased competition. This has not been made any simpler by the introduction of lowered interest rates in terms of loan-rates (a result of the government introducing the Capping Bill). Therefore, as an alternative strategy to closing down of branches and retrenching employees, this study seeks to find out if the re-use of merger strategy by these commercial banks will lead to a growth in profitability once again. The main objective of the study is therefore to analyze the effect of merger strategies on profitability of commercial banks listed in the NSE in Kenya. The research methodology used in the study was mixed research design methodology. The primary data was collected using questionnaires; while secondary data was collected from the audited financial statements. The researcher used purposive sampling in the study. The study was guided by the synergy-gains theory. In regard to correlation analysis being, it was observed that, merger strategy and ROA (after merger) had a positive and significant relationship. In regard to the regression analysis, the calculated p-value was 0.018, which was lower than the critical p-value of 0.05 for the study. This led to the researcher rejecting the null hypothesis that there was no significant relationship between merger strategy and profitability for commercial banks listed in the NSE. For primary data, using the five-point Likert scale, the responses average mean was found to be 3.75. This meant that, majority of the respondents agreed with the questions that were asked in the questionnaire for the study, which led to the conclusion that, merger strategies had significant effect on the profitability of commercial banks listed in the NSE. Therefore, a conclusion that the use of merger strategies by commercial banks listed in the NSE led to a growth in their profitability was drawn.

Keywords: Merger Strategy; Profitability; Nairobi Securities Exchange (NSE); Commercial Banks in Kenya

INTRODUCTION

In the recent past in Kenya, the banking sector had recorded a slow-down in growth in the assets, profit-margins, deposits as well as products they were offering to their clients. This slow-down in growth as well as fluctuating financial performances had been mainly attributed to factors such as increased competition as well as introduction of certain government policies such as the Capping bill (which enabled the government to regulate interest-rates offered by the banks). According to the CBK, players in the banking industry had been experiencing tough times of late. This had been attributed to a growth in competition for clients over the years, and this was due to greater innovations by players in the industry as well as more competitors into the banking market. The increased competition and introduction of the Capping Bill by the government were some of the major reasons that had caused the commercial banks listed in the NSE and had undertaken merger strategies not to attain their pre-set profit targets (that is, the expected profit margins). Despite the banks under study having undertaken an already proven growth strategy (that is, merger strategy), they had not been able to attain the expected profit margins after merging, a very worrying trend for the Kenyan banking sector. This economic hardship that the banks were experiencing had forced many banks to close some branches, and at the same time, drastically reduce their work-force as a way of ensuring their survival (through not hiring new staff as well as laying-off the already existing ones). This they had undertaken with the hope of increasing their profit margins. With this in mind, though the merger strategies may not have been the best option for the banks, more specifically for these banks which had tried it before, it looked like the better strategy to undertake compared to downsizing and closure strategies. The study therefore sought to find out what effects that undertaking merger strategy had on the profitability of these commercial banks that had previously undertaken the strategy before and were listed in the NSE in Kenya.

RESEARCH OBJECTIVE

The main objective of the study was to establish the effect of merger strategies on profitability of commercial banks listed in the NSE in Kenya.

RESEARCH HYPOTHESIS

To proffer useful answers to the study, the following research hypotheses were formulated for the study:

H_0: There is no significant relationship between merger strategies and profitability of merged commercial banks listed in the NSE

H_1: There is a significant relationship between merger strategies and profitability of merged commercial banks listed in the NSE

SCOPE OF THE STUDY

The scope of the study was further sub-divided onto two major categories, that is: content scope and geographical scope.

CONTENT SCOPE

The content scope of the study was on commercial banks that were listed in the NSE and had undertaken merger strategy before. In the current study, five commercial banks listed in the NSE which had undertaken merger strategies, that is: CFC Stanbic Bank Ltd and I&M Holdings Ltd (Consolidation merger strategy), and Barclays Bank of Kenya Ltd, KCB Ltd, and Co-operative Bank Ltd (Downstream merger strategy).

GEOGRAPHICAL SCOPE

The geographical scope of the study was Nairobi; and more specifically, the C.B.D. This was because, all the banks under study had several branches in the capital city of Kenya, a factor that further strengthened the reason for choosing the banks as well as the area of study.

OPERATIONAL DEFINITION OF TERMS

The operational definition of terms were as follows:

Listed commercial banks are banks whose shares are available for trading to the public through the NSE in Kenya (Ireri, 2011)

Merger is a restructuring technique used by companies whereby two or more companies comes together, have an agreement, and either move together jointly or individually for their own individual benefit (Akinsulire, 2006).

Merger strategy is a restructuring technique undertaken by a company's management meant to expand the operations of the company, mainly through increasing the long-term profits of the company. It can further be broken-down to specific strategies such as Consolidation merger strategy (Ireri, 2011).

Profitability is the financial benefit that a bank enjoys when the incomes that are generated surpass (that is, are more than) the expenses and costs they incur, as well as the taxes they pay so as to sustain their normal day-to-day activities (Sivathaasan, Tharanika, Sinthuja & Hanitha, 2013).

LITERATURE REVIEW

The Literature review for the study was divided into two major sections, that is: theoretical review and empirical review, which were discussed as follows:

THEORETICAL REVIEW

The theory that was used for the current study was synergy-gains theory. This theory is based on the principle that, an organization will use all its available resources for purposes of increasing its value in the market, and therefore, increasing its profits. Synergy-gains theorists believe that, for an organization to know whether it has created value or not, there needs to be a comparison between the total resources held by the organization and the total held in the economy; while at the same time, look at the opportunities with which the said resources are utilized for purposes of making profits. The term 'resources' in this instance could be used to mean: (i) inputs to the process of production; and (ii) factors owned and controlled by the organization.

This theory explains more about merger transaction whereby, a merger is undertaken for purposes of realizing synergies, and in the process, increase cash-flows in the firm, which results to the overall increase in profits for the firms.

EMPIRICAL REVIEW

The empirical review for the study was as follows:

EFFECT OF MERGER STRATEGIES ON PROFITABILITY

The profitability of organizations has over the years been calculated using measures such as: Return on Equity (ROE), Return of Assets (ROA), Earnings before Tax (EBT), as well as Gross Profit Margin (GPM) (Black, Wright & Davis, 2011). These ratios combined are what are referred to as 'Financial Performance Approach' of measuring how a merger is doing in terms of profit-margins. In the current study, profitability was meant to show how efficient a company

has been in terms of using its resources over a certain period of time. The ratio that was used to measure profitability for commercial banks in the study was ROA.

Findings from various researchers have yielded varying results on how undertaking the strategies affects their profitability, for example: (Boot, 2003; Campa & Hernando, 2006; Amel, Barnes, Panetta & Salleo, 2004) are researchers who have carried out researches and have produced varying results. Further researches are analyzed as shown below.

Research by Mishra and Chandra (2010) sought to find out the effect of merger strategy on the profitability of companies in India, focusing on companies that had undertaken the strategy between 2000 and 2008. The researchers used panel-data estimation technique, and their findings revealed that, the profitability of the companies dependent on their size, the amount of effort put into selling, the amount of exports as well as imports (which went on to affect their market share as well as demand). The conclusion of the study was that, there was no direct relationship between companies in India undertaking the merger strategies and effect on their profitability thereafter.

Previously, Saboo and Gopi (2009) undertook a study on Indian companies, seeking to find the relationship that existed between companies undertaking merger strategies, and the effect it had on their profitability. However, the researchers compared the findings of the companies that had undertaken local mergers and compared the profits with those of companies that had undertaken international mergers. In both instances, the researchers compared the profit margins before and after merging. The findings of the study revealed that, for both local and international mergers, the companies posted higher profit margins post-merging as compared to pre-merging. However, the companies that undertook international mergers posted higher profit margins than those that undertook local mergers.

Achua and Ola (2013) sought to find out the relationship that existed between commercial banks in Indonesia undertaking merger strategies, and the impact it had on their profitability thereafter. They made a seven-year comparative study (before and after the merger strategy) and found out that, commercial banks in Indonesia gained from undertaking merger strategies, as their profitability increased after undertaking the strategy. This they were able to conclude by the increased values of ROA, ROE, EBT and GPM. However, the research also revealed that, post-merging, the 'loan-to-deposit' ratios went down for the commercial banks, and this was attributed to slower business after merging.

In contrast, Kemal (2011) carried out research primarily on how undertaking merger strategies in Scotland by commercial banks affected their profit-ratios, and focus was laid on the Royal Bank of Scotland. The researcher used twenty (20) ratios, and of these, only six had better values after merging than before merging. The researcher concluded that, the strategy had failed for that particular bank (in terms of increasing its profitability). This therefore resulted to a

conclusion being made that, undertaking merger strategy was a total let-down for Royal Bank of Scotland.

