KIBABII UNIVERSITY

(Knowledge for Development)

PROCEEDINGS OF 2ND INTERDISCIPLINARY INTERNATIONAL SCIENTIFIC CONFERENCE 14 - 15 JUNE 2017

INNOVATIVE RESEARCH AND KNOWLEDGE FOR GLOBAL COMPETITIVENESS AND SUSTAINABLE DEVELOPMENT

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Theme: Innovative Research and Knowledge for Global Competitiveness and Sustainable Development

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Kibabii University and the Organizing Committee of the 2nd Interdisciplinary International Scientific Conference wish to thank all our donors' financial, material and technical support, thus making the conference such a success.
The Committee specificallyappreciates the support donations from the County Government of Bungoma, Midland Emporium, etc.
We are indebted to the overall Co-ordination and Planning Committee chaired by Prof. Dr. Ing. B. M. Mutua and the Conference Organizing Committee Chairman, Dr. P. Obino. The Technical Sub-committee chaired by Prof. D. Siamba, the Publicity Sub-committee chaired by Dr. K. Nyende, the Resource Mobilization Sub-committee chaired by Dr. R. Wafula and the Logistics Sub-committee chaired by Ms. E. Chepkurui deserve our applause for their dedication and exemplary service.

The success of this Interdisciplinary Scientific International Conference was largely due to teamwork of the entire Kibabii Community and specifically those who chaired the various plenary and technical sessions, as well as rapporteuring, security, catering, ushering among other key functions. We salute you individually and collectively.

We wish to acknowledge the work done by the team that put together this proceedings led by the Technical Sub-committee Chair, Prof. D. Siamba. Others are Dr. P. Obino, Dr. D. Nyongesa, Mr. S. Ogallo and Mrs. Margaret Wanambisi.
Sincere appreciation to the conference Chief Guest, Prof. Richard S. Musangi, and other Keynote speakers including Prof. M. Gikungu, Prof. P. B. Kibas, Dr. A. Assey, Dr. B. A. Mulinga, and Dr. Austin Owino. We are proud to be associated with you.

2nd Interdisciplinary International Scientific Conference
Kibabii University
P. O. Box 1699 – 50200
BUNGOMA, Kenya.

Forward

The 2nd Interdisciplinary International Scientific Conference was organized by the University in with support from the County Government of Bungoma among other organizations/agencies.

One of the key functions of the University is disseminate the outcomes of research scientific conferences, seminars, workshops among other fora. In line with this University mandate, the main objective of the conference was to bring together various stakeholders with a view to sharing and exchanging ideas, knowledge, skills and best practices in diverse fields. The conferences targeted scholars and industry players of diverse backgrounds under the main theme **Innovative Research and Knowledge for Global Competitiveness and Sustainable Development** and a series of subthemes herein outlined.

The set goal of this scientific conference was agreeably met. This document, therefore, sets to put together the Conference Proceedings including presentations, discussions and deliberations of the conference.

Kibabii University
Knowledge for Development

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Vice Chancellor's Introductory Remarks

Prof. Isaac Ipara Odeo

It gives me great pleasure to welcome all our distinguished guests, keynote speakers and other conference participants to the 2nd Annual international conference whose theme is 'Innovative Research and Knowledge for Global Competitiveness and Sustainable Development'
The conference will provide an opportunity for seasoned scholars in diverse disciplines from both within and outside the country to engage in academic deliberations that will witness the dissemination of research outputs key to socio-economic development of our country and the global society as provided in Kenya's Vision 2030 and the Sustainable development Goals

It is acknowledged that the conference will accord this young University an opportunity to market its programmes and activities at the National and International level. It is hoped that the conference will positively contribute to improvements in teaching and international ranking of the university.

Our drive in research as a TVET university is to provide workable and practical solutions to the socio-economic and technological and environmental challenges that face humanity. It is my hope and trust that the research findings and innovations will be useful in the quest to address issues related to health, education, climate change, food security and social equity.

Lastly, I wish to express my appreciation to the Chancellor, Members of the University Council, Senate, Management and the organisers of the conference for their support and contributions which made the holding of this conference possible

Thank you and may God bless you.

Rep. Chairman of Council Remarks

Embracing Research &Development for innovations and Sustainable Development

Prof. Mary Gikungu
Centre for Bee Biology and Pollination, NMK
Email: mgikungu@museums.or.ke /mgikungu@yahoo.com

Introduction

What is Research& Development?

Basic Research

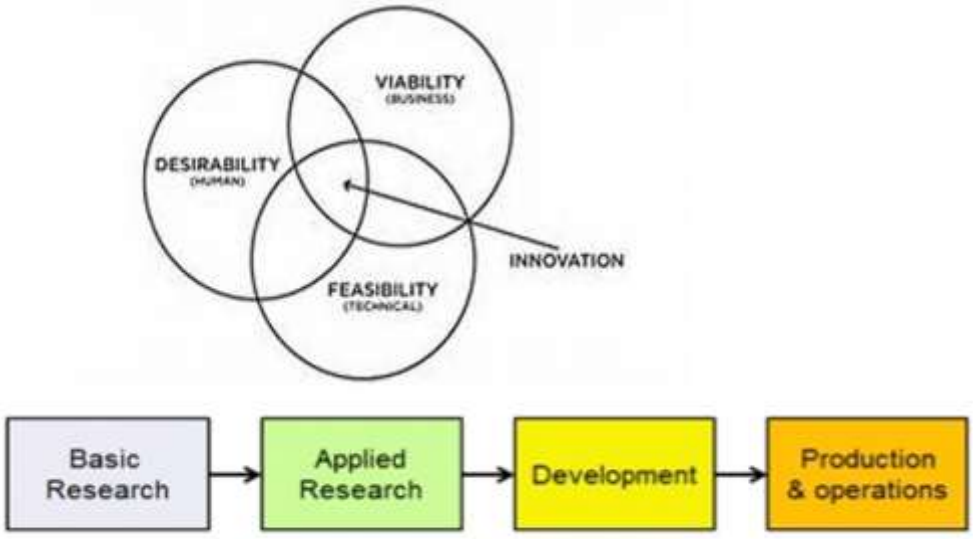
A systematic study aiming at more complete knowledge and understanding of fundamental aspects of a concept or a phenomenon. It is generally the first step in research and development, performed to give a comprehensive understanding of information without directed applications toward products, policies or operational processes. Basic research/pure/fundamental research is carried out to know and explain thorough testing theories which provide broad generalizations. Theory—predicts and explains natural phenomenathat is basis to develop knowledge but not solve social problems

Applied Research

It is the systematic study and gleaning of knowledge and understanding to apply to determining and developing products, policies or operational processes. Comparatively, basic research is time-consuming while applied research is more costly due to its detailed and complex nature.

Product innovation is the introduction of a good, or service, that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics.
Process innovation is the implementation of a new, or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software.
Marketing innovation is the implementation of a new marketing method involving significant changes in product design, or packaging, product placement, product promotion or pricing.
Organizational innovation is the implementation of a new organizational method in the firm's business practices, workplace organization or external relations.

The genesis of an innovation



Status and opportunities for innovative development in Kenya

Kenya has embraced the goal of industrialization as a way to transform the structure of the economy.

Vision 2030 envisions a country's transformation into "a newly industrialized, middle income country, providing a high quality of life to all its citizens in a clean and secure environment".

It is instructive to note that Kenya's capacity to compete in the global market depends on the ability of its people to research, innovate, patent, involve entrepreneurs and apply the relevant technology for industries' growth and development

Occupation	**Number**	**% Distribution**
Researchers	9,962	33
Technicians	6,498	22
Other support staff	13,526	45
Total	29,886	100

Recent studies conducted in Kenya revealed that innovation development in Kenyan universities and public research institutions ranks low.

Over the last two and half decades private companies and individuals led with 81.7 % while universities and research institutions have been awarded only 5.7%.

The question remains, why are the universities and research institutions ranking very low in innovations and patents???

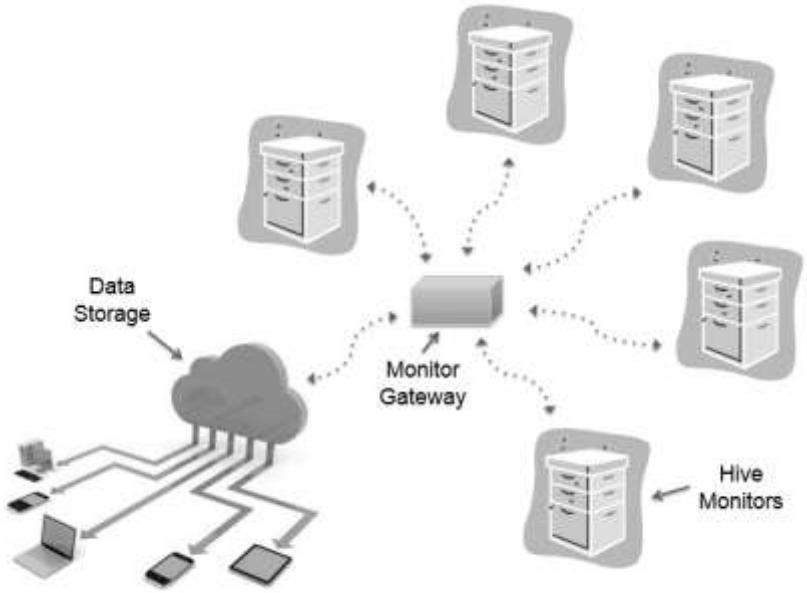
Case Studies

1. E- beehive monitoring

A methodology has been developed to monitor the effects of plant protection product on the homing flight of honeybee forager (Evans, 2015)

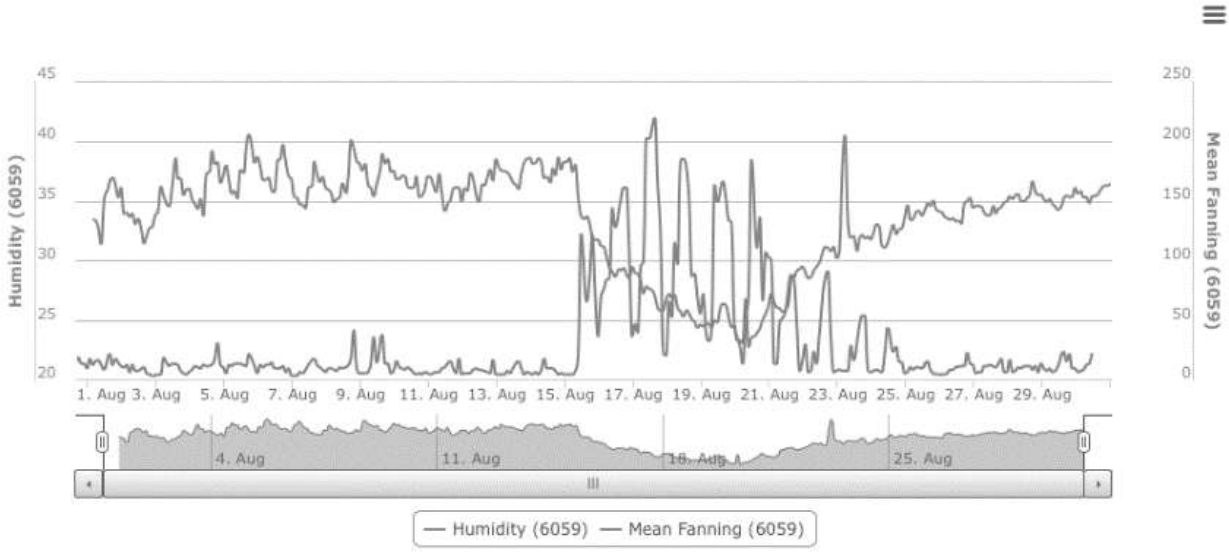
It has been found effective in Italy and Uk

The technology offers both economical and non-intrusive data collection

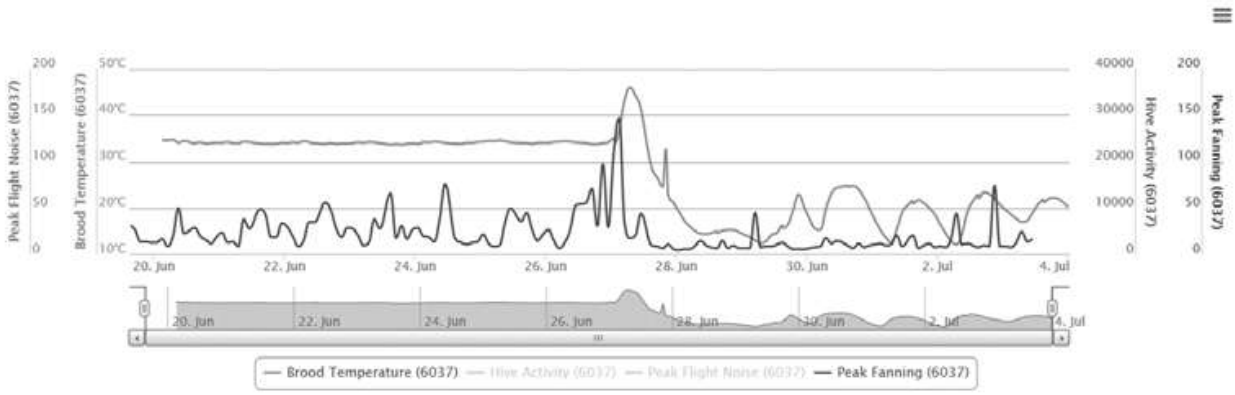


A hive monitor is fitted above the hive entrance.
It is can measure sound, temperature, relative humidity and movement. Sound is registered using a microphone which is housed within the monitor enclosure.
Temperature is measured both inside the monitor as well as.
Movement is sensed by the accelerometers within the monitor allowing detection of theft or hive displacement.
Furthermore, monitors have spare ADC (analog-to-digital converter) and relay inputs which can support third party CO2 measurements and bee counters.

Humidity data



Temperature data



2. Bee Vectoring Technology (BVT) using managed bees

Established on the basis of pollen transfer byBeesto deliverpesticides directly to the crop (Bee Vectoring Technology, 2015). The product uses Bumblebees to deliver pest controlling Vectorite as a substitute fortraditional spraying methods. The bees live in a hive, as normal, has a dispenser system that directs the bees to the one exit out of the hive. Bees fly through the inner tray containing the bio-pesticide powder that sticks to their legs as they exit. The technology was developed in Canada using that same capability to move other kinds of microscopic particles (e.g. spores etc. of biological control agents to suppress fungal pathogens and insect pests. It has been found successful in Mexico, Canada and Brazil and currently being applied in Kenya at JKUAT

Entomopathogenic fungi Technology

An *entomopathogenic* fungus is a fungus that can act as a parasite of insects and kills or seriously disables them**.**

Mode of action of entomopathogenic fungi

- Lives parasitic and saprophytic life
- Spores stick on host cuticle and develops pegs to hold on the host
- Cutinase is produced for penetration
- Mycial marts ramify in hosts coelom blocking the respiratory and breathing as well as feeding system
- Hosts succumbs and dies

- Fungus turns saprophytic
- "Mourning "or visiting insects get infected and the cycle continues.

In the absence of the host, the fungus produces resting spores (Chlamydospores)-which can persists in the soil for several years-Food to BGBD

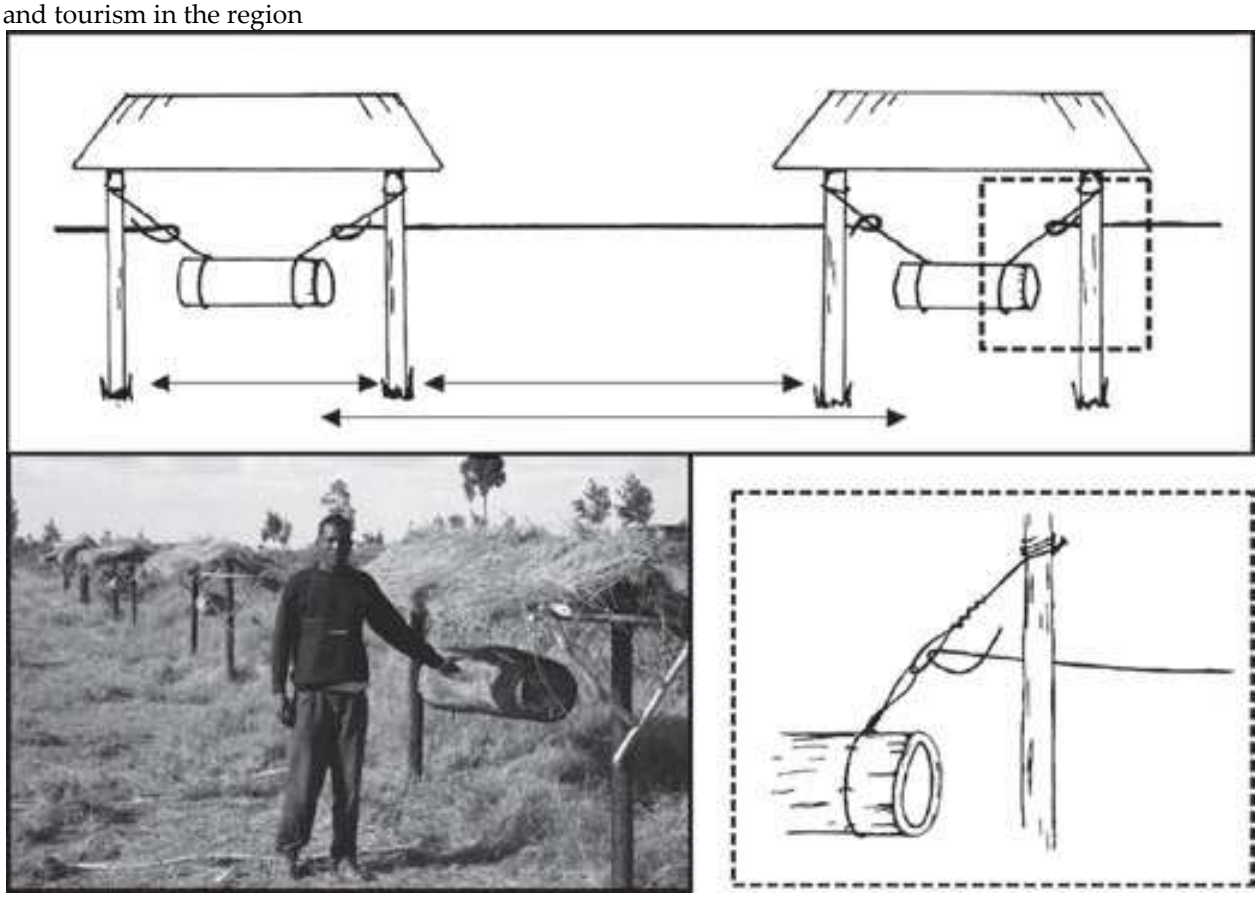
Metarhiziumanisopliae infected cockroach (green muscardine disease)

3. Beehive fence for elephant movement control

Size does not always matter

-A successful bee and elephant project in Mozambique, Tsavo (Kenya and Chad has led to reduced human animal conflicts.

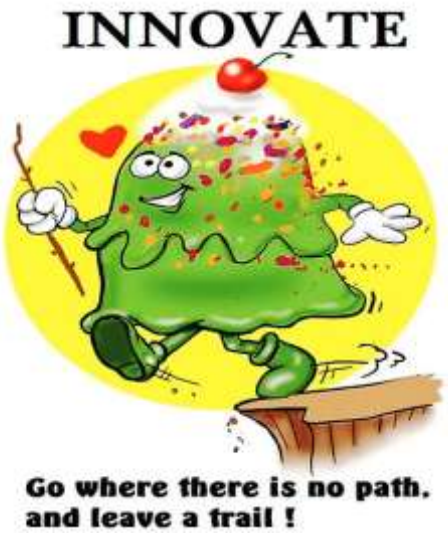
Benefits include increased community income through hive products, increased crop production and tourism in the region



Beehive fence, honeybees a deterrent to elephants (LucyKing, 2009)

Challenges affecting innovations in Kenyan public institutions

Lack of innovative culture-perception
Lack of innovation integration in education curricula at all levels
Lack of innovation-oriented courses
Poor mentorship in entrepreneurship e.g. Bodeni Primary School-
Lack of problem solving approaches
IT illiteracy –Malaysian children recently made robots that can play football
Poor lab facilities
Lack of IP and patenting knowledge
Patenting procedures take too long
Insufficient money for research
Lack of incentives or weak rewarding system
Inadequate IPR and incubation centres or offices where innovative ideas can be reported and protected-e.g .KU
Individualism-researchers do not interact with entrepreneurs and industries
Poor implementation of innovation policy-KENIA
Innovations costs are too high



Way forward
Change of attitude—education for job creation and industrialization
Increased funding for R&D by the government
Teaching of courses/modules on innovation
Increased collaboration between universities, industries and entrepreneurs
Introduction of policies on integration of innovation activities into all levels of education system.
Mentorship in ST&I
Tax incentives by the government
Government support to encourage spin-off businesses from universities and R&D funded research institutions

Chief Guest Address and Official Opening

Professor Richard S. Musangi Ph.D, EBS
Chancellor, University of Kabianga

1. INTRODUCTION

I would like to express my sincere gratitude to the Council, Management, Senate and Staff of Kibabii University for having requested me to officially open this important conference. This conference forms a major event in the calendar of this great institution. As we are all aware, the main mandate of an institution of higher learning is to train and carry out research aimed at sustainable development. I therefore note with satisfaction that in the two days of this conference, you will be covering seven topics that are within the preview of your mandate. I also note from the programme, that there are lead experts who will guide each of the topics that are listed. My comments will, however be limited to only four areas namely;

a) Training
b) Research and development
c) Environment, climate change and sustainable development
d) Agricultural productivity and marketing systems

However, the issue of gender equity is very much inherent in each of the topics mentioned above. On the other hand, I will leave the topically important issue of ICT and global security to experts at this conference. Surface is to say however, that ICT is an integral part of training, research and agricultural productivity and marketing.

2. TRAINING

Training at university level becomes more specialized, more so as we move from undergraduate to masters and Ph.D levels. The school syllabus, on the other hand, provides a general background. There has been a lot of criticism of late about the competency of our graduates, sometimes unfairly. However, it should be noted that this criticism is based on many things two, among them, being the inability of graduates to communicate and translate theory into practical application. I have, throughout my time as a university teacher, held the view that the blame for luck of effective communication can be apportioned equally to schools and universities. Writing compositions at school was one way of improving communication. The others were school debates and being able to carry out precis of long texts while retaining the thrusts of those texts. At university levels, essay answers and seminars are sure ways of improving communication. However, these exercises are hampered by large classes occasioned by double intakes and/or parallel programmes. Additionally, there is staff shortage arising out of funding deficits. This has forced many universities to rely heavily on part-time lecturers who themselves may be full-time teachers elsewhere. This type of lecturers naturally prefers giving lectures than seminars which are more involving as they are faced sometimes with long travels. This phenomenon is mostly manifested at campuses and in private institutions which to not want to invest in permanent staff who are more expensive than part-timers.

Practical skills are important in translating theory into practice. Two examples in agriculture will suffice:

a) It does not matter whether you know the consequences of the wrong pulsation ratio (that is the ratio of air to vacuum) in a milking machine if you cannot fix the machine properly on the udder of a cow when milking. Wrong adjustment will lead to the milking machine teats falling off the udder. On the other hand if it stays on, it will lead to bleeding of the udder. This will result in the cow getting mastitis that is if the cow can withstand pain.

b) The second example is related to tractor ploughing. If the plough is not adjusted properly, this will increase traction and lead to excessive consumption of fuel, cause plough chains to break often, cause excessive ware of the tyres in addition to the ploughed land showing ridges instead of being even or flat a phenomenon called complete inversion. One needs to know how to address these consequences practically.

3. RESEARCH AND DEVELOPMENT.

The need for research in an institution of higher learning cannot be over-emphasized. This has many benefits among them being:

a) The creation of necessity for teaching staff to read new advances in the areas of their specialization. This ensures that they constantly update their teaching materials. This has been made simple in this era of technology and ICT. Libraries are though still important particularly in the provision current journals. Text books are also relevant in that they provide the basic knowledge of a particular discipline.
b) Research is used to train graduate students who are needed in the country and globally to provide specified skills for development.
c) In the area of agriculture, for example, graduate research is often used to provide solutions to local agricultural development problems. The 1862 Land Grand Universities in the USA were used to solve local problems thus improving agricultural productivity. Locally, agricultural research at universities forms an integral part of the National Agricultural Research System and that of the consultative Group for International Agricultural Research (CGIAR). Two of these are located in Kenya, namely the World Agroforest Centre (WAC) and International Livestock Research Institute (ILRI)

4. ENVIRONMENT, CLIMATE CHANGE AND SUSTAINABLEDEVELOPMENT

The fact that climate changes are taking place thus affecting the environment and consequently sustainable development cannot be denied. In Kenya, climate conditions are influenced by the country's equatorial location, differences in altitude and the monsoonal system of the Indian Ocean. The maritime air mass from the Indian Ocean penetrates in an easterly direction, bringing in the long rains from March to May. This trend is repeated, although weakly, in September to November, inducing what is referred to as short rains but which in some years, such as 2006, tend to be heavier than the long rains. Mean annual rainfall ranges from 250mm to over 2000mm, with 80% of the total land area receiving between 250mm and 750mm. the differences in altitude have a pronounced influence on the annual temperatures. Tropical hot and humid temperatures (above 25^0C) are experienced in the Coast and in the Northern regions of the country, while cool temperatures (below 20^0C) are characteristic of the higher altitude areas where most high potential agricultural land is situated. It is evident, therefore, that there are large variations in climate as a result of differences in rainfall and temperature. However, unlike most other equatorial countries, Kenya has a mostly dry climate.

The effects of climate change globally are for example:

a) The world oceans have become more acidic since the industrial revolution of the 1800s, thus affecting the plankton upon which fish feed. This has consequently led to the decline of fish yields, a major source of protein for humans. To this, add the effect of plastics that are increasingly being dumped in the seas and thus causing also the decline of fish yields.
b) Forests affect the recharge of underground water capacity by slowing down surface run-off, apart from their major role of absorption of carbon dioxide (CO_2) from the atmosphere.

A study published in Australia five years ago showed that tropical forests absorb four times Co_2 morethan temperate forests because most of their trees are ever green and have large leaf area index unlike temperate forests which shed leaves during winter have mostly spinny leaves with low leaf area index.

c) Wetlands act as river kidneys by absorbing silt contained in surface run-off and thus preventing pollution of rivers. They also provide biodiversity in their environment. Furthermore, they mitigate against frequent floods and draughts caused by climate change.

All in all, climate change is an accelerant of instability that could cause food and water shortages and increase global tensions. President Trump should heed Pope Francis' advice that he should build bridges and not walls by helping developing countries to cope with the effects of climate changes. This cannot by any stretch of imagination, be called distribution of American wealth to the world! It is a well-known fact that the USA holds only 5% of the world's population but contributes 25% greenhouse emissions.