Hackbarth and Morellec (2008) carried out research to find-out the impact that merger strategies had on various operational aspects for publicly-listed banks in China. The main variables used as operational variables in the study were the profit-margin ratios (that is, ROA, ROE, EBT and GPM). The researchers carried out various tests to find the kind of relationship that existed between the two variables, and their findings revealed that, there was a significant improvement in the profit-ratios after undertaking the merger strategies by the commercial banks. The researchers' findings also revealed that, the markets highly anticipated future merger deals due to the high profits that were being witnessed by the publicly-listed commercial banks.

Pazarskis, Vogiatzogloy, Christdoulou and Drogalas (2006) carried out research on how undertaking various merger strategies by publicly-listed commercial banks in Greece affected on their profitability. The researchers undertook the study on a sample of 50 banks that were listed in the Athens Stock Exchange (ASE), and had undertaken at-least one merger deal between the years 1999 and 2003. They focused on three financial ratios that depict profitability, that is, ROA, ROE and GPM. The researchers compared the ratios before and after merging. The findings of the study were that, banks listed in the ASE and had undertaken merger strategies recorded higher profit-ratios after undertaking the strategies as compared to before. However, this was only noted in the short-run, as in the long-run, the profitability decreased.

Mantravadi and Reddy (2008) carried out an analysis on the banks in India, seeking to find-out the effect that merger strategies had on the profit-ratios for commercial banks in the country. The researchers compared the ratios with those of banks that had not undertaken the strategy. The study was based on publicly-listed commercial banks, and was based between the years 1990 and 2004. The findings of the study revealed that, the banks that undertook merger strategies had an insignificantly higher profit-margin than those that had not merged. This led to the conclusion that, undertaking merger strategies led to publicly-listed commercial banks in India slightly increasing their profit margins.

From the studies above, it could be observed that, various researchers had tried to find the impact that undertaking merger strategies by commercial banks had on their respective profitability. However, other researchers seemed to note a positive impact where as others record negative impact; this inconclusiveness in the various findings left a research gap that clearly needed to be addressed. The study distinctively differed from previous studies undertaken in that, the researchers had been too general in their findings, with none being specific as to what was expected by the banks when a strict government policy such as the Capping-bill was introduced. Furthermore, the lack of specific studies on how merger strategies being used by commercial banks listed in the NSE in Kenya left a conceptual gap (which made this study unique from other studies previously undertaken) as well as a knowledge gap that would be addressed by the current study.

RESEARCH METHODOLOGY

RESEARCH DESIGN

Under the current study, the research methodology that was viewed to be highly appropriate was mixed research design methodology. This was for purposes of avoiding biasness when using any of the research designs.

LOCATION OF THE STUDY

The study was based in the Central Business District (CBD) of Nairobi County in Kenya. To collect primary data, it entailed administering questionnaires to management of the branches of each of the listed commercial banks, all of which had branches in the Nairobi CBD (totaling to 120 managers, that is: 54 branch managers, 54 operations managers and 12 section managers).

DATA COLLECTION METHODS

In the current study, data was collected through primary as well as secondary sources. Primary sources of information were obtained by the researcher administering questionnaires to the respondents. Secondary information was obtained from the audited financial statements of the commercial banks that were available online.

DATA ANALYSIS, PRESENTATION AND DISCUSSION

FINANCIAL PERFORMANCE TRENDS

RETURN ON ASSETS (R.O.A)

The figure 1 that follows indicated the trend of the R.O.A for the banks from the years before merger, year of merger, and years after merger. The tend indicated a drop from the period t-3 to t-2, and then a rise from t-2 to t+2, which was then followed by a slight drop from t+2 to t+3. This generally indicated that, from secondary data, the profitability (in terms of R.O.A) increased over the years.

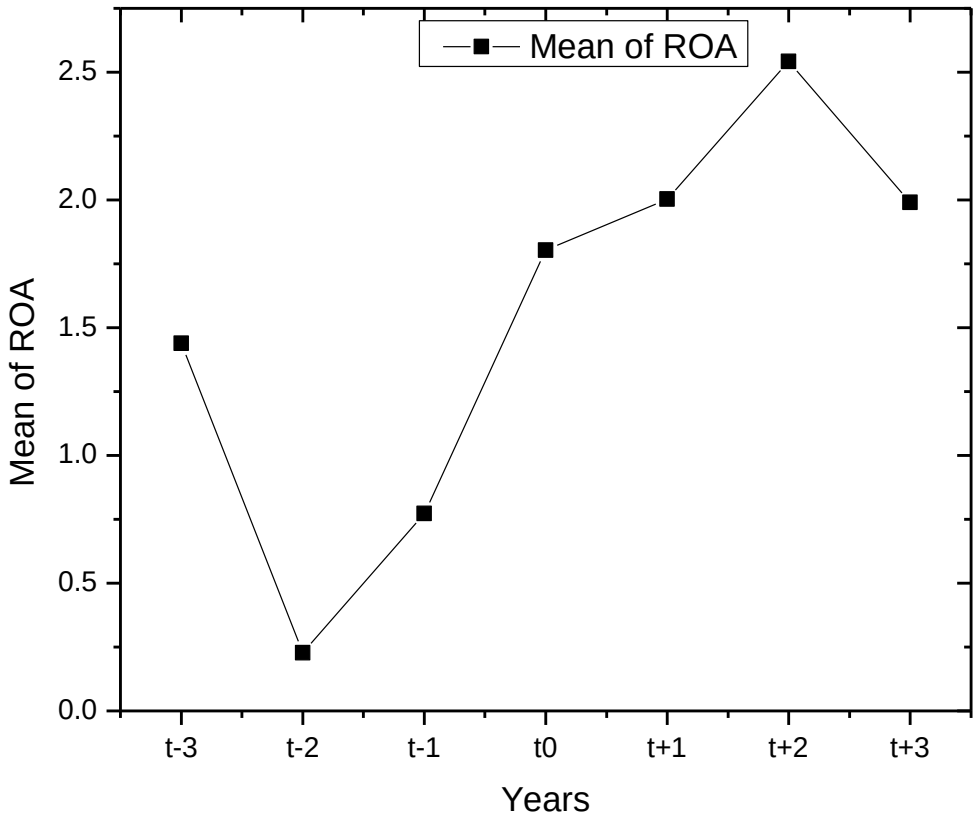


Figure 1: ROA Trend

Source: Researcher, 2019

RESULTS OF CORRELATION ANALYSIS UNDERTAKEN ON EFFECT OF MERGER STRATEGY ON PROFITABILITY (SECONDARY DATA)

Table 1 that follows showed the relationship that existed between merger strategy, ROA (before merger), and ROA (after merger). From the findings, it was observed that merger strategy and

ROA (after merger) were positively and significantly correlated (r=0.354, p=0.0376). This was after comparing the calculated p-value of 0.0376 with the critical p-value of 0.05.

Table 1: Correlation Analysis (From Secondary Data)

		ROA (Before Merger)	ROA (After Merger)	Merger Strategy
ROA (Before Merger)	Pearson Correlation	1	0.025**	0.063*
	Sig. (2 tailed)		0.000	0.034
ROA (After Merger)	Pearson Correlation	0.025**	1	0.354
	Sig. (2 tailed)	0.000		0.0376
Merger Strategy	Pearson Correlation	0.063*	0.354	1
	Sig. (2 tailed)	0.034	0.0376	

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

HYPOTHESIS TESTING

Using the regression analysis results shown in table 9 below, the hypothesis (I) was tested and was as shown below:

H_0: There is no significant relationship between merger strategy and profitability of merged commercial banks listed in the NSE

H_1: There is a significant relationship between merger strategy and profitability of merged commercial banks listed in the NSE

Rule: Accept Null Hypothesis if the calculated p-value is greater than the critical p-value of 0.05

From the findings in table 2, it showed that the study rejected the null hypothesis and accepted the alternative hypothesis. This was because, the calculated p-value (0.018) was lower than the

critical p-value (0.05). This showed that there was a significant relationship between merger strategy and profitability.

From the findings, the following equation was derived:

ROA (After Merger) = (0.798) + (0.779) Merger Strategy

This meant that, a unitary change in Merger Strategy (that is, number of branches opened) led to 0.779 change in ROA.

Table 2: Regression Analysis (Profitability)

	ROA (After Merger)
Parameter Estimate	Coefficient (p-value)
Constant	0.798 (0.004)
Merger Strategy	0.779(0.018)
R Squared	0.25
F-Statistics (ANOVA)	7.138(0.018)

The findings of the study revealed that, for the regression model, the goodness of fit between merger strategy and ROA (after merger) (obtained from R-squared value) was 0.25. This meant that, 25% of any changes in the ROA (after merger) were explained by the company undertaking merger strategy.

RESULTS OF EFFECTS OF MERGER STRATEGY ON PROFITABILITY (FROM PRIMARY DATA)

Table 3 that follows showed the findings from primary data on the effects of merger strategy on the profitability of the banks.