5. AGRICULTURAL PRODUCTIVITY AND MARKETING SYSTEMS.

Agriculture is the mainstay of many developing countries, especially in Africa. In Kenya for example, over 70% of the economy is dependent on agriculture. When agriculture does well so does the economy and vice-versa. Major challenges have been experienced in this sector, especially in Kenya, some of which being:

a) Land: Availability of land for agricultural production has continued to decline due, mainly, to sub-division of land into small and uneconomic sizes. The Ndung'u report recommended, among others, the minimum size of land to be no less than two acres. This recommendation has not been effected leading to subdivisions of land to less than two acres in many rural areas of Kenya. In some areas of rural Kenya, the subdivision has reached a point of an acre, hardly enough for a house.

b) Productivity: This too has declined over the years. This has been occasioned by several factors, namely

   i) Continued use of DAP, for example, has seen crop yields decline due to the lowering of soil pH (hydrogen ion concentration) thus making the phosphorus, which is responsible for greening in plants, not being absorbed by plants, despite being present in the soil. It should be noted that most soils in Trans Nzoia and Bungoma counties contain significant deposits of rock phosphates. These deposits of rock phosphates continue into Eastern Uganda.

   ii) Timely availability of inputs and at affordable prices and indeed attainable conditions. Seeds are also expensive. Research into the provision of composite maize seed incorporating apomistic gene found in grass growing locally (*Bracharia ruzuziensis*) in Bungoma County was not encouraged by even international agricultural research systems probably at the behest of international seed companies. This would have enabled small scale farmers to select their seed for planting the next season from the previous season phenotically.

   iii) Marketing. Efficient marketing systems will encourage agricultural production. Announcement of next season's prices in advance would enable farmers to plant more or less, accordingly. This is done in the USA. As early as 1951, W.O Jones of Stanford University proved that even small scale cassava farmers in the Belgian Congo, now DRC Congo, responded to prices in the normal way thus growing more if the prices were good and vice versa. Previously, a theory had been

advanced that peasant farmers respond to prices in a perverse way thus growing little when the prices were god and more when the prices were bad because they have a target demand. In 2016 in South Africa for example, because the drought that led to maize shortages and consequently increase maize prices, the area under maize increased from 1.9 million hectares to this year's 2.6 million hectares thus producing surpluses.

iv) Storage. Proper storage both at farm and at national level has impacted adversely on food availability. It is estimated that up to 25% of crop produce is lost due to poor storage. This may be understandable for resource poor farmers but not for institutions such as NCPB. Recently we heard that the NCPB had lost thousands of bags of maize due to bad storage when some of it was released for human consumption in Samburu County. I do hope that this maize was not sold to livestock feed producers because the carcinogenic aflatoxin they contained will manifest themselves in the meat and milk that humans consume.

v) Availability of Credit. Due to lack of collaterals and high transaction costs frequently involved in doing business with formal institutions, small scale farmers especially women, are unable to access finance from lending institutions. Although it is recognized that the basic roles of a government are to establish macroeconomic stability and ensure that markets are free to respond to economic incentives, these are not enough especially in the case of rural poor farmers. Commitment of public resources through such institutions as AFC or similar institutions as the Grameen Bank in Bangladesh, are essential in alleviating food insecurity by:

   a) Enabling farmers to have access to farm inputs such as fertilizers, improved seed and acaricides leading to increased productivity of both crops and animals.
   b) This in turn leads them to be in a better position to adopt technology that is necessary for increased yields.
   c) The availability of credit also enables farmers to prepare their fields early and plant on time in the case of crops.

In conclusion, I am sure that presenters of the various topics outlined in the programme will have much more to say than I have raised above. However, the ultimate aim of this conference is to make the proceedings of this conference available to as many stakeholders as possible. Once again I would like to thank the conference organizers for inviting me to grace this occasion. I wish the second University of Kibabii 2nd International Conference a great success.

THANK YOU.

Keynote Speeches

1. Agricultural Productivity and Marketing Systems through Science, Technology and InnovationDr. B. Mulianga
2. Women and Gender Equality in Social and Community DevelopmentDr. A. Aseey
3. Dynamics in Global Trade, Investment And Sustainable Development. Prof. P.B. Kibas
4. Emerging Trends in Science and Technology for Global Security and Sustainable Development. Dr. Austin Owino

Sub-Theme 1:

Paradigm Shifts in Access and Management of Education for Societal Development

Challenges Facing New Kenyan Higher Education Institutions: The Case of Kibabii University

Isaac Ipara Odeo
Kibabii University

Introduction

Over the past two to three decades, universities have faced with major challenges. These have resulted in significant transformations in the scope of their mission, governance, knowledge production and circulation, and relations with wider national, regional and global economies and societies (Materu, 2007). These transformations are part of a wider 'paradigmatic transition' facing all societies and universities, around the world (Santos, 2010). In, Kenya, higher education system has expanded significantly since independence based on few elite national universities that catered only for the fortunate few to over 33 public and several private Universities. As a result, student growth has been impressive. Just 1000 students were enrolled in 1963 and today there are over 350,000 university students in Kenya, both full-time and part-time. This exponential growth in student enrollment and public university system has had and still is faced with many challenges. This paper uses Kibabii University, one of the Kenyan universities established in recent times to identify the main challenges facing Kenya's public higher education system and to propose plausible and concrete steps to policy makers and educational leaders can take to address those challenges to ensure the country's higher education system prepares the human capital, which is necessary for the construction of a knowledge economy

Establishment of Kibabii University

Kibabii University was among the 9 that were established at the beginning of this decade. The others were Taita Tavetta, Rongo, Kirinyaga, Murang'a, Machakos, Embu, Co-operative and Garissa. The establishment of Kibabii University (KIBU) is traced to the origins of Kibabii Teacher Training College which dates back to 1932. But was moved to Eregi in 1962. The idea of Kibabii Teachers College was revisited by the local community in 1978. For more than twenty years, the proposed Kibabii Teachers Training College in Bungoma South district remained a mere dream until 19th September, 2007, when His Excellency President Mwai Kibaki graciously presided over a ground breaking ceremony at the proposed site with a target that the college was to be fully operational by 25th of May 2011.

Due to a request by the leaders from Bungoma County, His Excellency, President Mwai Kibaki, declared that the newly constructed facilities for Kibabii Diploma Teachers' College be converted to Kibabii University. This was formalized by the Kenya Gazette Notice of 12th August 2011 that established Kibabii University as a constituent college of Masinde Muliro University of Science and Technology (MMUST) via Legal Notice No.115 of August 2011.

Kibabii university College started operations with a workforce of 52 staff and enrolment of 333 students distributed across four prorammes allowed by MMUST Senate including Education Arts and Science, Commerce, Science (Physics, Chemistry and Biology), Computer Science, Information Technology, Social Work and Criminology, all housed in two faculties. In November 2015, His Excellency Hon. Uhuru Muigai Kenyatta President of the Republic of Kenya and Commander in Chief of the Defence Forces awarded the Charter which gave the institution fully-fledged university status.

Rationale for establishment

At the time Kibabii University was established, there were 21 fully fledged Universities in Kenya. Yet there was still the push to have more. According to UNESCO (2014) the expanding number of KCSE students who obtain the required grade of c+ and above for direct admission to universities and in this case the universities have not been able to admit all the students who qualify for direct admission from school. One major push was the need to have institutions of higher learning that would provide

education that was relevant to the national interests and government policies. Efforts towards poverty reduction that came into effect in 2003 had still not been met. The first cycle of the Vision 2030 which laid emphasis on quality higher education to drive Kenya to a middle income country was gaining momentum along with the Millennium Development Goals and Sustainable Development Goals. The narrative of developing critical human resource and responsible citizens to contribute to economic development became imperative.

The existing legal structures in the form of the Universities Act 2012 which provided for a university in each county added momentum. It was not surprising that political pressure and completion from leaders took advantage to lobby for the establishment of such institutions in different parts of the country.

Events at the global level added another dimension. It became clear that without more and better higher education, developing countries would find it increasingly difficult to benefit from the global knowledge economy. Increase in the number of universities and therefore increase in university graduates appeared to be the most possible strategy to leverage. The world economy is changing as knowledge supplants physical capital as the source of present and future wealth particularly with technology driving much of the process. Whoever has a piece of this cake would place themselves at a point of advantage.

One other reason that made it possible for government to concede to the creation of new universities was a decision that was made a decade earlier. In 2003 the Government introduce free and compulsory primary education. The numbers of students seeking admission who may have benefitted from this became clear in 2012. Flow from increased access at secondary level.

Significant developments

It was expected that Kibabii University would contribute to the generation of knowledge which was becoming increasingly critical to national competencies and strides have been made in this direction. Kibabii University has identified and taken advantage of the opportunities available and has made significant developments in it short period of existence. These include:

i. *Increased autonomy to Universities*

   Academics thrive when they are given the liberty to pursue original and timely issues, and the space to provide critical analysis. Their work, in turn, challenges society to grow and improve. Currently 25 per cent of African states constitutionally protect academic freedom. Documents like the *Dar es Salaam Declaration on Academic Freedom and Social Responsibility of Academics*, and the *Kampala Declaration on Intellectual Freedom and Social Responsibility* are also encouraging

   In line with these declarations, the Government of Kenya has directed State corporations including universities, to embrace modern business management practices. State corporations boards have therefore been accorded relative autonomy in running their respective organisations. KIBU has seized upon this opportunity to positions itself as a major player in innovative research, technology development and transfer. This has been possible due to cordial relationships with regulatory entities, engagement with other stakeholders including the public through its outreach programmes

ii. *Increased awareness on the role of STI in sustainable development*

   In the recent past, the government has recognised the important role of STI in sustainable national development. To this end, it has not only increased the number of STI institutions but also increased funding for STI activities. KIBU as a TVET institution has taken advantage of this opportunity to prioritise its activities with flagship projects being STI based.

iii. *Increased enrolment*

The enrolment trend from 2012 reveals that figures have been rising exponentially and more and more students have over the few years have identified Kibabii as a university of their choice. This is evidenced by the number of PSSP students which has been rising steadily with encouraging gender and ethnic distribution across programmes. In line with the vision,

Review and development of Programmes

In line with the vision, quality and relevance of programmes is a strategic focus of Kibabii University. Previously academic programmes were those inherited from MMUST. After graduation and as one of the requirements by CUE it was found imperative to address issue of quality and relevance of programmes. A successful Curriculum review and Accreditation process for existing programmes has been undertaken incorporating inbuilt quality assurance characteristics such as evaluation of lecturers by students, external moderations and alignment to CUE and ISO standards

In addition, new programmes such as Nursing have been developed to address key development and social issues in the county, region and beyond.

Physical development

Like the rest of the university colleges, Kibabii inherited incomplete structures of the Kibabii Diploma Teacher Training College. With support from the National and County governments, Kibabii University has been able to complete the stalled tuition block. Offices and laboratories. Management. This has facilitated hosting technology materials, ease delivery of lectures, assessment, consultations. Improved Internet access has blended electronic learning and assessment methods to advantage of the academic community.

Reasons for success

The significant strides have been possible due to Clear vision of units and university, Direction for strategic planning with efforts popularize the concept among faculty, students and administration, strict compliance withStewardship Laws (mwongozo) and otherstatutory requirements and stakeholder consultations

Challenges

The rise in student numbers has been most dramatic in public universities compared to their private sector counterparts, with the bulk of enrolments occurring in the public sector (Mutula 2002; Ngome 2013). Enrolments in public universities increased steadily from 3.443 students in 1970 to about 20,000 students by 1989/1990 (Ministry of Education 2012). The numbers sky-rocketed with the 1990 intake of 21,450 students, increasing to a total of 41,000 students. By 1998/1999, total enrolment in public universities had climbed to 42,020 students (Mutula 2002), reaching 67,558 students in 2003/2004. The number increased to 159,752 students by 2009/2010, reaching 198,260 students in 2010/11 and about 240,551 students in 2011/12 (ICEF Monitor 2015; Ministry of Education 2012; Nganga 2014; SoftKenya n.d). By the end of 2013, enrolments in public universities had reached 276,349 students (ICEF Monitor 2015; Nganga 2014). The dramatic growth in enrolments in 2013 resulted from the admission of record numbers of students by public universities, beating their fast-growing private sector rivals and defying infrastructure constraints that have been dogging them. Despite the surge in student numbers, higher education faces numerous challenges, frustrating its ability to produce more quality graduates. These include:

1) *Inadequate requisite Infrastructure*

The University is still in the process of building the requisite infrastructure and therefore certain facilities needed for conduct of research such as highly equipped laboratories are not in place. Like most young Universities KIBU was established in facilities utilized by tertiary institutions of training /learning. Such inherited structures in most cases do not depict a University aura. Even those constructed through government funding are grossly inadequate and do not meet current needs of staff and student rising population. Due to paucity of the facilities, Kibabii University is unable to attract and retain qualified and experienced staff particularly from other parts of Kenya.
Poor and inadequate infrastructure has often led to congestion in the library, lecture rooms, laboratories and catering.

2) *Inadequate collaboration*

Although the University is already collaborating with other peer academic and research institutions and development partners, this remains inadequate and needs enhancement in a globalized education system to improve on student/staff exchange and Public and Private Partnerships (PPP) especially in establishing of suitable accommodation facilities. Being a relatively nascent University, KIBU is still in the process of establishing and operationalising the requisite infrastructure, structures and systems to enable it to fully meet its mandate in development and also to be recognised internationally.

3) *Relatively low visibility amongst peers*

The visibility of KIBU is still low and is partly attributed to *Inadequate ICT capacity.* ICT is a key driver for research, innovation, technology development and transfer. The current ICT infrastructure at KIBU is not adequate to support the growing demands for its services. Teaching methods are outmoded. Rote learning is common. A more enlightened view of learning is urgently needed, emphasizing active intellectual engagement, participation, and discovery, rather than the passive absorption of facts..

4) Inadequate human resource

Numbers and quality. Majority are holders of masters degrees. These are unable to provide academic leadership and capacity in cutting edge research that would attract funding. The other dimension is administrative staff. As a result, institutions make do with officers who have little grasp of operations in institutions of higher learning and are unable to give direction and stewardship in terms of development of policy, financial management, human resource /labour issues and principles of corporate governance.

Funding *(Budgetary)* Constraints

Currently, Kibabii University draws its funding from the National Government. As presented in table 1, the funds are grossly inadequate for KIBU's activities. Being in a nascent Institution, KIBU needs a large pool of developmental and recurrent expenditure..

Exchequer grants for the period 2012 to 2017

Financial year	Recurrent	Capital development
2012/2013	178,900,000.00	33.587,515.00
2013/2014	206,505,672.00	50,223,809.00
2014/2015	231,670,749.00	177,746,667.00
2015/2016	281,558,795.00	100,994,714.00
2016/2017		235,000,000.00

Total		

In addition, the policy requirements that funds are released against completion certificates meant that KIBU missed on 2013 and 2014 allocations on development capitation. This is great setback on requisite infrastructural development needed to meet the basic requirements. With poor structures, the University is unable to attract fee paying student raise enough appropriation in aid (A- in A) and since ability to invest in other income generating projects is limited. It is thus not possible to raise A-in-A to supplement and complement Government funding.

Geographical Location

Universities established in the rural settings with no complement infrastructure including all weather roads, power supply, fixed line or even mobile telephone connections, internet services, appropriate medical services, accommodation facilities, etc find it difficult to attract and retain qualified staff and students. For instance, Commission for University Education has outlawed pit latrines on university campuses but in the rural areas without reliable water supply, this becomes the only remedy.

Local population expectations and External interference

External interference from political circles and local leadership which has been exacerbated by devolution. It is common for communities to demand for their own in the appointment of academic and administrative staff. There is discernible element of tribalism, nepotism and favouritism at the expense of quality. Unfortunately this has also infiltrated students' minds, relations and leadership. There is an emerging trend of rising ethnicity among staff and students. Politicization: while it has helped address injustices and promote democracy, in many instance it has inappropriately disrupted campus life.

Problems faced by students

Difficult conditions for study. Overcrowded classroom, inadequate library and laborartory facilities, distracting living conditions and few student services if any. Cost of education: Roughly 15% of students are unable to raise fees and pay for upkeep. For one reason or the other, these are the ones normally left out of the Higher Education Loans Board safety net. Even when they benefit, they are rarely allocated the full amount applied for. Of great concern is that some of the underprivileged use this meagre resource to also support siblings back home. Many students start studies academically unprepared for higher education and the drastic shift from employment based to entrepreneurial training.

Way forward

Debate about higher education must be informed by historical and comparative knowledge about contribution of higher education to social, economic and political development-but also should take clear account of the challenges the future will bring.

- Manager should be: competent, hardworking, forward looking, effective management, and communication skills, professionalism, ethics, flexibility among qualities expected.
- Cost cutting measures: School practice. Restricted to within the region, cost of operations reduced, phase out campuses, right sizing staff, out sourcing, use of staff on contract. Strategies to decrease medical bills.
- Need for dialogue-national conversation. Higher education no longer a luxury. It is essential to national social and economic development.
- Reshaping response to on-going challenges.
- Strengthen research capacity
- Controlling expansion

- Improving the process of identifying and initiating reform. Innovative reforms: ERP. Transformative reforms: Modules
- Winning the support and collaboration of stakeholder groups. People here should give ideas.

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Availability of School Facilities and their Influence on Students' Academic Achievement in Public Day Secondary Schools in Kisii County, Kenya

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Abstract

The study intended to investigate availability of essential school facilities and their influence on students' academic achievement in public day secondary schools in Kisii County. The study was guided by the Education production function model. The study adopted a correlational research design which involved students and teachers from the 246 public day secondary schools in Kisii County. The target population was 75,977 subjects comprising of 73,554 students and 2,423 teachers in public day secondary schools in Kisii County. The sample size was 350 students and 50 teachers totaling to 400 subjects. Data collection was done by use of student questionnaire Document analysis guide and Teachers Interview Guide. Data collected were both quantitative and qualitative. Quantitative data were analyzed using descriptive statistics, correlational statistics and multiple regression. Qualitative data were analyzed thematically and were reported as direct quotations. Findings from the analyzed data were presented as tables, pie charts and graphs. The study found out that most facilities needed for teaching and learning were available in most public day secondary school in Kisii County .These facilities ranged from recommended course books and set books, basic laboratory equipment, classrooms and libraries. Among the facilities that were not available in almost all schools were libraries. The study indicated that availability of school facilities alone did not influence students' academic achievement. .

Key Words: *School Facilities, Students' Academic Achievement*

1.0 Introduction

School facilities are the material resources that are used by learners and teachers so as to aid the teaching and learning process. In this study the school facilities that were studied were the size and capacity of classrooms, laboratories and laboratory equipment, library facilities, which included recommended textbooks and set books. According to Alimi (2004), the main purpose of school establishment is for teaching and learning. Schools therefore need to have adequate facilities to enable teachers and learners to achieve the set objectives at the end of the course. This is the essence of the school plant and facilities. Carbonaro (2005) notes that several studies in the field of education have focused on school characteristics such as type of school (public or private), size, student body demographic, teacher qualification and their relationship to students' academic outcomes. Carbonaro (2005) continues to argue that, schools are able to influence their students' attachment, commitment in all school activities and academic achievement through their facilities. Students and teachers of schools with inadequate facilities are likely to fail in perceiving a clear focus on academic purposes and the learning environment and such a school is likely to be unconducive for learning process to take place properly. Mwiria (2004), is in agreement with what Carbonaro say about school facilities but says that materials on their own cannot bring about improved performance in schools.

In Nigeria, Udo (2006), notes that academic achievement of students in science subjects generally had witnessed a deplorable trend and linked his to inadequacy of laboratory facilities. On the other hand, Akpan (2006), on an investigation of the relationship between adequacy and academic performance in Chemistry in Nigeria examined adequacy of laboratory facilities using frequency counts and percentages. The result revealed that 61.1% of the total respondents agreed that the laboratory facilities for the teaching of chemistry were adequate in secondary schools. This poses a question as to why the deplorable

trend of academic achievement of student in science subjects when the majority 61.1% agree that laboratory facilities for the teaching science were adequate.
According to the South African Press Release Login (PRLog, 2012) boarding schools have the facilities which are needed by students for their studies which creates a learning environment for pupils to access libraries, computers, while doing their work. This is particularly in boarding schools which is not the case in the non-boarding schools. While in agreement with adequacy of facilities in boarding schools the research fails to give reason why some students from boarding schools do not perform satisfactorily and some from non-boarding schools without facilities perform very well in examinations. This also gives reason to study the availability of school facilities so as to ascertain whether indeed public day secondary schools do not have the required school facilities.

According to Reche et al (2012), Kenya's education system is dominated by examination oriented teaching where emphasis is laid on passing examination. Performance in examination is seen as an indicator of academic achievement which depends on the type of teaching and learning process that takes place in the school. It is for this reason that schools need to avail adequate and relevant facilities for teachers and learners to utilize them for their academic achievement. According to UNICEF (2000), teaching and learning can take place anywhere but the positive learning outcomes that educational systems seek will take place in quality learning environment. Quality learning environment that is aimed at better academic achievement includes quality school facilities, adequate instructional materials and textbooks, working conditions for teachers and students and the teachers ability to utilize these facilities through proper instructional approaches, availability of clean water supply and lavatories, classroom maintenance, space and furniture availability and lastly class size (UNICEF, 2000). According to Tremu and Sokan (2003) better academic performance is achieved through effective teaching and learning materials, proper teaching methodologies designed to encourage independent thinking, a well-maintained learning environment, well-trained and motivated teachers a well-designed curriculum, a valid and reliable examination system, adequate financing and effective organizational structure support.

This study attempted to establish whether there was a relationship between school facility utilization and students' academic achievement in public day secondary schools in Kisii County. Literature and researches on the extent of utilization of school facilities and students' academic achievement in public secondary schools seemed to be relatively scanty.

1.1 Objective of the study
The main objective of the study was establish the level of availability of essential school facilities and their influence on students' academic achievement in public day secondary schools in Kisii County.

1.2 Theoretical framework
The study was guided by the production function model of education. In this case, the education production function model holds the view that a school is a firm which receives inputs (students, resources, teachers) and transforms them into educational outputs as graduates, through a process. Production function model has been used by a number of authorities including its proponent James Coleman (1966) and later by Fuller (1985). Coleman et al (1966) used this model in the United States of America in an attempt to measure on the contribution of various factors on educational achievement. The study was done to get the findings on why the poor and minority children performed poorly. The findings of this study which was released on July 4, 1966, revealed that children in schools were segregated by race and status. Those from poor background attended schools with inadequate facilities. The production function of education model measures students' achievement by standardized

achievement test scores. For this study school inputs are students and school facilities while school output is the students' academic achievement measured by test scores.

2.0 Review of literature

World Bank (2008) in a study on textbooks and school library provision in secondary education in Sub-Sahara Africa revealedthat textbooks and libraries were not only inadequate but unevenly distributed among ruraland urban schools in the area of study. Similarly Asiabaka (2008) on effective managementof schools in Nigeria noted that the government's failure to establish policy directive onminimum standards in relation to schools facilities has led to disparities in acquisition. This isbecause while some have well equipped laboratories, libraries and other facilities foreffective teaching and learning others have none and where they exist, such facilities arepoorly equipped. On the same vein Olaniyan and Ojo (2008) also noted that lack of textbooksand training manuals was one of the challenges facing successful implementation ofintroductory technology in Nigerian secondary schools. This is supported by Chiriswa (2002)who noted that effective teaching and learning depends on the availability of suitableadequate resources such as books, laboratories, library materials and host of other visual andaudio teaching aids which enhance good performance in national examination.

Philias and Wanjobi (2012) reveals that lack of facilities for teaching and learning are negatively affecting the academic achievement of schools. The result is in agreement with Hallak as cited in Owoeye and Yara (2011) as he posited that facilities form an important pillar in the academic achievement of students. He further argues that availability, relevance and adequacy of school facilities such as the entire school layout, playground and recreational equipment, buildings and accommodation, classrooms and furniture, libraries, laboratories and their apparatus and other instructional materials contribute to academic achievement. According to World Bank (2004), low quality schools can suppress schools' enrolment and impede student progression and achievement in developing countries. The education literature has not reached a consensus on the relationship between various elements of school quality and student outcomes despite the large number of public studies (Hanushek, 2007). According to Mbiti (2011) students in Kenya are assigned to public secondary schools on the basis their performance in the Kenya certificate of primary school examination, district level allocation, and stated preferences for schools. The most selective (or elite) government schools are the National Schools, followed by the provincial (now County) schools and then the district schools (now Sub-County). National schools which are assumed to be having the best facilities attract the best students from the country while provincials (now County) schools attract the best remaining students from the region, and the district (Sub-County) schools admit the best remaining from the sub county.

According to Education Insight (2005) inadequacy of facilities such as text books and laboratory equipment pose a big challenge in many schools. Yeya (2002) is in agreement with other researchers who have found adequate school facilities to have an influence in students' performance in examinations. These facilities enable effective teaching and learning which influence the academic achievement. Mwiria (2004) adds that for the Kenya Secondary Education System to have a strong educational foundation there is need for the provision of adequate and relevant school facilities to all secondary schools. These facilities enable effective teaching and learning which influence the academic achievement.

Most of these studies focus on relationship between primary school quality and student's academic performance with more limited evidence at the secondary school level. This particular study on the other hand focused on public day secondary schools. The main aim was to find out how availability of school facilities in these public day secondary schools influences their students' academic achievement.

3.0 Research Methodology

The study used correlational research design so as to meet its objectives. The study was carried out in Kisii County of Kenya, with the target population that comprised of students and teachers in the 246 public day secondary schools in Kisii County. According to the Kisii County Education Office (2016), the total enrolment in public day secondary schools at the time of this study stood at approximately 73,554 students. The number of teachers employed by the Teachers Service Commission, teaching in public day secondary schools in Kisii County was approximately 2,423 (Kisii County Education Office 2016). All these added together brought the total to be 75,977 subjects and this formed the target population.

Sampling techniques that were used in this study included purposive sampling, systematic random sampling and non-proportionate sampling techniques. Teachers were sampled purposively where only two heads of departments were sampled one from language department and another from science departments in each school sampled. Students were sampled using systematic random sampling from a list provided. Schools were sampled using non proportionate sampling technique from the sub-counties. The sample size for the study was 398 respondents drawn from the sampled public day secondary schools in the county. The data collection instruments that were used in this study included student questionnaires, Teachers interview guide and document analysis guide.

3.1Data analysis and presentation

This study generated both quantitative and qualitative data. Mouton (2002) refers to quantitative data analysis "as the stage where the researcher through the application of various statistical and mathematical techniques, focuses separately on specific variables in the data set". The raw data that were collected from the field were organized and coded for analysis. The researcher used correlation to analyze quantitative data. Thematic analysis was used to analyze qualitative data. In this type of analysis data were organized, summarized and categorized into related themes. Patterns in the data were identified to look for relationships among the data. Direct quotations of the views expressed by respondents were used. Statistics that were gathered from quantitative data included means, frequencies, standard deviation and regressions.

4.0 Results and Discussions

The study sought to establish the level of availability of essential school facilities and their influence on students' academic achievement in public day secondary schools in Kisii County. It was meant to avail information on adequacy of essential school facilities in public day secondary schools in Kisii County and how these facilities influence students 'academic achievement. The essential school facilities under inquiry in this study were categorized into two, those required for the teaching and learning Languages and those required for the teaching and learning sciences. Facilities for teaching languages focused on English and Literature, Kiswahili and Fasihi, while facilities for teaching science the researcher focused on Physics, Chemistry and Biology. Classroom space, library and library facilities such as the recommended text books, Laboratory and laboratory facilities were also under inquiry. To get the level of availability of school facilities, a twenty four item likert scale with all the essential school facilities recommended for secondary schools was constructed with a five scale ranging from; 1- Very Low, 2- Low, 3- Medium, 4- High and 5- Very High. Students were asked to respond to the likert scale which was used to get the computed summated score.

4.1 Level of availability of school facilities in languages

Out of the twenty four item likert scale constructed to investigate the level of availability of school facilities, six of them contained the essential facilities recommended for the teaching of languages.