Table 3: Effects of merger strategy on profitability

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Std. Dev.	Mean
1.Banks are getting higher profits after merger that before	8	15	12	25	33	1.1	3.8
2.Banks are getting higher profits than their projected values	5	21	13	30	24	1.2	3.7
3.Profits have risen post-merging	10	20	13	22	28	1.3	3.7
4.Profits would rise further if merger strategy was to be undertaken again	9	25	12	19	28	1.2	3.8
Average						1.2	3.75

Primary data was also used to explain the effect that merger strategy had on the profitability of banks. From the findings on primary data (using the Likert Scale), it could be seen that, 58 respondents (62.4%) agreed that the banks made higher profits after merger than before merger; 29 respondents disagreed (24.7%), while 12 respondents were neutral in their answering (12.9%).in regard to the question of whether the banks were making higher profits (post-merging) than their initial projected values, 54 respondents agreed (58.1%), 26 respondents disagreed (27.9%), while 13 respondents remained neutral (14.0%). In regard to whether profits had risen post-merging, 50 respondents agreed (53.8%), 30 respondents disagreed (32.2%), while 13 respondents remained neutral (14.0%). On whether profits would rise if the banks were to undertake the merger strategy again, 47 respondents agreed (50.5%), 34 respondents disagreed (36.6%), while 12 respondents remained neutral (12.9%).

In regard to the five-point Likert Scale, the responses' average mean was found to be 3.75, and this meant that, most of the respondents in the study were in agreement with the questions that were being asked in the study; however, there was a variation in regard to the answers, and this was shown by an average standard deviation value of 1.2(that is, answers gotten from respondents mostly ranged from 3 to 5).

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSION

The main objective of the study was to find out the effect of merger strategy on the profitability of commercial banks listed in the NSE. The findings of the study revealed that, there was a positive and significant relationship between merger strategies and the profitability there after. The general implication was that, the undertaking of merger strategies by banks generally led to improved financial performance in terms of raising profitability levels. Therefore, from the findings, a conclusion that the use of merger strategies by commercial banks listed in the NSE led to a growth in their profitability was drawn.

RECOMMENDATIONS FOR IMPROVEMENT

From the findings of the study, in regard to the effect of merger strategy on profitability, the study recommended that, the commercial banks listed in the NSE that opted to undertake merger strategy (for whatever reason) should be more vibrant in marketing their products, plan adequately on how to diversify their products, improve on their efficiency level, and also improve on their staff productivity levels. With this, would ensure that the banks got higher profits after merger as compared to before merging.

REFERENCES

Achua, K. J. & Ola, P. (2013). Mergers and Acquisitions Recapitalization Strategy and the Volatility of Banks in Nigeria. 5th Annual American Business Research Conference, (pp. 54-67). Lagos.

Akinsulire, O. (2006). Financial Management. Lagos: El-Toda Investment Ltd.

Amel, D. B. (2004). Consolidation and Effeciency in the Financial Sector: A Review of International Evidence. Journal of Banking and Finance , 28(10), 2493-2519.

Amel, D. B., Barnes, C., Panetta, F. & Salleo, C. (2004). Consolidation and Efficiency in the Banking Sector: An International Evidence Review. Journal of Banking and Finance , 28(8), 2495-2510.

Boot, W. (2003). Restructuring in The European Banking Sector: Its Implication on the Economy. EIB Papers , 8(7), 109-130.

Campa, M. J. & Hernando, I. T. (2006). Mergers and Acquisitions in the European Financial Industry. Journal of Banking and Finance , 30(12), 3365-3390.

Hackbarth, D. K. & Morellec, E. M. (2008). Stock Returns in Mergers and Acquisitions. Journal of Finance and Economics , 62(5), 1213-1223.

Ireri, J. K. (2011). Effects of mergers and acquisitions on financial performance of oil companies in Kenya.Unpublished Dissertation, School of Business, University of Nairobi.

Kemal, M. U. (2011). Post-Merger Profitability: A Case of Tunisian Banking Sector. International Journal of Business and Social Sciences , 2(5), 1-6.

Mantravadi, P. &. Reddy, A. (2007, July 23). Relative Size of Mergers and Operating Performance: Indian Experience. Economic and political Weekly , p. 3936.

Mantravadi, P. B. & Reddy, V. A. (2008, September). Types of Mergers and Effects on Performance: Experience From India. Economic and Political Weekly Review of Management and Industry , pp. 65-75.

Mishra, P. K. `& Chandra, T. (2010). Mergers, Acquisitions and Firm Performance: Experience From Firms in India . European Journal of Business and Economics , 3(5), 111-126.

Pazarskis, M. N., Vogiatzogloy, M. T., Christdoulou, P. T. & Drogalas, G. K. (2006). Exploring The Improvement of Firms Post-Merging: A Case of Greek Firms. International Research Journal of Finance and Economics , 5(3), 185-195.

Saboo, S. & Gopi, S. (2009). Comparing Post-Merger Performance for Indian Firms. Munich: MPRA, Munich University Library.

Sivathaasan, N., Tharanika, R., Sinthuja, M. & Hanitha, V. (2013). Factors Determining Profitability: A Study of Selected Manufacturing Companies Listed on Colombo Stock Exchange in Sri Lanka. European Journal of Business and Management , 5(27), 99-109.

Examination Of Government Policies That Address Tacit Knowledge Sharing And How Well These Policies Have Been Applied And Fortified To Enhance Public Sector Performance.

Dr. Wamitu Susan Njeri, Department of Business and Entrepreneurship, School of Business and Economics, South Eastern Kenya University

Email: swamitu@seku.ac.ke, susanwamitu.sw@gmail.com

Abstract

Knowledge is an integral part of the factors that impact growth in an economy; more so in this knowledge age. Both public and private sector enterprises have embraced the knowledge concept, through not only harnessing the knowledge that abounds, but also managing it as they also ascertain that it is shared. Out of the numerous facets of knowledge, the most elusive and difficult to share is tacit knowledge, yet it highly impacts performance of organisations. The public sector generates and is also exposed to a lot of knowledge which in most cases is acquired but rarely shared. In the Kenyan civil service, there seems to be ignorance in the following areas: the amount of knowledge that flows through the Kenyan civil service every day, accounting for the knowledge that the Kenyan civil servants require for present and future needs, how to acquire that knowledge, the kind of knowledge that individual employees in the civil service possess and how to share such knowledge so as to enhance public sector performance. This situation then begs the question: are there tacit knowledge sharing policies in the Kenyan civil service and if there are how are they applied and fortified to enhance public sector performance?

Key words: knowledge, tacit knowledge, public sector, civil servants, performance

1. Introduction

Tacit knowledge is a facet of knowledge that is implicit and intangible unless transformed into explicit knowledge. Its demand to be managed has become a clarion call for institutions that are looking to engage a resource that is inexhaustible and non-imitable. Due to this fact, knowledge management is inevitable. Knowledge management is as old as mankind with its eminent debut being traced to the late forties, during the Second World War, when it was noted that upon successive building of fighter planes, fewer defects were reported and this was associated with knowledge sharing. The early industrial age saw the ancient man make improvements on the survival tools which improved in quality as he made one tool after the other, each time realizing fewer defects because of perfection derived from experience. Upon such understanding, man decided to start saving the experience gained in forms that can be retrieved if need arises. This brought about the concept of learning that encouraged producers of goods to engage in quality

mass production that came to warrant exchange of products in form of barter trade (Cortada & Cortada, 2011).

An empirical study conducted in Malaysia by Syed-Ikhsan and Rowland (2004), which investigated and examined the availability of KM strategy in the ministry of entrepreneurs and development of Malaysia and whose concerns were perceptions of KM benefits, problems, responsibilities and technology involved in managing knowledge, revealed that the ministry did not have KM strategies required to harness the benefits of knowledge even though knowledge was embedded in the ministry's procedures and policies and therefore available. Many workers felt that the ministry was responsible for managing knowledge and therefore made little attempt to go out of their way to benefit from the available knowledge. Other studies done in the public sector on KM include benchmarking of KM (Syed-Ikhsan, 2004), knowledge sharing (Liebowitz & Chen, 2003), KM initiative (Shields, Holden & Schmidt, 2000) and KM practices in public administration (Wiig, 2002). Knowledge by its very nature is non-imitable and as such is a unique resource that should be nurtured at all costs.

Africa lags behind in knowledge management initiatives but amidst this quagmire, are bodies associated with knowledge that ensure that knowledge is created and shared. Knowledge Management Africa (KMA) is a KM body that holds biennial conferences in different countries to promote knowledge management implementation in Africa and devices ways in which knowledge management and sharing can be enhanced. The first conference was held in Johannesburg, South Africa in 2005, and the second was in 2007 in Nairobi and whose theme was Pursuit of Mutual Advantage to rival the countervailing dominance of trade, finance, and investment by affluent countries with high technology. The latest one was held in Dakar Senegal in 2009 (Shields, Holden & Schmidt, 2000). Most of these conferences are driven by realization by Africa that her vast resources are useless unless she takes her people's knowledge as very crucial to her growth and move from a resource-based economy to a knowledge-based economy.