Table 4.1: Categories of availability of facilities in languages

	Frequency	Percent	Cumulative Percent
Low availability	76	22.1	22.1
Medium availability	171	49.7	71.8
high availability	97	28.2	100.0
Total	344	100.0	

Table 4.1 above shows the responses on the level of availability of school facilities needed for the teaching and learning language subjects in Kenyan secondary schools. The table displays the results of the level of availability of schools facilities for the two language subjects under inquiry. The frequency column shows the number of responses and the percentage column shows the percentage representing the response. Results from this table revealed that the majority of the respondents 171 (49.7%) rated the availability of facilities needed for teaching and learning language subjects in public day secondary schools in Kisii County as medium, 97 (28.2%) rated the availability of these facilities as high, while 76 (22.1%) rated them as low. Cumulatively those who rated availability of school facilities as medium and high were 268 (77.9%). This shows that most public day secondary schools in Kisii County have availed recommended facilities for the teaching of language subject.

Table 4.2: Rate of availability of science facilities

	Frequency	Percent	Cumulative Percent
Low availability	20	5.9	5.9
Medium availability	119	35.2	41.1
high availability	199	58.9	100.0
Total	338	100.0	

Findings from table 4.2 above shows that the majority 199 (58.9%) of the respondents rated availability of school facilities needed in the teaching and learning sciences in their school as high. 119(35.2%) rated availability of these facilities as high while 20 (5.9%) rated them as low. Cumulatively those who rated availability of school facilities needed for the teaching and learning of science subjects from medium to high were 318 (94.1%). This is a very high percentage compared to 20 (5.9%) those who rated availability as low. This strongly shows that recommended school facilities for teaching and learning science based subjects were available to most of the respondents. Free day secondary school provides for free tuition and books for secondary school students in public day secondary schools. This is the reason why most of the recommended course books for sciences are available to most of the respondents.

4.2 Relationship between availability of school facilities and students' academic achievement

The study sought to find out the relationship between availability of school facilities for teaching and learning in public day secondary schools in Kisii County. To find out the relationship between availability of school facilities and students 'academic achievement in public day secondary schools, students' academic achievement was to be established first. This was done by computing the average mean score per student for each subject. Multiple regression was then used to establish the relationship between availability of school facilities and students' academic achievement

Table 4.3: Model summary for School Facilities Students' Academic Achievement

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.136[a]	.019	.013	11.045	.019	3.114	2	329	.046

Table 4.3 above represents a model summary on availability of teaching and learning facilities and students' academic achievement. The independent variable studied explain 1.3% as represented by the adjusted R square which shows a weak positive relationship between availability of school facilities and students' academic achievement. The adjusted R square of .013 suggests that only 1.3% of the variance can be explained by the availability of school facilities. This infers that other factors not studied in this research contribute 98.7% of students' academic achievement. This therefore means that there are other factors other than availability of these school facilities that contribute to students' academic achievement in public day secondary schools.

Table 4.4: ANOVA[a] for School Facilities and students' academic achievement

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	759.718	2	379.859	3.114	.046[b]
	Residual	40134.268	329	121.989		
	Total	40893.986	331			

According to Table 4.4 above, the F calculated was found to be 3.114. This shows that the overall model was statistically significant. Further the *p*-value in this study was 0.46 which was less than 0.05 thus the model was statistically significant in predicting students' academic achievement in public day secondary schools in Kisii County. This infers that availability of school facilities has influence in students' academic achievement in public day secondary schools. Thus despite the fact that the availability of facilities only explain 1.3%,

Table 4.5 Coefficients for School Facilities and students' academic achievement

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	43.479	3.417		12.725	.000
	Availability of facilities in languages	.008	.137	.004	.057	.955
	Availability of facilities in sciences	.111	.054	.138	2.064	.040

The regression equation multiple regression is;

$Y' = a + b1X1 + b2X2$

Where; Y' = a predicted value of Y (which is the dependent variable)

a = the value of Y when X is equal to zero. This is also called the "Y intercept"

b = the change in Y for each 1 increase change in X

X1 = an X score on the first independent variable for which one is trying to predict A value of Y

X2 = an X score on the second independent variable for which one is trying to predict the value of Y

When substituted the for, the equation will be;

$Y = 43.479 + .008\ X1 + .111\ X2$

The regression equation establishes that taking all factors into account constant at zero. Students' academic achievement in public day secondary schools in Kisii County has an index of 43.479. The findings presented also shows that taking all other independent variables at zero, a unit increase in the facilities for teaching languages leads to a .008 increase in students' academic achievement. The *p*-value of

.955 which is more than .05 and thus the relationship is not significant. The study also found out that a unit increase in the facilities used for teaching sciences leads to a .111 increase in students' academic performance. The *p*-value is .040 which is less than .05 and thus the relationship is significant. This infers that availability of facilities for teaching science subjects contributed more (.111) to the students' academic achievement than the facilities for teaching language subjects. Generally it can be seen from the findings above that availability of school facilities alone does not have much contribution to students' academic achievement in public day secondary schools.

5.0 Conclusion

The study revealed that most of the school facilities were adequately available. On the influence of available school facilities on students' academic achievement, the study found out that there was no statically significance between availability of school facilities and students' academic achievement in languages but there was a statistically significant relationship between availability of school facilities and students' academic achievement in science subjects. This study can therefore conclude that availability of essential school facilities on their own cannot influence students' academic achievement. This means that there are other factors other than availability of school facilities that influence students' academic achievement in day public secondary schools in Kisii County.

6.0 Recommendations

Based on the findings of this study, the following recommendations are made as follows;

(i) Most of the respondents agreed that their schools had adequate facilities needed in teaching and learning except libraries. There is need therefore for Free Day Secondary Education to embark on putting up a library in every public day secondary school in Kenya.

(ii) Schools should be encouraged to start income generating activities so as to get extra income to support provision of teaching and learning activities in their schools.

(iii) It is evident from the study that most schools had no libraries they only had book stores without reading spaces. The government should put up at least one library in a central point in each division for students from public day school to access books and reading areas.

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Assessment of Teacher Trainees in Teaching Practice and sustainable Teaching profession in Reference to Trans-Nzoia County

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Abstract
Assessment of teacher trainee in Teaching Practice (TP) is the last training of teachers in Teacher Training colleges and Universities. Teaching Practice is done by assessors who had the previous training of the same from such colleges and the criterion is followed worldwide. The problem is that some universities located in Trans-Nzoia are using unqualified/untrained assessors to assess students in TP. The consequence is poor assessment which eventually leads inadequately prepared teachers. The assessors send are administrators/ coordinators who are employed as full timers because the part time lecturers are not allowed to assessor and claim for allowances from the university. The objective of the study is to investigate who the assessors are; what are their qualification and training and the challenges the teacher trainees go through during TP assessment. The research applied survey method and interview technique collecting data from teacher trainees in Teaching Practice in Trans-Nzoia County through simple random sampling in secondary schools where teacher trainees were attached from various universities. The target population was two hundred and sample size was fifty. The key results indicate that assessors harass the teacher trainees, since they are administrators working in offices not having the content and methodology or pedagogy in assessment. The universities management sends administrators to assess student trainees because no full time lecturers. It is concluded that poor assessment done lead to half-baked graduates who lead to poor standards and low quality of education in Kenya. It is recommended, the universities follow the assessment criteria of assessing student trainees done three times by one lecturer of methodology and two teachers of subjects of student trainees subject of specialization of major and minor for three sessions in TP.

Key Words:*Assessment, Teacher Trainee, Trained Assessors, Administrators, Teaching Practice, Quality Education.*

1.0 Introduction
Assessment of Teacher Trainee in Teaching Practice (TP) is the last training of teachers in Teacher Training colleges and Universities. Teaching practice is done by assessors who had the previous training of the same from such colleges and the criteria is followed worldwide. Teacher trainees are prepared for teaching of the subject lecturer/tutor in the last year before or waiting for graduation if qualified. In this sense in teaching practice quality and standards are assessed. This means assessment is the process by which the quality of an individual's work or performance is judged(Farrant,1980).Teaching Practice needs monitoring which is focusing of attention on a process or performance with the objective of drawing attention to particular features that may require corrective action. Further ,it needs standardization, when used in educational assessment, refers to the process by which tests that set out to measure specific qualities such as intelligence, aptitude and personality are made into accurate and statistically reliable measuring instruments for validation. Validation is a process by which a test is itself tested as an effective instrument for measuring what it claims to measure(Farrant,1980).This is the main objective of Teaching Practice(TP) and it is a practice done professionally world for maintain teaching professionalism.
The first step in their preparation is micro-teaching(MT) which is done the last semester of teaching practice(TP).The term micro-teaching is used for teaching situation which is a small scale version of the real one in the classroomin micro-teaching the teacher trainee teaches lessons which last 5 to 8 minutes instead of 40 minutes and teaches only 5 to 6 student/teacher trainees instead of full class of 30 to 40

students and then concentrates on practicing only one particular skill instead of trying to apply the whole skills and techniques(Department of educational communication&technology-Kenyatta university).

Micro teaching is important part of assessment in preparation for Teaching Practice (TP).The reason for micro-teaching is to enable teacher trainee/student teacher to realize some of the mistakes or errors committed which in Micro-Teaching (MT) and should be avoided in Teaching Practice (TP).in some universities/colleges teaching practice assessment marks are awarded in micro teaching therefore, student teacher take micro teaching seriously. The following is the procedure given at Kenyatta University-the diagram illustrates three phases involved in micro teaching and the research added the fourth phase of teaching practice.

Phase 1-Deals with each skill is skill is discussed and analyzed in a general lecture after which a film is shown. The film illustrates how experienced teacher demonstrates how the skill can be used effectively and for what purpose.

Phase 2-Indicates each student-teacher, after careful study of the skill, prepares a short lesson of 5 to 8 minutes duration.

Phase 3-an integrated skill practice of approximately 15 t0 20 minutes, duration is introduced which aims at integrating the various skills practiced before isolation. The block teaching practice provides of course the best opportunity for ensuring that these skills are transferred to the teaching in the classroom by student teacher in Teaching Practice (TP).

Phase 4- was introduced by the research and indicates that 'micro-lesson' is not a 'Miniature' lesson, in which a teacher tries to squeeze the content of a full 40 minutes' period. Therefore, in micro-teaching, the teacher chooses the objectives and content according to their suitability for practicing the skill. This means, instead of the objective determine the approach as in normal lesson, in micro teaching the approach determines the objective. This indicates that Micro-Teaching is artificial which Teaching Practice is real teaching, where a student teacher should be assessed through the topic taught which match with the lesson plan. Subsequently, the lesson plan should also correlate with the schemes of work. The topic taught should be also evaluated in the records of work book where the remarks should be given by student teacher, whether students understood or not.

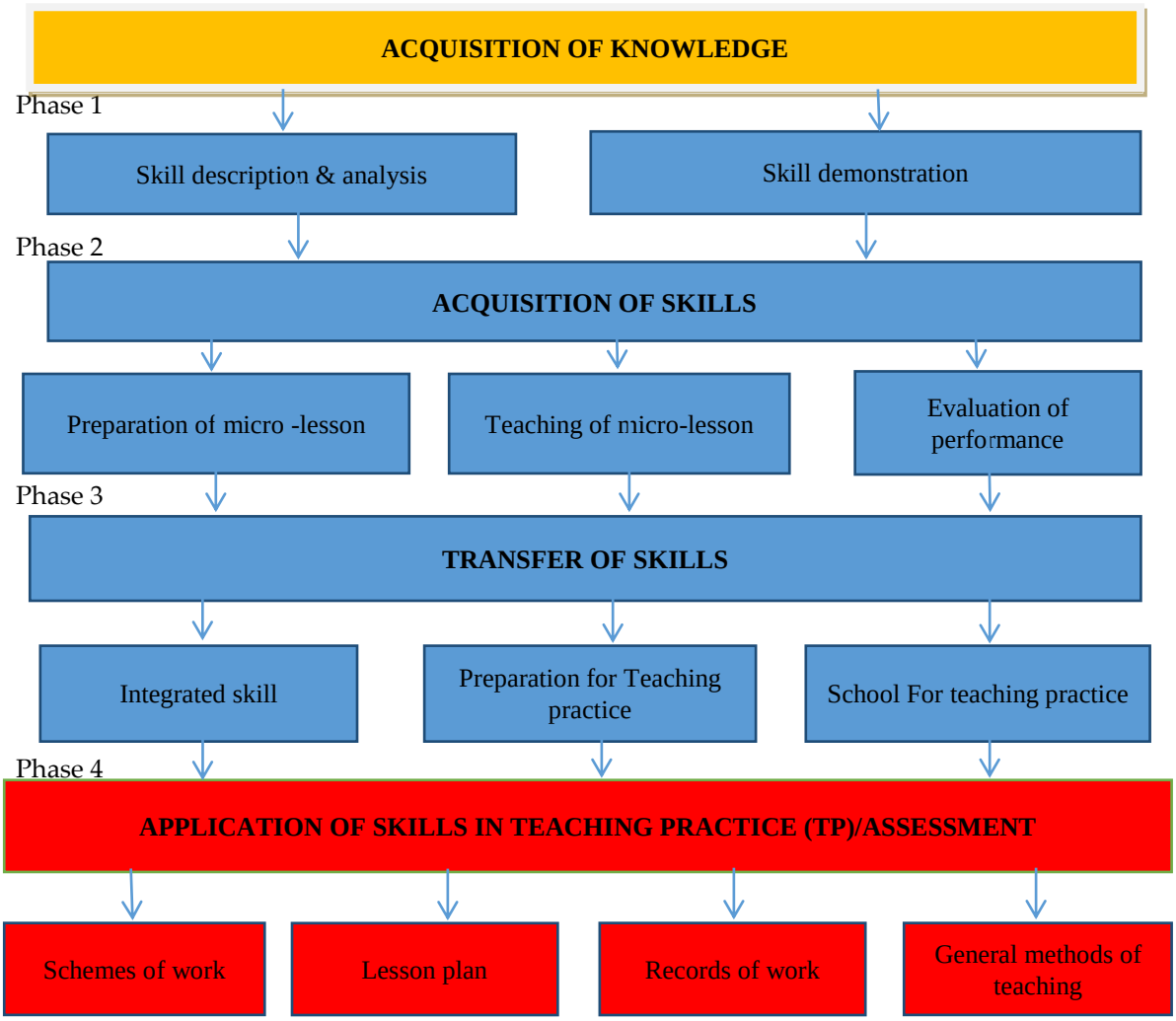

Figure 1: Model of phases of Micro-Teaching, Adopted Dept. of Education communication Technology (Kenyatta University), Researcher, 2017.

The development of the ability to teach will needs great deal of experiences, practicing, self-examination, discipline and training.it is important to note and realize that for one to become a skilled teacher takes years(Igaga,1978),two to four years depending on the level and institution a student teacher/teacher trainee is pursuing a course of profession. According to Igaga (1978), the student teacher on Teaching Practice be aware that the supervisors/assessor/tutors, qualified members of staff and the head teacher know his/her in experiencing weakness and strong points and most of all that s/he is a learner. These will all be taken serious consideration while assessing his/her worth and promise as a teacher. That is why the student teachers are supposed to be assessed by qualified supervisor/tutor/lecturers and not departmental administrators.

1.1 Statement of the problem

The problem is some universities located in Trans-Nzoia are using unqualified/untrained assessors to assess students in Teaching Practice. The consequence is poor assessment is done and prepare teachers who graduate inadequately. The assessors send are administrators/coordinators who are employed as full timers because the part time lecturers are not allowed to assessor and claim for allowances from the university.

1.2 Objective of the study

The objective is to study the factors which influence the university management send administrators to assess students in Teaching Practice instead of qualified and trained lecturers.

2.0 Literature Review

The term "Assessment" is used in the society to measure or examine a phenomenon. Assessment is done to people in the society or community or educational institution because people or experts want to have important information on the people who have a "know-how" or knowledge on certain concepts and how they can be done excellently or perfectly. The information received through assessment will: tell exactly how much of something there is; expose problems and weaknesses; reveal differences of quality; assist selection; maintain standards and test claims that people make about certain things or practices in the society. In Education according to Farrant (1980),the term assessment is carried out to: test how much is known about something supposedly learned; expose weaknesses of learning; monitor teaching; maintain standards; motivate pupils and teachers; measure specific abilities such as intelligent quotient and so on; discriminate between children of different ability; classify children; predict the suitability of individual children for particular courses or careers and select children for secondary or further education.in this sense in Teaching practice quality and standards are assessed. This means assessment is the process by which the quality of an individual's work or performance is judged in Teaching Practice (TP).

Educational assessment of students is a systematic process of gathering educationally relevant information to make legal and instructional decisions about the provision of services. Educational assessment focuses mainly on the many areas of learning in school as well as any other factors affecting school achievement. Academic, language, and social skills are examined (McLoughlin and Lewis, 1994).Therefore, in assessment, according to Danielson (1996), the content must be transformed through instructional design into sequences of activities and exercises that make it accessible to students. all elements of instructional design-learning activities, materials and strategies-should be appropriate to both content and the students.in their content assessment techniques must also reflect the instructional goals and should serve to document student progress during and at the end of teaching episode (Danielson,1996).

There are two types of assessment, according to Pitler et al(2007),assessment can be *formative*(conducted during the learning process) or *summative*(conducted at the culmination of the unit or school year).in this research Teaching Practice(TP) apply the former(formative) assessment of teacher student/teacher trainees.in this sense an effective teacher student must carefully plan each of his/her lesson presentation as follows: (i) analyses his/her learners:-What are the needs, values, backgrounds, knowledge level, and misconceptions of his/her learners with regard to the topic s/he to present.

(i) Specify the learning objectives:-what should students do? How much time do present? Limit the objectives and content to the time available.
(ii) Specify benefits or rationale:-why is this presentation important for students? If the teacher student cannot answer this question, the focus should be altered to meet the students' needs.
(iii) Identify the key points:-Brainstorm the main ideas. Presentation has from five to nine points.
(iv) Organize presentation in a logical order: Overview-a teacher student should tell the learners what s/he going to teach; Present-teach them; and Review-tell them what s/he taught them.in the lesson, the teacher student, should apply examples and specimens. This is referred to as authentic

assessment, which is using such things as actual specimens of students' work to determine educational achievement (Ryan and Cooper, 2001).

According to Danielson(2007),there are four important domains for assessor to evaluate the teacher student on Teaching Practice(TP).The domains include Domain one-planning and preparation for teaching lesson, has the following components; demonstrating knowledge of content and pedagogy, demonstrating knowledge of students, selecting instructional goals ,demonstrating knowledge of resources, designing coherent instruction and assessing student learning. Domain two-the classroom environment; has the following components, creating an environment of respect and rapport, establishing a culture of learning, managing classroom procedures, managing student behaviour and organizing physical space. Domain three-instruction has the following components; communing clearly and accurately, using questioning and discussion techniques, engaging students in learning, providing feedback to students and demonstrating flexibility and responsiveness. Domain four-professional responsibilities; has the following components-reflecting on teaching, maintaining accurate records, communicating with families, contributing to school and district, growing and developing professionally and showing professionalism.

3.0 Methodology

The research would apply survey method and interview technique used to collect data from teacher trainee in Teaching Practice in Trans-Nzoia through simple random sampling.50 secondary schools were sampled which was approximately 20 percent of the study population. This is in line with Gay et at. (2009), recommends of 10-20 percent sample size for survey research. Interpretation approach was used to help unearth the nature of reality surrounding the Assessment of Teacher Trainees in Teaching practice socially construed by sources, content and audiences (Puttergill, 2000). Data was collected from teacher trainees in teaching practice (TP) from various universities in secondary schools in Trans-Nzoia County. Data was collected from 80 teacher trainees in teaching practice (TP) through simple random sampling from Moi, Kisii, Mount Kenya, Masinde Muliro, Kibabii, JKUT universities. Data collected was analyzed in percentages and presented through tables. The interview schedule with six items is shown in the appendix page.

4.0 Key Results

The key results indicate that assessors harass the teacher trainees, since they do not have the content and methodology or pedagogy in assessment. The universities management sends administrators to assess student trainees because no full time lecturers. Data collected was analyzed in percentages and presented through tables as follows:

Table 1: Gender of student teacher/Teacher trainee N=50

Gender	Frequency	Percentage
Male	35	70
Female	15	30
Total	**50**	**100**

Table one shows 30 percent females teacher student were on Teaching Practice and 70 percent were male teacher trainees.

Table 2: Teacher trainees/Student teacher's institutions N=50

Name of university	Frequency	Percentage
Moi	16	32
Kisii	4	8

Masinde Muliro	8	16
JKUAT	6	12
Mount Kenya	6	12
Kibabii	2	4
Nairobi	8	16
Total	**50**	**100**

Table 2 shows the student teachers on Teaching Practice from various universities in Trans-Nzoia County. Moi university had the highest number of student trainees on Teaching Practice 32 percent, While Nairobi University and Masinde Muliro University of Science and Technology was second with 16 percent respectively, Jomo Kenya University of Agriculture and Technology and Mount Kenya University has 12 percent respectively, Kisii University was the fourth with 8 percent and Kibabii university was the last with 4 percent.

Table 3: The number of sessions of assessment **N=50**

Sessions	**Frequency**	**Percentage**
Once	10	20
Twice	35	70
Thrice	5	10
Total	**50**	**100**

Table 3 shows the number of sessions the assessment was done, therefore, 20 percent indicated they were assessed once; 70 percent indicated were assessed twice and 10 percent indicated thrice.

Table 4: The supervisor/assessors/tutors **N=50**

Assessors/supervisors	**Frequency**	**percentage**
Assessed by assessors taught subjects/methods	15	30
Assessed by assessors not taught subjects/methods	35	70
Total	**50**	**100**

Table 4 shows the assessors who assessed the teacher trainees.30 percent of the respondents indicated were assessed by assessors who taught them in either subject content or methods of teaching and policy and 70 percent of respondents indicated they assessed by different assessors who did not teach in either subject content or methods of teaching and policy.

From the above analysis, table one shows that males are dominating in the teaching profession.it is suggested more females should be encouraged to venture into the profession however it a sample from one county. Table 3 shows the number of sessions the student teachers were assessed.20 percent showed were assessed once and the Head Teachers were complaining to write a confidential letter to teacher trainees to their institutions about the inadequate assessment done.10 percent indicated they were assessed three times and this correlate with one assessors of general methods of teaching and the other two assessors of major and minor teaching subjects of teacher trainees.70 percent indicated were assessed twice and this was inadequate for evaluation of a teacher trainee in Teaching Practice.

Table 4 shows the assessors who assessed the teacher trainees.30 percent indicated were assessed by their lecturers who taught them subject content and general methods of teaching.70 percent indicated they were assessed by different people who never taught them in subject content and general methods of teaching. The teacher trainees indicated the teachers harassed them because they did know how to evaluate the topic, with lesson plan and matching it with the schemes of work.

The student teachers suggested in order improve assessment in teaching practice, the student teachers should be assessed by the assessors/lecturers who taught them the content. This will lead to reliability in Teaching Practice. The students should be assessed at least three times for excellence and perfection in teaching practice.

5.0 Conclusion

Basing the discussion of the data analysis and interpretations, it is concluded poor assessment done lead to half-baked graduates who lead to poor standards and low quality of education in Kenya. The supervisors/assessor/tutors do not look for a qualified teacher but a promising and a prospective teacher.in this sense, the main criterion used in assessing a student/teacher trainee is the progress in the use of the skills of teaching.therefore, the assessors who assess the student teacher should be a trainer/tutor who taught the student the subject content in the classroom before going to teaching practice. The above finding that administrators in the departments who are not trained to assess are not qualified to assess student teacher and lead to poor or inadequate process of half-baked teachers from college or universities into labour market. Naturally, the student teachers' ability to teach will be expected to be more developed and more mature at the end of his/her Teaching Practice(TP) than at the beginning(Igaga,1978).that why a student teacher, should be assessed three times or more to mark the progress of the student. The assessment should be done by tutors/supervisors/assessors of general methods of teaching and taught the student teacher in the classroom, whereby a student teacher is expected to use varied techniques of teaching in the classroom. The second assessment will be done after two weeks from the first one. The student teacher will be assessed by the tutor/lecturer of either the major or minor subjects or similarly the third assessment.

It is also concluded that teaching practice (TP) is an integral part of teaching certificate (professional certificate) the student teacher is pursuing, be it a bachelor's degree, a diploma in education or certificate. Paradoxically, the student teacher/teacher trainees are expected to be prepared adequately by their lecturers/tutors/supervisors to meet the ethical standards required in the teaching profession. Therefore the lecturers/tutors/supervisors who will assess the student teacher must produce marks to show that the student teacher was visited and observed in a class situation and that s/he is capable of teaching(Igaga,1978).this is usually done be by supers/tutors/lecturers visiting a student teacher while s/he is teaching.in this sense, there is a format to be followed and the procedure of assessment usully,the supervisor/tutor/assessor sits in the classroom with a copy of the student teacher's lesson plan.

During the lesson the supervisor/assessor makes points on a prepared form, the teaching practice observation report (TPOR). If the assessment is done by the administrator/unqualified to assess, they will give a poor or unreliable teaching practice observation report (TPOR).after the lesson, the student teacher and the tutor/assessor, normally find a quiet place where they discuss the progress of the lesson taught based on the student teachers; self-assessment and the supervisor's or assessor's comments and general observation. The assessor recommends to the students areas or skills to be improved in teaching. Likewise the student teacher has the opportunity to ask questions on the areas of difficulties so that to rectify in the next assessment.

In some universities or colleges, the assessor/supervisor gives the student teacher a signed copy of the comments s/he has made about the lesson, together with the grade. Other universities/colleges do not give grades because the Teaching Practice (TP) is part of the whole certificate and the grades should be kept confidential. Certain universities/colleges do not even encourage giving a copy of the supervisor's [points to the student teacher.it is significant to note that the supervisor does not have to give a grade whenever s/he sits in the student teacher's class. What is strongly recommended is that the two must discuss every lesson the supervisor observes (Igaga, 1978).

It is concluded a student should a student should be seen teaching by a number of supervisor/assessor and not only once. All the grades/marks from the supervisors for each individual student teacher are added together at the end of the teaching practice and the average comprises the final mark for that student teacher and determines whether s/he passes or fails the teaching practice.

6.0 Recommendations

It is recommended, the universities follow the assessment criteria of assessing student trainees to be done three times by one lecturer of methodology and two teachers of subjects of student trainees subject of specialization. Some skills for instance lecturing requires the use of teaching aids, therefore, special attention should be taken to assess a teacher trainee in Teaching Practice(TP) as follows; Whether the teacher trainees did use any aids; whether the teaching aids were adequately prepared; and whether they were used effectively and efficiently.

It is recommended the Ministry of Education under directorship of the cabinet secretary to take this matter serious so that colleges and universities to channel the qualified student teachers who are assessed by qualified tutors/supervisors not departmental administrators.