Kenya has 83 registered non-profit organizations and 277 profit-making organizations which in one way or another generate knowledge but whose sharing is not ascertained (Ireri & Wairagu, 2007). This is exemplified by the civil service which keeps reinventing the wheel (repeating mistakes) and routinely conducting business with no improvement (Ondari, 2006). Reinventing the wheel is a costly endeavor for it involves reproduction of what others have already produced and therefore does not give the coveted competitive advantage. In this regard, Kenya exhibits similar traits with other Sub-Saharan countries since she has not productively integrated KM into its government agencies (Ondari, 2006).

Further, in Kenya, the KM system is just beginning to appear in many organizations and consequently, little research and field data to guide the development and the implementation of systems that can give potential benefits of KM systems exist. Chief among the reasons why KM has not been integrated is slow application of appreciation of information and communication technology and introduction of e-government. Similarly, rigid bureaucracy, lack of incentives

and cultural barriers continue to contribute to KM inadequacies. Lodge and Kalitowski (2007) confirm this view in their paper on "The Role of Knowledge Management in Enhancing Government Service Delivery in Kenya" that: the civil service is bloated, rigid, hierarchical and over-centralized and its monopoly status ensures that it is unresponsive and inefficient in enhancing KM systems. Furthermore, the government is driven by the interest of producers, not users. There is also a notable absence of a performance culture and civil servants are unaccountable and over-privileged according to Lodge and Kalitowski (2007). The Kenya knowledge management and sharing initiatives and policies can be said to be almost wholly reliant on Africa initiatives as indicated by KMA, GDN, AMREF and World Bank but not the government.

In Kenya, like in other sub-Saharan regions, members of the public are rarely involved or consulted in policy formulation mostly due to the culture of secrecy that prevails in the government matters, which is even demonstrated by the Swahili word that denotes government's name (Serekali) which if translated means "top secret" (Ondari, 2006). Consequently, the civil servants are not eager to acquire or create knowledge and the few who do, are not motivated enough to continue doing it. Consequently, very little knowledge is generated and shared and therefore not many people are specialized in specific areas and only few are specialized consultants.

Concept of Tacit Knowledge

Tacit knowledge refers to the soft invisible knowledge that is hard to recognize its existence and which could be termed as more valuable than hard knowledge. it is captured through four ways as postulated by Popper (2000. The first one is mentoring a new employee, which means assigning a mentor to new employees as part of an orientation process and new hire acclimatization process where the mentor transfers and shares knowledge. The second is focusing on employee retention. It is expensive to recruit, hire and train new employees and so the most effective way is to retain good employees. This helps to sustain a strong tacit knowledge base. The third is to provide employees with opportunities to share experiences. This can be as formal as weekly staff meetings or as informal as annual employee events. The forth is to document all processes. This process can be automated to have very detailed and written processes sequenced step by step for every job. Worth noting is that tacit knowledge can offer sustainable and comprehensive competitive advantage because competitors have a difficult time replicating it.

Tacit Knowledge Sharing in the Kenya Civil Service

The Kenyan public service goes by many similar names like the public sector, public service and public administration. Those working in the departments in this sector are referred to as public servants or civil servants, whose responsibility is to articulate public policies and implement

government strategies. These departments provide essential public utilities like education, agriculture, planning, defense and health services (Potts, 2009).

Tacit knowledge is not well understood and embraced in the Kenya civil service because of its abstract and intangible nature which makes people pay more attention to explicit knowledge as opposed to tacit knowledge. Further, the Kenya civil service consistently loses experienced workers when they attain the age of 55 years and recently 60 years due to retirement, which translates to loss of valuable knowledge. Other reasons for people leaving the service are transfers, dismissals, and natural attrition. This leaves a lacuna of knowledge which in most cases is filled through explicit knowledge by those who remain (Butler, 2011). Polanyi (1966) advocates for the harnessing of that crucial knowledge which is embedded in people's mind and is difficult to express.

The Kenyan civil service is characterized by rigid bureaucracy and hierarchical chains that dictate the organizational structure and modes of operation (Clavier, Senechal, Vibert & Potvin, 1999). This hierarchy has inflexible norms, policies, and rules which must be adhered to and only adjustable if orders come from above (Arowolo, 2010). Bureaucracies are a precursor to a culture of mistrust and impersonal interactions which inhibit tacit knowledge sharing. Comparing the Kenyan public sector with other economies brings out an interesting contrast. A case in point is what is noted by Herbert (2000) that successful companies like Yahoo, Google and Intel, rely heavily on tacit knowledge as a major asset for competitive advantage and therefore keep on generating intellectual skills which they continuously encourage members to share. It is no wonder then that they have led the world in terms of inventions and innovations.

Tacit knowledge often requires that those already holding knowledge, work with the novice to teach them in a hands-on process (Zucker & Darby, 2001). Awad and Ghaziri (2007) posit that brainstorming; free exchange of ideas and holding of healthy debates and discussions should be encouraged. They point to the introduction of e-governance to enable the civil service to move towards more customer-centered services as it brings with it a redistribution of tasks and hence of knowledge. It is common knowledge that the Kenyan civil service is not particularly customer-centered and that service delivery is of uneven quality and availability. Citizens receive services as and when the civil servants have the time and ability to render them and also that service delivery is often delayed and of poor quality. However, the scenario has slightly improved upon the introduction of Huduma centers. Opinions direct to the view that if the Kenyan government was to introduce e-governance, there would be better redistribution of tasks and knowledge and a move towards customer-centered services and enhanced service delivery. Knowledge management would be one of the major pillars enhancing service delivery in the Kenyan civil service.

The benefits that tacit knowledge sharing brings to the civil service can only be realized if KM practices are effectively integrated into public service operations (Weber, 1978) though this would involve a very complex process that depends on the government's approach to the

situation. For instance, it is crucial that any knowledge management program should take into account both tacit and explicit knowledge, as well as the dominant managerial model of governance. A further factor is the extent to which individuals are both willing and able to maximize their own value, based on the amount of knowledge they have and are willing to share with others. This, in turn, may dictate how knowledge is structured and presented to best enhance the decision-making capabilities of civil servants. Another aspect to consider is that of introducing practical knowledge management practices into the civil service though this does not necessarily mean the relevant civil servants will be willing to share knowledge.

Within any bureaucratic structure such as predominates the Kenyan public sector, there is an unspoken motivation not to share knowledge, since according to Weber (1978), the power of any bureaucracy rests upon two types of knowledge: "technical know-how" and "official information". Considering that technical know-how may be shared by many, a civil servants competitive advantage may lie in official information. This is usually confined in their minds and only exposed upon an individual's choice and it is unfortunate that knowledge sharing decreases as the level of competition within an organization increases.

Public Sector Performance

Public sector performance (PSP) refers to the total unit performance that adds up to the whole organizational performance. PSP involves comparing the expected results to actual results and investigating deviations and their causes (Hashim, 2007). Knowledge is a key component in the performance of any economy and in the Kenyan case; the counties are the basis or parameters of measurement of the overall public sector performance. The Government of Kenya has since 1992 put initiatives in place to improve service delivery. Key among them is the enactment of the public procurement and disposal act (2005), to streamline the procurement efforts partly by trying to channel resources where within the government in a timely manner and avoiding wastage of resources. The Kenya government has also increased the anti-corruption efforts implementation through the Anticorruption and Economics Crime Act (2003), aimed at reducing corruption. In the year 2010, the new constitution was promulgated to create a decentralized government wherein the two of the three arms of the government namely the legislative and the executive were devolved and to the 47 counties and the legislative remained in the National Government. The intention amongst other primary intentions was to enhance and improve service delivery through devolution, the byproduct of which was creation of counties. This caused power devolution with key government functions being entrusted on county governments, though the policies were still cascaded downwards from the national to the county governments. The counties are as profiled.

Baringo, Bomet, Bungoma, Busia, ElgeyoMarakwet, Embu, Garissa, Homa Bay, Isiolo, Kajiado, Kakamega, Kericho, Kiambu, Kilifi, Kirinyaga, Kisii, Kisumu, Kitui, Kwale, Laikipia, Lamu, Machakos, Makueni, Mandera, Meru, Migori, Marsabit, Mombasa, Muranga, Nairobi, Nakuru,

Nandi, Narok, Nyamira, Nyandarua ,Nyeri, Samburu, Siaya, TaitaTaveta, Tana River, TharakaNithi, Trans Nzoia, Turkana, Uasin Gishu, Vihiga, Wajir,and West Pokot county.

2. Objectives

To establish what employees in the national government understand by the term tacit knowledge

To establish the policies that have been put in place to enable effective management and sharing of tacit knowledge

To determine the extent to which specific tools of internal organization's best practices are used in government departments.

To recommend to the national government the interventions that can enhance Tacit Knowledge Sharing.

Guiding Theory

The study is guided by the following theory.

Knowledge Economy Theory

The theory was penned by Piaget (1959) and is concerned with the production and distribution of knowledge as commodity function consumption within the organization's value chain. The concept of knowledge results from the recognition of the role of knowledge and technology in economic growth. Knowledge as embedded in human beings is considered as human capital which is central to economic development. Knowledge in this theory is considered as part of the most important assets in an organization, is non-imitable and in most cases, is a resource that defies the vagaries of time. The theory uses capital assets which are firm-specific resources and are indispensable in a firm's value chain (Nonaka, Toyama, & Byosière, 2001). These scholars' views, point to the role played by knowledge as it interplays with other resources to create value that contributes to organizational performance.

The knowledge assets according to the theory acts as inputs that after processes and procedures are performed on them, the results are increased productivity. Boisot (1998) notes that knowledge economy theory involves organizational processes and unconscious cultural knowledge that blends together to add value to the whole value chain of resources. The theory advocates for value gained through networks out of partnering of individuals to achieve competitive concentration of resources with a view of sharing knowledge which is said to decline with network length or distance (Inkpen & Tsang, 2005).The knowledge sharing network improves on skills and competencies and gives an organization enduring knowledge advantage

that lasts beyond employee turnover, death, dismissal or resignation and offers the organization minimal or inconsequential knowledge loss.

The theory calls for continuous KM that is motivated by the need to diversify KM across individuals to the degree that a reasonable magnitude of employee turnover does not disrupt organizational operations because the knowledge required for continuity had been continuously shared way before the time it requires to be used (Beazley, Boenisch, & Harden, 2002). This study upholds similar views and behoves the Government the responsibility of crafting policies that can harness tacit knowledge for sustainable competitive advantage. However, the theory fails to recognize different types of knowledge-based capabilities like information systems that can be used to synthesize, enhance and expedite large-scale intra and inter firm management (Alavi & Leidner, 2001). It can also be criticized on the basis that there is no guarantee that knowledge cannot be imitated as happens in programming and plagiarism.

4. Methodology

The study employed the use of descriptive research design. The target population consisted of top level managers and line staff of 6 non-devolved ministries.

Study Sample

The study utilised purposive sampling to select 1 top level manager and 4 line staff from 6 non-devolved ministries. In this respect, six departments were purposively selected which are labor, sports, national public works, national health, national education and housing. Efforts were made to stick as much as possible to the departments already picked in the same study for the analysis of the relationship between tacit knowledge sharing and public sector performance in devolved governments. The sample was as indicated below.

Table 1: Study Sample

	Top level managers	Line staff	Total
Labor	1	4	5
National Education	1	4	5
Sports	1	4	5
National Public works	1	4	5
Housing	1	4	5
National Health	1	4	5
Total	6	24	30

5. Findings

Out of 30 questionnaires administered to the national government officers, 21 questionnaires were returned giving a return rate of 70 percent which can be termed as good.

5.1. Employees Understanding of the Term Tacit Knowledge Sharing

The respondents were asked to indicate their understanding of the concept of tacit knowledge sharing. The result is indicated in table 2.

Table 2: Understanding of Tacit Knowledge Sharing

	Frequency	Percent
Knowledge acquired informally	6	28.6
Involve the act of exchanging views and ideas	3	14.3
Sharing ideas openly	2	9.5
Knowledge Acquired by people during normal interaction	2	9.5
A way of sharing knowledge by working together	1	4.8
Knowledge learnt through experience	4	19.0
On job training from colleagues	1	4.8

There is an indication that though there are varied meanings associated with the term, all the national government employees have a common understanding of tacit knowledge sharing as an informal knowledge acquired from other employees by the very nature of working together, experiences and during normal interactions.

5.2. Policies in place for TKS

The respondents were asked to indicate whether there were policies in place in their ministries that facilitate TKS and the following were their responses.

Table 3: Whether there were Policies in Place for TKS

	Frequency	Percent
Yes	8	38.1
No	13	61.9
Total	21	100.0

The results indicated in table 3 reveal that majority of the national government departments do not have policies in place for the management and sharing of knowledge which accounted for 61.9 percent. This is an indication that tacit knowledge sharing has not been institutionalized by the national government departments.

5.3. TKS Tools and Practices in the Ministries

Table 5.3: Specific TKS Tools and Best Practices Used in Government Departments

	N	Minimum	Maximum	Mean	Std. Deviation
Induction and orientation of new hires/employees	21	1.00	5.00	3.0476	1.39557
Building of new and old hire capacity	21	1.00	5.00	2.1905	1.16701
Mitigation in the loss of experienced workers	21	1.00	4.00	1.5714	1.20712
Making stored data or information searchable and available knowledge on the intranet	21	1.00	2.00	1.4762	.51177
Valid N (list wise)	21				

The results indicate that induction and orientation of new hires/employees is highly rated (mean score=3.0476) followed by Building of new and old hire capacity (mean score=2.1905). This is an indication that national government inducts and orients new hires/employees though there is no policy in place to guide this practice/induction program. The Government departments were also found to take an initiative to build new and old hire capacity though very little effort is made to mitigate the loss of experienced workers. Making stored data or information searchable and available on the intranet was also scarcely done. Mitigation in the loss of experienced workers and making stored data or information searchable and available on the intranet had a mean score of 1.5714 and 1.4762 respectively. These scores are quite low and therefore gives the impression that once the experienced workers leave the departments, they walk away with their knowledge which is neither stored or searchable. The little that may remain is what the leftover workers may have imbibed through their self-initiatives of observation or self-mentorship.

5.4. Recommendations on Government interventions in enhancing TKS

The respondents were also required to recommend to the national government the interventions they can use to ensure tacit knowledge is managed and used in a bid to improve public sector performance. the results are shown in figure 1 in the next page.