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Factors Influencing Participaton of Children in Early Childhood Development and Education Programme in Bungoma South Sub-County, Bungoma County – Kenya

Oyamo Joanna Murugi & Wafula Robert

Abstract

The purpose of the study was to investigate factors influencing participation of children in the ECDE programme in Bungoma South Sub-county of Bungoma County. Early childhood care and education programmes yield greater investment returns than any other level of education yet it is the age at which children are most vulnerable to life threats like disease, abuse and neglect. This study was guided by the objectives: To examine the influence of common ailments, teachers' motivation and School Feeding Programme on participation of children in the ECDE programme. Systematic Random Sampling was used to identify 21 ECDE centers to be included in the study and 2 teachers from each centre involved directly as respondents. Data collection was done using questionnaires; collected data was further organized into themes then frequencies and percentages obtained. The information was presented on tables to make its interpretation clearer. Results obtained showed that absenteeism rate of 3% - 5% daily in the ECDE centres was due to common ailments; the highest satisfier for ECDE teachers was their good social relationship with other ECDE stakeholders while their highest dissatisfiers were their social status and remuneration; and, the feeding programme was very effective(88%) in enhancing enrolment and daily attendance of children. Based on the findings, the study concluded that childhood diseases affected children to the extent of them missing important school hours; the ECDE teachers' motivation was generally low due to poor remuneration and the status accorded to them and finally, School Feeding Programmes enabled smooth transition from home to pre-school since it acted as a bridge between home and school. The study recommends that local communities be empowered economically to afford nutritious food and medical services for their children; a clear Scheme of Service for ECDE teachers be put in place stipulating their remuneration and School Feeding Programme be availed in every ECDE centre without fail.

Key terms: *Participation, Sanitation, Immunization, Motivation, Retention.*

1.0 Introduction

The Early Childhood Development and Education(ECDE) programme which caters for children between 0-8 years of age is crucial for holistic development of children since it lays a foundation for primary, secondary and further education exposing children to various experiences that enhance their development preparing them for higher level professions and ultimately helping them lead better lives (Peru, Cueto, 2005). In the developing economies, the programme is largely provided by the communities themselves, local authorities, Faith Based Organizations (FBO), and individuals. According to Ahmed (2003), Bangladeshian children affected by hunger and malnutrition as well as ill health did not have the same potential to do well at school in comparison with well nourished and healthy children. In addition, Ahmed (2003) points out that poor health and malnutrition lowers children's cognitive development and performance, reduces their capacity to participate in learning activities or both.

According to Del-Rosso (1999), the National School Nutrition Programme (NSNP) in South Africa aims at fostering better quality education by enhancing children's learning capacity, encouraging regular attendance and punctuality, decreasing gender disparity, addressing micro-nutrient deficiencies and alleviating short term hunger by providing 30% of daily energy requirement for the child. Del- Rosso (1999) argues that the minimum policy is to feed all grades from R (pre-school) to grade 7 for 196 school days per year. In addition, Agarwal et.al. (2003) advices that menus should provide at least 20% of the recommended dietary allowances for energy, protein, calcium, zinc, iron and vitamin A. Agarwal et. al.,

(2003) insists that a meal must be served before 10:00 am to enhance the learning capacity. Common ingredients in South African school meals include beans, rice, canned fish, soya, fortified maize meal, fortified bread, fruits and vegetables.

In a survey of primary school children in a rural area in Kwa Zulu-Natal, Grantham-McGregor (2005) revealed that a great number of children had persistent micronutrient deficiencies including inadequate vitamin A status (40%), anaemia (28%) and iodine deficiency (97%). Malnutrition is therefore one of the main causes of childhood ailments. If children are not given the right combination of food , they are likely to fall sick and suffer from deficiency diseases like kwashiorkor, marasmas, scurvy, rickets, night blindness to mention but a few. WHO, (2007) claims that the other main cause of childhood ailments is infection by pathogens like bacteria, fungi and viruses. This mainly results due to poor sanitation or environmental hygiene where food and water gets contaminated by the said pathogens (food and water born diseases), healthy skin comes into contact with infected skin (contact-borne diseases) or a healthy person inhales pathogens from an infected person (airborne diseases). Kent(2004) in Geneva illustrates that lack of safe water, sanitation and hygiene education contributes to diarrhea, cholera, pneumonia and worm infestations which are killers of children under age 5; hence MDG No. 7, seeks to half the proportion of people without access to safe water, proper sanitation and hygiene. Whatever the cause of the ailment, the final impact on the ECDE child's participation in activities is significant; it may have an influence on the child's attendance, performance of class activities, interaction with others, cognitive growth and final transition to primary school i.e. participation. In his speech, Mzee Jomo Kenyatta, while outlining KANU election manifesto blueprint in 1969, indicated that only healthy children could fully utilize the opportunities provided by schools to fully develop their intellectual potentiality. (KANU manifesto 1969).

Children have a right to care that would lead to their holistic development (UNCRC, 1989, OAU 1990 and Republic of Kenya, 1998). To secure this right the conditions necessary for optimal development of children need to be secured within children's environments among which are ECD centres (Bronfenbrenner 1989). To attain this, communities need to focus on some important aspects of the preschool environments including teachers' working conditions, salaries, interpersonal relations and the physical learning environments. Gardner et.al.,(1993), in a study conducted in Canada claim that teachers play a critical role in children's development but their effectiveness largely depended on the existing levels of motivation. To enable ECDE stakeholders prioritize the areas that require urgent intervention in ensuring the conditions necessary for optimal participation and development of children, there is need to establish the extent to which preschool teachers are motivated, as well as the factors that motivate them(Ndani and Kimani, 2010).

According to Okwach (1997), the pre-primary education sub-sector received no funding at all from the government under the Education Development Expenditure until 1997 where it was allocated a mere K£ 2,150,000. Under the recurrent expenditure the sub-sector was allocated K£ 290,000 only. Though currently the Count Governments' involvement in the ECDE sub-sector is increasing, they have not come out strongly in terms of funding pre primary education. For instance, the Ksh. 1.6 billion mentioned in the 2009/10 National Budget Estimates to employ ECDE teachers has not been actualized to date. This may be the reason for reduced enrolment in ECDE training colleges currently. Compared to the primary education sub-sector funding, the government has treated pre-primary education rather casually, leaving a big burden to the community and parents in feeding and providing the physical infrastructure to ECDE children.

2.0 Methodology

Descriptive survey research design was employed in this study because it was useful in the collection of original data from a population which was fairly large to observe directly. The target population was ECDE teachers in the Sub-county. The entire sub-county has about 210 ECDE centers (public and private) with an average of 2 teachers each thus the target population comprised of 420 ECDE teachers.

Bungoma south Sub-county comprises of three clusters or educational zones namely Municipality (110 ECDE centers), Sanga'lo (54 ECDE centers) and Mwibale (56 ECDE centers) . Through Systematic Sampling 10% of ECDE centers were taken to form a sample (Mugenda and Mugenda 2003). This was done by taking every 10th centre from the Municipality, Mwibale and Sang'alo zone's list of ECDE centers generating 11 centers from the municipality zone and 5 centers each from the Mwibale and Sang'alo zones. Two teachers from each center formed the sample required comprising of 42 ECDE teachers.

Questionnaires with both closed and open ended questions titled "Questionnaire on factors influencing participation of children in the ECDE programmes in Bungoma South Sub-county of Bungoma County" were used to obtain information from 42 ECDE teachers. The Likert scale type of questionnaire was also employed on some respondents.The pretesting of the questionnaires was done in five ECDE centres in the neighbouring Bumula Sub-county.

Written consent from the National Council for Science and Technology was obtained to authenticate the carrying out of the study in the office of the sub-county commissioner and the head - teachers of ECDE centres involved. Confidentiality and principles of anonymity were upheld and respondents clearly informed about the purpose of the study they were about to participate in so as to boost their confidence in providing adequate and accurate information.

Qualitative data was first organized into themes, then descriptive statistical method used after frequencies and percentages were calculated from the data obtained. This information was presented on tables to make its interpretation easier and clearer.

3.0 Results and Discussion

The study focused on the influence of common ailments, ECDE teacher motivation and School Feeding Programme on participation of children in ECDE programme in Bungoma South Sub-county, Bungoma County-Kenya.

It was established that majority of the ECDE teachers (52.4%) were between 26 – 35 years of age. No teacher in the sampled group was over 50 years of age. If given an enabling environment including adequate motivation, majority of the teachers were middle-aged and thus strong enough to deliver on their mandate. According to Ndani and Kimani (2010) relevant strategies should be geared towards motivating teachers and providing a child friendly environment in Kenyan ECDE centres. Similarly, Makoti (2005) agrees that key factors influencing ECDE teacher motivation need to be investigated in order to guide communities in areas where they need to concentrate their efforts since most teachers worked in an "unhealthy psychological work environment" without clear terms and conditions of service.

When asked about their experience in service, majority of the teachers, 47.6%, had an experience of between 11 – 15 years which was not very small; thus this study raises the question of whether teaching experience of an ECDE teacher had any influence on participation of children in ECDE or not. Teachers who have been in the field for over 10 years are expected to enhance participation since they understand children and can handle them better. Training at diploma and degree level for the sampled teachers was 23.8% and 2.4% respectively. Majority of the teachers,69% ,were ECDE certificate holders. Abagi (2008)

asserts that since ECDE teachers have only been trained upto certificate level, they taught children basing on the primary school pedagogy which emphasized reading and writing rather than promoting holistic development and school learning readiness. According to Read, Garder and Mahler (1993) teachers have been found to play a critical role in children's development; their effectiveness depends on their level of training as well as levels of motivation.

Majority of the ECDE centres (40.5%) had an enrolment of between 40 – 60 children. Those with more than 100 children (9.5%) were centres attached to public primary schools some of which had basic facilities like classrooms and trained personnel. They however faced the problem of congestion and the facilities available were strained. Most of the centres with fewer children (less than 40) were private institutions managed by individuals or Faith Based Organizations (11.9%). They also however, faced the same challenge of strained meager facilities and lowly motivated teachers.

Based on the marking of the Daily Attendance Register by teachers, 52.4% of the children missed school for 3 – 5 days per week while 47.6% were absent for 0 – 2 days per week. However, it was very rare to have all children present in school every day. This meant that some children missed school daily due to one reason or another thus interfering with smooth running of programmes and acquisition of concepts by children.

(i) Common ailments and Participation of children in ECDE

ECDE teachers were asked to mention the most common ailments among children at their ECDE centres. Their response, in order of prevalence was; Malaria, commom cold, chicken pox , diarrhea, jiggers infestation and measles. Malaria was the most prevalent disease (33.3%) among children especially during second term of the year when there was much rain and maize plantation bushes. Outbreaks of measles and chicken pox (and occasionally mumps) spread very quickly among children who closely interacted with each other. Diarrhea (14.3%) and the jiggers menace (11.9%) may have resulted from low hygiene standards both at home and in school. Common cold and other allergic reactions by hypersensitive children occurred due to change of weather or consumption of foods to which the children were allergic yet the teachers were not aware. Over 80% of children in ECDE centres were affected by one or more of these ailments at one point or another in the course of the year. This heavily interfered with their coming to school (attendance) and active participation in learning activities especially play as also indicated by Del – Rosso (1999) in his report in the National School Nutrition Programme in South Africa. Pruss (2005) asserts that infestation with soil transmitted worms, inadequate sanitation and hygiene (which result in diarrhoea) can be prevented through deworming services and hygiene education to prevent re-infections and re-exposure.

Most ECDE teachers agreed that childhood ailments influenced participation of children in school activities to a very great and great extent (71.5%).WHO (2007) also claims that the main cause of childhood ailments was infection by pathogens due to poor sanitation Asked to explain their responses, most teachers (71.5%) claimed that sick children hardly came to school and even if they did, they were dull and less active in learning activities, especially play. To minimize incidences of illness, teachers questioned suggested that parents ought to be sensitized on common childhood ailments and advised to seek medical intervention for their children early enough. This, they said, would lower absenteeism rate and enhance participation of learners in school programmes. This agrees with the National Nutrition Survey (2010), which revealed that high rates of diarrhea, acute respiratory infection and fever contributed to high rates of malnutrition resulting in lowered enrolments and absenteeism. Hutton and Haller (2004) claims that many children miss millions of school hours due to diarrhea while Hall et. al., (2008) points out that the worm burden in children contributes to much absenteeism.

Majority of ECDE centres, 78.6% obtained water from a borehole in the school compound or in the neighbourhood. Though all ECDE centres had some source of water, most of them did not achieve adequate water, sanitation and hygiene (WASH) standards for the water to be safe for pupils. There was a strong indication that many centres were far from safe water sources like springs and streams thus had to spent considerable amount of time to reach the water. This interfered with class time and is in agreement with a Banglandeshian study by UNICEF (2006) which showed a 15% increase in attendance when water was available within a 15 minute walk compared to an hour or more. Kent (2004) claims that water, sanitation and hygiene (WASH) in schools enhances children's participation and is significant in achieving MDGs related to universal access for primary education, child mortality reduction and increase in gender equality.

Only 16.7% of the ECDE centres had all their children fully immunized.. Majority (52.4%) had only done it halfway thus predisposing their children to life threatening, yet immunizable diseases like measles,polio, chicken pox and whooping cough. Abagi (2008) claims that immunization follow-ups and Growth Monitoring and Promotion (GMP) was not known to many Kenyan ECDE teachers and that the latter did not maintain proper health records. This resulted in children remaining sick for long periods and missing many valuable school hours.

(ii) Teachers' motivation and Participation of children in ECDE

High satisfiers for teachers were: their relationship with children (92.9%), their relationship with school management (76.2%), their relationship with the community (81.0%) and the number of children in their classes (71.4%). Disatisfiers included: Teachers' status in the sub-county, (85.7%), physical conditions of the schools (83.3%), supply of teaching materials (85.7%), parents' expectations of their children's performance (76.2%) and the salary they received (95.2%). The good social relationships were very important in motivating teachers. Ndani and Kimani (2010) agree strongly that Interpersonal relationships such as ECDE teachers' relationship with the children, parents, school administration and each other were very important motivators since they provided a conducive environment for children to develop psychosocially.

Qualities like well maintained classrooms, enough play ground, hygienically kept compound and adequate sanitation measures described the physical and social environments preferred by most ECDE teachers. Unfortunately, many ECDE centres in the sub-county fell short of the above criteria. This coupled with unavailability of equipment and low supply of teaching/learning materials contributed to teachers' dissatisfaction with the physical infrastructure/conditions in their centres. Sanitary facilities and play equipment were in bad shape in many public and community ECDE centres and unsuitable for learning and safety of young children. They did not meet the Early Childhood Development Service Standard Guidelines. Classrooms were less than 8 x 6 metres and in dilapidated condition (Akwach, 2008).