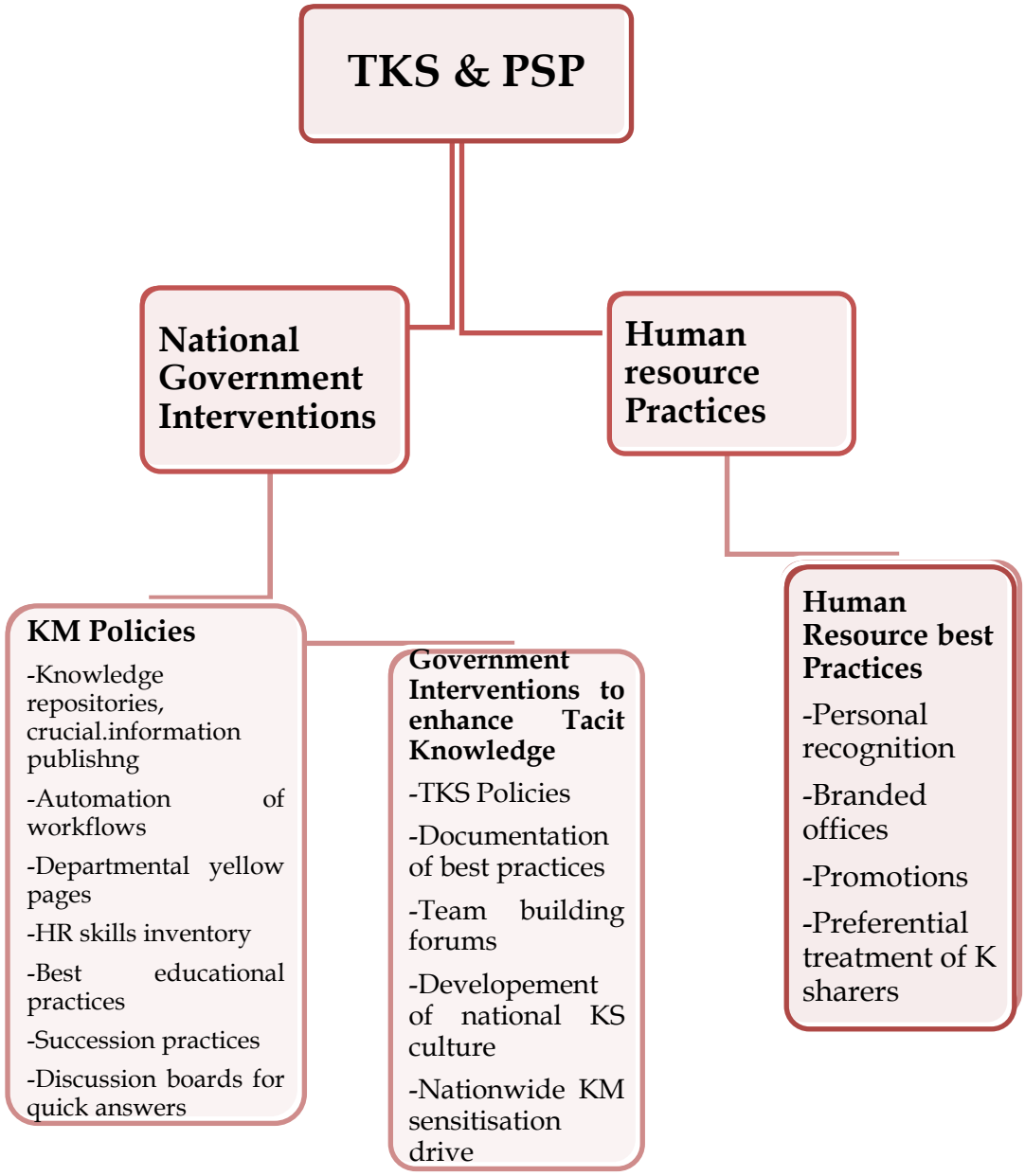


Figure 1: Recommendations on how Tacit Knowledge Sharing can be enhanced for PSP

6. Conclusion.

The findings reveal that there are inadequate policies in place for management and sharing of knowledge through the means under consideration. The results of the tools of tacit knowledge internal organization's best practices used in the national government department indicated that while induction and orientation of new hires/employees is effectively done, mitigation in the loss of experienced workers is hardly done implying that there is no policy in place to guide knowledge retention. This makes knowledge traceability a herculean task and leads to the conclusion that the national government lacks in knowledge sharing policies and what exists is still in the infancy stage.

7 . References

Alavi, M. and Leidner, D. (2001). Knowledge management and knowledge management systems: Conceptual foundations and research issues. *MIS Quarterly*, 25(1), 107-136

Arowolo, D. (2010). The State, Bureaucracy and Corruption in Nigeria, *Academic Leadership Journal,* 8 (3), 1-5.

Awad, E. and Ghaziri, H. (2007). *Knowledge management*. Delhi: Pearson Education.

Beazley, H., Boenisch, Z. and Harden, J. (2002). *Continuity management: Preserving corporate knowledge and productivity when employees leave*. New York: John Wiley.

Boisot, M. (1998). C*ulture as a knowledge asset in knowledge assets securing competitive advantage in the information economy*. Oxford: Oxford University Press.

Butler, T. (2011). Anti-Foundational knowledge management in Schwartz, D. G. and Te'eni, D., Eds...*Encyclopedia of Knowledge Management, (2 ed.), IGI Global, Hershey, 1-11*

Clavier C., Sénéchal Y., Vibert S., & Potvin L. (1999). A theory-based model of translation practices in public health participatory research. *Social Health*

Illn, 34, 791-805. DOI: 10.1111/j.1467-9566.2011.01408.x.

Cortada, A. & Cortada, J. (2011). Knowledge management yearbook (2000-2001ed.). Routledge. Amazon books

Hashim, M. (2007). *SMEs in Malaysia: A brief handbook*. Kuala Lumpur: Sdn. Bhd

Herbert, I. (2000). Knowledge is a noun learning is a verb. *Financial Management*, 78 (2), 68-69.

Inkpen, A. and Tsang E. (2005). Social capital network and knowledge transfer. *Academy of* Management *review* 30(1), 146.

Ireri, J. and Wairagu, A. (2007). *Bridging the —knowledge-how and the _knowledge-do gap in public health in Africa: From traditions to E: AMREF's role and experiences in health information dissemination* (Paper presented at the Knowledge Management Africa (KMA second biennial conference).

Liebowitz, J. & Chen, Y. (2003). Knowledge sharing proficiencies: The key to knowledge management. *Handbook on knowledge management* (pp. 408-438). New York: Springer-Verlag.

Lodge, G. and Kalitowski, S. (2007). *Innovations in government: International* Perspectives *on Civil Service Reform*. London: Institute for Public Policy Research.

Piaget, J. (1995). Piaget's constructivism - emerging perspectives on learning, teaching and technology. Retrieved November 22, 2015, from *http://epltt.coe.uga.edu/index.php?title=Piaget percent27s_Constructivism*

Polanyi, M. (1966). *The tacit dimension*. London: Routledge & Kegan Paul.

Popper, K. (2000). Karl Popper's the three worlds of knowledge. Retrieved November 21, 2015, from *http://www.knowledgejump.com/knowledge/popper.html.*

Potts, D. (2009). *Project planning and analysis for development.* Boulder CO: Lynne Rienner Publishers.

Nonaka, I., Toyama, R, & Byosière, P. (2001). A theory of organizational knowledge creation: Understanding the dynamic process of creating knowledge. *Handbook of organizational learning and Knowledge* (pp. 491-516). New York: Oxford University Press

Ondari E. (2006). *An investigation into the practices, procedures, and challenges of knowledge management in government owned organizations in Kenya* (Unpublished PhD. Thesis). University of Cape Town, South Africa.

Shields, R., Holden, T. and Schmidt, T. (2000). A Critical analysis of knowledge management initiatives in the Canadian public service: The impact of a knowledge-based economy on work

in the public service, the virtual organization of expertise and knowledge. www.carleton. Ca/innovation/km- fed. Pdf, accessed: 7 February 2001.

Syed, I. & Rowland, F. (2004). Benchmarking knowledge management in a public organization in Malaysia. *Benchmarking: An International Journal,* 11(3), 238-266.

Weber, M. (1978). *Economy and Society,* Vol. 1-2. Berkeley: University of California Press.

Wiig, K. (2002). Knowledge management in public administration. *Journal of Knowledge Management,* 6(3), 224 – 239.

Zucker, L., & Darby, M. (2001). Capturing technological opportunity via Japan's star scientists: Evidence from Japanese firms' biotech patents and products. *J.*

Influence Of Entrepreneurial Skills And Innovation On Performance Of Small And Medium Enterprises (Smes) Review From Theoretical Literature

Jane Matingi Nyikuri, R. Winnifred Nduta, Jemmy Mutua

Contacts: 0722248109: 0722835647: 0723366664

Email: janematingi@gmail.com, winnifred.nduta@mksu.ac.ke, jemmymutua@mksu.ac.ke

Abstract

The Small and Medium Enterprises (SMES) sector plays an increasingly important role in many economies in the world. Innovation is an important issue for many SMEs. Entrepreneurial skills as the skills needed to develop innovative products and services and to generate solutions to emerging needs in the marketplace. Innovation is the creation of a of new products and services in all sectors of the economy, new marketing methods and changes in ways of organizing businesses, in their business practices, workplace organization and external relations. The entrepreneur in SMEs is often engaged in promoting novel products and in relating to relevant clients and partners through effective communication processes and instruments such as word of mouth and personal networking. The secondary data collected was analyzed using descriptive statistics and quantitatively. The data was presented through report writing. The study found out that small medium enterprises have introduced more innovative products and services, have developed and implemented new business methods and services which have improved productions and delivery of services and that innovative marketing and promotion campaigns to find new markets have had significant implication on financial performance of SMEs. There is need for the government to foster innovation amongst SMEs through creation of a business environment conducive for entrepreneurship, creation of awareness and implementation of relevant policies. In terms of improving process innovation SMEs need to focus on improving their core competences. SMEs need to pursue market innovation strategies that focus on product customization and customer intimacy in delivering their products and services.

Key words: Entrepreneurial skills, Innovation, Performance, SMEs.

Background of the study

The term "SMES" incorporates a wide range of definitions. The definitions are however based on guidelines surrounding headcount of personnel, sales or assets. For instance Dalberg (2011), Egypt defines SMEs as having more than five personnel but less than fifty employees. Whereas Vietnamon on the other hand defines SMEs as having between 10 and 300 employees. The Inter-

American Development Bank however defines SMEs as having a maximum of 100 employees and less than $3 million revenue. Europe defines SMES's as having manpowerof under 250 employees. World Bank defines SMEs as businesses with a maximum of 300 employees and $15 million annual revenue (Pandya, 2012).

The Small and Medium Enterprises (SMEs) play an important role in the Kenyan Economy. According to the Economic Survey (2006), the sector contributed over 50 percent of new jobs created between the year 2005 and 2010. Despite their significance, past statistics indicate that three out of five businesses fail within the first few months of operation (Kenya National Bureau of Statistics, 2007). According to KNBS (2005), one of the most significant challenges is the negative perception towards SMEs. Potential clients perceive small businesses as lacking the ability to provide quality services and are unable to satisfy more than one critical project simultaneously.

The capacity of SMEs to meet the ever growing expectations of the customer will be determined by their ability to come up with new products and innovations. This will be possible if they read effectively the changing marketing trends and adapt to them effectively.

1.1.1 Entrepreneurial Skills

Entrepreneurial skills are simply business skills, which an individual acquires to enable him function effectively in the turbulent business environment as an entrepreneur or a self-employed individual (Folahan & Omoriyi, 2006). Lyons (2002) described entrepreneurial skills as the skills needed to develop innovative products and services and to generate solutions to emerging needs in the marketplace. Stella (2014) explains entrepreneurial skills as skills or competencies that are critical for any entrepreneur for success in his or her business venture.

Entrepreneurs require a variety of skills in order to successfully manage an enterprise. Wickham, (2006) defines skill as simply knowledge which is demonstrated by action, before going on to add that SMEs performance results from a combination of industry knowledge, general management skills and personal motivation.

Lazear (2015) maintains that an entrepreneur is not necessarily required to be an expert in any single skill but, instead, is required to be a jack-of-all-trades (JAT). He argues that, in order to be successful, one must be 'sufficiently skilled in a variety of areas to put together the many ingredients required to create a successful business' (Lazear, 2015). Moreover, the JAT view of entrepreneurship is supported by Wagner (2006) who suggests that having a balanced skills mix stimulates entrepreneurship.

The idea that skills can be acquired also underpins the work of Lichtenstein and Lyons (2001) who developed a skills based framework termed the 'Entrepreneurial Development System'

(EDS). The EDS framework has been applied to rural areas of the United States to establish both the quantity and quality of an areas' entrepreneurial capital and is based on three main premises:

(1) ultimate success in entrepreneurship requires the mastery of a set of skills;

(2) these skills can be developed; and

(3) entrepreneurs do not all come to entrepreneurship at the same skill level (Lyons, 2003).

This system has also been utilized by Smith, Schallenkamp and Eicholz (2007), who present the skills framework under the headings of technical, managerial, entrepreneurial skills and personal maturity skills.

Study by (Stevenson, 1993) argues that entrepreneurs need innovative skills which comprise of the cognitive skills like creativity and behavioral skills like problem-solving. The study further argues that the main reason entrepreneurs are successful is their abilities to imagine, innovate and work around challenges within their environment. Nevertheless, skills alone are not largely effective as the local government should be involved directly in providing funds for capital investment in order to promote entrepreneurial ventures (Faizan & Haque, 2016).

Empirical studies of (Hamm, 2002; Whetten & Cameron, 2005; Scudder 2001) have revealed that entrepreneurial skills influence the growth and operations of SMEs. The success of entrepreneurs rely on the identification of competencies for start-ups and established businesses, as well as their survival and early-year growth. The study of Whetten and Cameron (2005) categories these skills into three groups namely "personal, interpersonal and basic management skills". Managerial level personnel are more adaptive and use social support constructively (Haque, Aston, &Kozlovski, 2018). Hence, adaptability is a skill that could be used by having higher social orientation.

1.1.2 Innovation

Innovation is defined as the process through which an invention or idea is translated into a good or a service from which value can be derived (Kantor, 2001). Innovation can be related to new products or services, new production processes, new marketing techniques, and new organizational or managerial structures. It also involves new technology, intellectual property, business, and physical activity (Mazzarol & Reboud 2008). Managers of SMES's behind small firms enjoy the advantage of flexibility and responsiveness and if able to respond quickly to innovative ideas could easily stir the progress of the company. SMEs which engage in innovation perform better (Mazzarol & Reboud 2008).

According to Laforet (2011) innovation for SMEs is driven by a vision to be successful, and improve on working conditions for a particular organization. Innovation creates positive outcomes for SMES's such as an improved reputation, a credible image, increased operational efficiency, lower costs upon growth benefits, better business performance, attracting a more skilled workforce, better in-house expertise and further openings for innovation. Innovation in an SMES however needs to be approached systematically by the management of a company to manage the possibility of incurring operational issues, having financial costs, uncontrollable business growth, loss of a good image and reputation due to poor innovations, employee and clientele issues. (Laforet, 2011).

Innovation has helped in the growth of several businesses, however it also backfires on some of the feasibility study if not properly done. Kiraka (2013) notes that the success of many innovations is measured in financial terms which is not always the outcome hence for those who want immediate returns always get disappointed as coming up with innovative ideas involves use of financial and human resources in the business which might not be available. Studies have also noted various benefits that come along with innovation. Hafeez (2013) for example mentioned product diversification, creating new markets, customer loyalty, brand awareness, business survival and meeting the customer expectations as some of the few benefits when a business embraces innovation.

Performance is often defined simply in terms of output terms such as quantified objectives or profitability. Armstrong (2006) defines performance as both behavior and results. This definition covers the achievement of expected levels as well as objective setting and review. According to Ginsbert (1985), there are three different levels of performance within organizations. They are distinguished as the financial performance, business performance and organization effectiveness, although the latter has been subsequently known as organizational performance. Performance is the key interest of every business manager or owner. The overall performance of the organization depends on proper management of the three levels, which fall within the jurisdiction of top, middle and lower management.

1.2 Statement of the Problem

Abor & Quartey, (2010) highlight that SMES's are largely driven by entrepreneurial skills. A lack of effective management through processes impacts on an SMES's ability to grow and could lead to the ultimate failure of a business. An entrepreneur's core strengths and skills are the paramount factors that determine the success of a business venture. SMES's are opened every year and only 80% make it through the first year of operation, 66% make it through the 2nd year, 50% manage the fifth year and only 30% make it to the 10th year (USA Bureau of Labor Statistics, 2017). The Kenyan environment presents an alarming situation where 400,000 SMES's fail every year without making it to the first anniversary, 2.2 million SMES's have been closed in between 2011 and 2016 due to operational challenges in costs, financing, and management and a lack of innovation.

Previous studies have been done assessing factors influencing performance of SMEs in general for example Kinyua (2014), did a study on Factors Affecting the Performance of Small and Medium Enterprises in the Jua kali sector in Nakuru Town, Kenya. There are no studies evaluating the influence of entrepreneurial skills and innovation on performance of small and medium enterprises (SMES).

1.3 General Objective

An assesSMEsnt of the influence of entrepreneurial skills and innovation on performance of small and medium enterprises (SMES)

1.4 Specific Objectives

1.4.1 To examine the influence of business entrepreneurial skills on performance of small and medium enterprises (SMES)

1.4.2 To determine the influence of innovationon performance of small and medium enterprises (SMES)

1.5 Significance of the Study

This study will be significant in enabling policy makers to analyze major factors contributing to the performance of SMEs in order to put in place the right support structures to enable the survival of this industry which is critical to the success of any economy especially in developing countries.

This study will also be resourceful in providing information for development agencies and researchers who may use it in educating, equipping and training entrepreneurs and executive management teams in companies to give room for the growth of this sector. Entrepreneurs and SMES managers will also benefit significantly from this study which they can use as a tool to improve on their practices and make it possible for them to excel in their small and medium business ventures.

The government of Kenya can use the findings for the research to assist in policy formulation and development of a framework for performance of small and medium enterprises (SMEs). Policy-makers will use the knowledge and data to adjust or strengthen the position in businesses policy formulation.

1.6 Scope of the Study

The main purpose of this research was to assess the influence of business entrepreneurial skills and innovation on performance of small and medium enterprises (SMEs). It focused on the business entrepreneurial skills and innovation as the specific objectives.

2.0 LITERATURE REVIEW

2.1 Schumpeter Theory of Innovation

According to Schumpeter (1935) Innovation is a specific process that is distinct from the combinations commonly carried out in the production process. In fact, although production is nothing other than a particular combination of productive forces, defined as coefficients of production or functions of production, inlinking input and output, innovation must be put into focus.

Schumpeter's theory therefore states that whenever an economy or a sector of an economy adapts itself to a change in its data in the way that traditional theory describes, the economy or an industry or some firms in an industry do something else, something that is outside of the range of existing practice. It specifies that innovation could occur from within itself and not as a response to an event. He therefore further states that, if at a given moment, the same quantity of a good or a product costs less than previously or if the cost of productive factors has not decreased, that means that innovation has occurred.

2.2 Empirical Studies

Schumpeter (1935) argued that a business without innovation and entrepreneurship cannot stand the test of time. This concept has been proven by several studies which have shown a positive relationship between innovation and the performance of SMEs. Several scholars have noted this import and have come with varied conclusions on this relationship.The survival of the business is also dependent on how innovative the business is (Polevoi, 2003). He found out that the businesses that come up with new products are able to weather the storm of change in the customer tastes and preferences. This helps in the performance and the growth of the business and this makes it survive.

Innovation and skills are strongly related to the performance of SMEs. A study by (Ruth, 2011) found a strong correlation between the two elements. Kiraka, (2013) also did a study on Innovation and Small, Micro and Medium Enterprises in Kenya and he found out the growth was more significant in those SMEs that embraced innovation and came up with new ideas. He, however noted that not all innovative activities were successful. Some faced rejection from the markets where consumers maintained status quo and were always afraid to try new products and hence stuck to what they already believed in. Therefore convincing them to purchase the improved product or service was a serious challenge.

2.3 Performance of Small and Medium Enterprises (SMEs)

According to Sebikari (2014), SMEs performance can be measured objectively by return on investment, market share, profitability and sales growth. Objective values are measured using

collected quantitative data. According to Kithae, Gakure, and Munyao (2017), the employment trend of the small enterprises sector in Kenya between 2014 and 2016 was noticeable. The total employment was estimated at 6.4 million persons, and which was almost entirely attributed to the increase in employment in SMEs.

Brem, Kreusel, and Neusser (2011) indicated that as SMEs resources increase, so may their investment expectations, leading to an increase in demand for products, services and labour. From resource-based perspective, SMEs performance can be evaluated by their profitability, turnover, and market share and job creation being measured by number of employees.

Performance measures may be in terms of profit, growth in sales, stake holderssatisfaction, competitive position and success in launching new products. Factors determining the performance of SMES include entrepreneur education, raw materials, entrepreneur competencies, technology. According to Sarwoko, Surachman, Armanu, and Hadiwidjojo (2013), performance of SMEs is determined by the characteristics of the owner. The overall entrepreneurial competencies are attributes of the entrepreneurship which include attitudes, beliefs, knowledge, skills, abilities, personality, and behaviour which is directed to achieve success. SMEs performance will be influenced by the skill and the ability.

3.0 RESEARCH METHODOLOGY

3.1 Introduction

This chapter looked at the suitable research methodology, the population involved in the study, the sample selected to participate in the study, the criteria used in selecting the sample, relevant data collection methods and procedures, as well as the data analysis methods that enabled the researcher find answers on the objective of the study.

3.2 Research Design

Descriptive research design was used for this research. It involves the use of relative variables and scientific methods to describe and analyze behavior. The intention of the researcher is purely to observe and describe the subject being studied without exerting any form of influence on the subjects. This study was descriptive in nature and involved quantitative analysis of data.

3.4 Data Analysis

The secondary data collected was analyzed using descriptive statistics and quantitatively. The data was presented through report writing.

4.0 RESULTS AND FINDINGS

The study established that there is a significant relationship between entrepreneurial skills, innovation and financial performance of SMEs. From the research, for SMEs to remain they have to introduce new products/services. Besides, the introduction of new product/service, technological newness in product and product/service differentiation (improve old products/ services to compliment customers' needs) has resulted in positive influence on the financial performance of SMEs.

The study found out that there is a positive significant relationship between process innovation and financial performance of SMEs as SMEs have developed and implemented new business methods and services which have improved production and delivery of services of most SMEs. The SMEs have applied entrepreneurial skills, new technology and new combination of materials in production which have enhanced process innovation which has resulted in improved the performance of the SMEs. This can be seen from the research that improved business processes and introduction of superior materials was worthwhile for SMEs in order to maintain sustainable competitiveness.

The study established that SMEs who implemented market innovation and entrepreneurial skills got a boost of increased sales resulting in high revenues. The study also established that SMEs should respond to customer complaints in time, introduce new market approaches (online marketing) and offer special delivery packages. This has significantly influenced the relationship between market innovation and financial performance of SMEs.

5.0 Summary of Findings, Conclusion and Recommendations

5.1 Summary of findings

Entrepreneurial skills and product/service innovation affect financial performance of SMEs as the introduction of new product/service, technological newness in product and product/service differentiation has influenced financial performance of SMEs. In comparison with competitors, the enterprises have introduced more innovative products and services.

Entrepreneurial skills and process innovation affects financial performance among SMEs consequently SMEs have developed and implemented new business methods and services which have improved production and delivery of services of most SMEs.

The SMEs have applied new technology and new combination of materials in production which have enhanced process innovation which in turn has improved the performance of the SMEs. Market innovation from the research has significant implication on financial performance of SMEs. Indeed most SMEs have managed to deliver special products flexibly according to customers' orders and that the application of online transaction, innovative marketing and

promotion campaigns to find new markets has a positive significant implication on financial performance of SMEs.

5.2 Conclusions

Entrepreneurial skills and product/service innovation affect financial performance of SMEs as the introduction of new product/service, technological newness in product and product/service differentiation has influenced financial performance of SMEs. In comparison with competitors, the enterprises have introduced more innovative products and services.

Process innovation affects financial performance among SMEs consequently SMEs have developed and implemented new business methods and services which have improved production and delivery of services of most SMEs.

The SMEs have applied new technology and new combination of materials in production which have enhanced process innovation which in turn has improved the performance of the SMEs.

Market innovation from the research has significant implication on financial performance of SMEs.

Indeed most SMEs have managed to deliver special products flexibly according to customers' orders and that the application of online transaction, innovative marketing and promotion campaigns to find new markets has a positive significant implication on financial performance of SMEs.

5.3 Recommendations

In order for the SMEs to successfully achieve high product and service innovation both the government and enterprise management need to create a business environment conducive for entrepreneurship and enterprise creation in which innovative firms have scope to expand their product innovation. There is also need for the government to develop and implement a broad range of mutually reinforcing and supportive policies that promote best practice policies which support company innovation such as those affecting patent, labour markets, taxes, competition, financial markets and business registration laws. They should also support the emergence and maintenance of innovative business through spinouts or collaborative development, promoting product development partnerships and attracting similar actors to come forward for creating a positive ambiance for product and service innovation, while at the same time improving the availability of market information and strengthening co-operation among firms, for instance in the fields of market intelligence, design and branding.

There is need for the government to enhance SMEs awareness and knowledge of all elements of the intellectual property system through greater interaction between intellectual property

offices, SMEs support institutions, and business associations, national and regional governments. These elements include patents, trademarks, industrial designs, utility models, trade secrets, copyright and related rights, plant varieties and non-original databases. Strengthen the integration of intellectual property issues in programmes and policy initiatives aimed at fostering innovation in SMEs.

In terms of improving process innovation, SMEs need to focus on improving their core competences. Furthermore, they need to cooperate with external partners to recompense for other competences and resources, especially in case of new product development.

SMEs need to pursue market innovation strategies that focus on product customization and customer intimacy in delivering their products and services while at the same time cultivating relationships with a small number of captive customers. This market intimacy will help SMEs make up for lack of resources for market intelligence as the customers will be able to offer them information on their current need and any changes in market competition.

REFERENCES

Abor, J., & Quartey, P. (2010). Issues in SMES development in Ghana and South Africa. International Research Journal of Finance and Economics, 39(6), 215-228.

Armstrong C. (1997), Development Management in Marketing, 3rd Edition, Business Skills, Preston UK.

Cooper, D., R., & Schindler, P., S. (2003). Business Research Methods.8th Ed, Boston, Boston. McGraw-Hill Irwin.

Hafeez, M.H (2013) "Does innovation &Relational Learning Influence SMES Performance?" Pakistan Study. Canada. Canadian Centre of Science and education.

Kinyua, A. N. (2014). Factors affecting the performance of Small and Medium Enterprises in the Jua kali sector in Nakuru Town, Kenya. Journal of Business and Management, 6(1), 5-10.

Kiraka, M.K. (2013). Micro, small and Medium enterprise Growth and Innovation in Kenya.Nairobi: Longhorn Publishers.

Kumekpor, K. B. T. (2002). Research Methods andTechniques of Social Research. Son Life Press and Services; Accra, Ghana.innovation in small firms. International Journal of Innovation Management,12(2), 223–253.

Laforet, S. (2011). A framework of organizational innovation and outcomes in SMEs.International Journal of Entrepreneurial Behavior & Research, 17(4), 380-408.

Lazear E. P. (2015) Entrepreneurship. Journal of Labor Economics23(4): 649-680.

Lichtenstein G. A. and Lyons T. S. (2001) The Entrepreneurial Development System: Transforming business talent and community economies. Economic Development Quarterly15: 3-20.

Malhotra,N., & Birks, D. (2007). Marketing Research: an applied approach: 3rd Ed.Harlow, UK. Pearson Education.

Mazzarol, T. and Reboud, S. (2008). The role of complementary actors in the development of Socio-Economic Stability of Karachi', Indus. Journal of Management and Social Sciences,4 (2), 30-44.

Orodho, A., J, & Kombo D., K.(2002). Research methods. Nairobi.Kenyattauniversity, institute of open learning.

Pandya, V. (2012). Comparative analysis of development of SMEs in developed and developing countries. In The 2012 International Conference on Business and Management(pp. 6-7).

Polevoi, L. (2013). How to Measure Your Small Business Performance. Los angeles: Vistage International.

Ruth, K. (2011). Relationship Between the Characteristics of SMEs and Performance. Kisumu: Maseno University.

Schallenkamp K. and Smith W. L. (2008) Entrepreneurial skills assesSMEsnt: the perspective of SBDC directors. International Journal of Management and Enterprise Development5(1): 18-29.

Schumpeter, J. (1935). Theories of Innovation. Paris: Dallos Library.

Wagner J. (2006) Are nascent entrepreneurs 'Jacks-of-all-trades'? A test of Lazear's theory of entrepreneurship with German data. Applied Economics38(20): 2415 -2419.

Wickham P. A. (2006) Strategic Entrepreneurship, Harlow: Pearson Education.