In terms of number of working hours per day, most of the ECDE teachers in centres attached to public primary schools were contented since they only worked for about 6 hours per day. Their counter parts in privately owned ECDE centres were forced to remain in school up to about 3.00 p.m in the afternoon and were heavily supervised by the school administration in order to produce results. The latter may have felt over – worked yet underpaid and seemed to always have a bone of contention with their administrators. This greatly affected their performance and in turn children's' participation in ECDE.

Teachers' remuneration was very poor with some receiving as little as Ksh. 500 up per month. This pay was also irregular thus demotivating many teachers. A few private school owners in big towns paid teachers to the tune of Ksh. 10,000 per month, claims Abagi (2008). Only teachers in two ECDE centres (4.8%) were satisfied with the salary they received. They probably were paid better and on time. They may also have been enjoying fringe benefits from the school like accommodation, free snacks and chances for capacity building. These are mostly centres run by faith based organizations and private companies in the sub-county.

Finally, many teachers (76.2%) were dissatisfied with the parents' expectation of their children's performance. Many parents were too ambitious and expected their children to achieve language and mathematical competencies too soon. Teachers found such parents unrealistic and were therefore often demoralized.. The need for care that would lead to the holistic development of the child is appreciated globally and a corresponding right granted (UNCRC 1989, OAU 1990 and the Republic of Kenya, 1998). According to Bronfenbrenner, (1989) to secure the right conditions for optimal child development, communities need to focus on pre – school environment including teachers' working conditions, salaries, interpersonal relations and the physical learning environments. The effectiveness of teachers depends on the existing levels of motivation (Read, Gardner and Mahler, 1993).

(iii) School Feeding Programme and Participation of Children in ECDE

Some 40.5% of the teachers indicated that the ECDE centres did not prepare meals in school. Some children went home for meals at noon or carried some packed snack to be taken at breaktime. This was especially the case in urban centres where parents packed some snack for their children since they (parents) knew what their child(ren)'s tastes were. This is in agreement with Abagi (2008) who asserts that children in town centres usually carried 2 – 3 pieces of biscuit or 2 slices of bread. Some carried a packet of chips and soft drink or juice. However, the storage condition for these food staffs was very poor, if not a health hazard. Most centres did not have a kitchen or storage facilities. Some children however, came to school without any snacks yet the school offered none. This was attributed to poverty/lack of food at home. Such children were unable to concentrate in class and were susceptible to malnutritional diseases.

Some 59.5% of the teachers agreed that children had meals in school even if it was the break time snack alone. This snack mainly consisted of maize meal porridge that was taken as a common meal provided through the parents' contribution of cash or maize. This was more common in rural based ECDE centres. The snack was not available throughout the year in some centres as some parents did not provide the maize floor nor pay for it during some months of the year (November - May). According to Abagi's report in 2008, 57% of ECDE centres in Nairobi provided porridge for their 3 – 5 year old children while 50% did the same in the then North Eastern province. In other provinces the percentages of ECDE centres that provided a snack for children was as follows: Coast – 30%, Rift valley 42%, Nyanza 43% and Central 47%. From these figures, it means that many ECDE centres (over 50%) did not provide snacks for their children totally or even partially. Many parents could not afford a balanced diet comprising of enriched porridge, beans, rice, meat and fruit as seen in a few private ECDE centres attended by children from affluent families. This greatly affected children's active involvement in class and resistance to diseases.

4.0 Conclusion

Most ECDE centres had enrolments that were too high compared to the available facilities. The latter were overstrained due to large numbers of children who were congested in them. Due to sharing of sanitary units with the adult members of the school, the children risked being contaminated during toileting thus quick spreading of infections. Some ECDE centres never took any precautionary measures

to ensure water was safe for drinking and some parents did not ensure complete immunization for their children; thus childhood diseases including immunizable ones affected children for a long time making them miss school hours. The consequences of this included inability to qualify to transit to the next level, repetition and insufficient involvement in learning activities by the children.

The ECDE teachers' motivation was generally low mainly because government had not mainstreamed them in the remuneration offered to other teachers; they were left under the mercy of poor parents who could not afford to pay them or under selfish private centers' proprietors who over-worked yet under paid them for the essential services offered to children. The low status accorded to ECDE teachers in the district, the dilapidated physical conditions of the schools and very high expectations of children's performance by parents played a big role in lowering the spirit of most ECDE teachers. Though the transition rate was above 50%, other factors like age attainment and pressure from parents caused it rather than qualification of children. The dissatisfied teachers therefore had very little morale to work thus affecting participation of children in learning activities and in achieving the set goals.

The ECDE centres that organized the School Feeding Programme (SFP) had enhanced enrolment and daily attendance by children. The SFP created a conducive environment for smooth transition from home to pre-school since it acted as a bridge between home and school. Involvement in learning activities like play was very low in centres that did not provide some meal or snack for children since some children did not have breakfast at home and relied on the meal in the school. High poverty levels among parents and inadequate Water Sanitation and Hygiene (WASH) conditions posed a great challenge to the sustainability of S.F.P in many ECDE centres in Bungoma South Sub-county.

5.0 Recommendations

The following are recommendations made from the findings herein:

To keep children healthy, communities should be empowered economically through microfinance projects that improve agricultural production and small scale industry so that many of its members live above the poverty line and are thus able to provide nutritious food for their children, access medical services and put in place adequate water, sanitation and hygiene conditions. This will lower the incidences of malnutrition and poor sanitation – related diseases thus giving children a chance to participate in ECDE adequately. The officers in medical facilities should increase sensitization to young parents attending ante-natal clinics on the importance of the 'Early years' of their children so that they can be in a position to reduce illness among children who are at a critical age of growth and development.

On teacher motivation, efforts should be made by the national and the county governments to enhance ECDE teacher motivation through putting in place a scheme of service for them so as to provide a basis for them to access the County Government Public Service Board pay roll. The government and private ECDE practitioners should endeavor to improve the low status accorded to ECDE teachers in the sub-county by painting the ECDE sub-sector a better image than the present one; commitment from the Bungoma County Government should be seen through allocating ECDE financial and other resources to provide Teaching/Learning resources and improve infrastructure at ECDE centres.

As a matter of policy, School Feeding Programmes must be organized by the school managements and properly implemented in all ECDE centres. Availability of SFP will enhance smooth transition from home to school and improve enrolment and attendance of children. Common meals that are nutritionally balanced and adequate should be prepared in school for all the children present and served at an appropriate time. Individually packed snacks should be discouraged by the school management to minimize food contamination and stratification of children based on their economic backgrounds.

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Paradigm Shifts in Access and Trends in the Management of Education for Societal Development

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Abstract

Developing societies currently understand the values of education as a tool for economic and social empowerment. Increased enrolment in education programmes, with particular reference to adult literacy programmes, has been cited as a key factor that explains the suggested appreciation for education within society. However, the quality of adult literacy programmes remains comparatively low despite the suggested demand for the aforementioned services. Key problems identified within the adult literacy programmes include limited facilitation of resources and the poor quality of suggested resources. The study features an analysis of Bungoma Sub-County, with the primary objective of understanding aspects of teaching resources (facilitation and quality) that influence the scope and efficacy of adult literacy programmes within the suggested domain. This study assessed the availability of teaching and learning resources, the nature of physical facilities, and characteristics of learners and facilitators within adult literacy programmes. Purposive sampling was used to recruit respondents for the study. Questionnaires, interview guides, and document analysis were used for data collection. The collected data was analyzed by both quantitative and qualitative techniques. 224 respondents were identified and sampled for the study. Results from the study indicated an upward trend in adult literacy enrolment, which is a plausible indicator to growing appreciation for education. The quality and efficacy of resources was considered low that objectified standards of practice. Aspects of resources that included physical facilities were equally below standard. The quality of facilitators was identified as being lower that objectified standards of practice, which was a problem equally attributed to poor resource facilitation from the government and stakeholders within the societal domain. Findings from the study revealed a need for better resource facilitation to improve outcomes within adult literacy programmes.

***Key Terms**: Adult Literacy, Teaching Learning Resources, Curriculum, Implementation*

1.0 Introduction

Eradication of adult literacy globally has been slow due to declining enrolment levels, socio-economic factors, and inadequate skills for teachers and limited colleges established entirely for adult learners wishing to engage in lifelong learning at university level in the community (Pearce, Korach & Fourmy, 2009; Gust, 2006; Mazumdar 2005). Africa compared to other continents remains disadvantaged in terms of economic and educational growth due to the presence of large populations that were illiterate (Omolewa, 2008).

Kenya's development agenda since 1963 has been in the promotion of Adult and Continuing Education. This was evident in the commitment made in Sessional Paper No.10 of 1965, which declared a carefully planned attack on poverty, disease, and ignorance in order to achieve social justice, human dignity, and economic welfare for all. Literacy was seen as an essential weapon in fighting illiteracy, ignorance, and disease. Recognizing literacy as a critical component of education, Kenya has launched a massive literacy campaign since 1979. Findings by the Kenya National Adult Literacy Survey (KNALS, 2007) indicated that 7.8 million (38.5%) of Kenya's adult population is still illiterate (Republic of Kenya 2007). Some of the factors identified were enrolment in adult literacy classes in Kenya, Teaching and Learning (T/L) resources that are key when implementing the adult literacy and yet they are inadequate.

T/L resources are materials, hardware, software or services designed and intended for a teacher or trainer to enable, enhance or extend his or her teaching (Armitage et al., 2007). Learning resources are designed to enhance a student/trainee's understanding and can be used as an alternative to traditional taught approaches. They keep students in the mood for learning, provide opportunities to demonstrate and practice activities and may help learning to continue after the initial contact in the student's own time or in subject structured learning sessions (Armitage et al., 2007).

Limited research studies have been carried out on adult literacy in relation to T/L resources. Bungoma South Sub County has only 11 literacy centres that are unevenly distributed and do not have adequate T/L resources. This research study determined the influence of T/L resources on the implementation of the curriculum for adult literacy at the centres. This study also investigated the available reading and writing resources, physical facilities and the characteristics of the learners and teachers. Findings of this study would help create an enabling learning environment, and contribute to the field of knowledge through research.

2.0 Methodology

2.1 Study area

Bungoma South Sub County is located in Bungoma County. Bungoma County borders the Republic of Uganda to the West, Teso, and Busia County to the South West, Mumias to the South, Trans-Nzoia, Lugari, and Kakamega to the North East. The County has an area of 3,032.2 sq. Km and lies between 1,200-1,800 meters above sea level with latitude of 0.57 and longitude of 34.56. It has three Agro-ecological zones: Lower Midland (LM 1), Lower Highland (LH), and Upper Highland (UH). Bungoma County has a population of 1,630,934 (as projected in 2009) with a population density of 453.5 people per Km^2. It is divided into nine administrative and political divisions: Bumula**,** Kanduyi, Kimilili, Sirisia, Kabuchai, Webuye East, Webuye West, Tongaren, and Mt. Elgon, which are further divided into 46 political wards and 88 administrative locations. Bungoma Sub County has one division, Kanduyi Division. There are 11 adult literacy centres and each centre caters for both basic and post literacy learners.

2.2 Methods

The study used a mixed method design that included both quantitative (exploratory research design) and qualitative (descriptive research design) paradigms. The target population included basic and post literacy centres, all adult literacy learners and teachers (both full time and part time teachers), the Supervisor, the Sub-county District Education Officer, and the County Adult and Continuing Education Officer. The sample size of the target population included 11 literacy centres-Lutungu, Jirani Mwema, Habari Njema, Sinoko, Christ the King Mungeti ,Mayanja, Bukembe Kibabii, G.K Prison and Kimukungu- which catered for both basic and post literacy learners. It also included 15 teachers (eight permanent teachers and seven volunteers), one supervisor, one sub county District adult education officer, 226 adult literacy learners (116 male and 110 female learners) and one County Director for Adult and Continuing Education. This was a total sample size of 224. Both probability and non-probability sampling techniques were used. Simple and stratified random approaches were used in probability sampling. Simple random sampling technique was valued for its ability to increase the numerical score and quality of respondents, while stratified random sampling technique was used to group the target population into gender-based categories. Automatic and purposive sampling approaches were used as part of the non-probability techniques, adopted for the study to select teachers, the supervisor, the sub county adult education officer, and the county director for Adult and Continuing Education. Research instruments used were questionnaires, interview guides, and observation guide. The questionnaire was divided into sections that included demographic information, reading and writing materials, physical

facilities, and skills required by adult literacy learners, respectively. Other sections within the questionnaire included skills required by adult literacy teachers, challenges experienced, and solution to challenges, respectively. Content and construct validity was tested and spilt-half method were used to assess the reliability of the instruments. Interview guides were used to get information from the supervisor, county director and sub county District adult education officer.

3.0 Results and Discussion

3.1 Nature of learning facilities and environment

3.1.1 Expected aspects in learning facilities and environments

The study identified a correlation between the quality of learning environments as well as facilities and the ability to achieve high standards of academic development and quality of education services offered within the suggested domains. Key aspects within the domains included classrooms that are well-equipped, adequately spaced, school buildings and availability of workshops and laboratories for students to learn practical skills. The study also noted the need for playgrounds and other recreational facilities within education centres. Sanitary facilities were also deemed important, especially in the case of institutions that had a high enrolment of female students. Lastly, emphasis was pegged on the availability of relevant furniture such as desks and chairs as well as designated office spaces for educators and the centres' administration staff. When adequately available and utilized, the learning facilities and environment create interest among learners as well as allow the suggested individuals access to relevant information. Learning becomes easier, real, and more influential (Ngau, 1997; Gunawardena 1998).

3.1.2 Adequacy and availability

The study identified a general inadequacy of learning environments and facilities within adult learning education centres. One respondent for the study noted that there were generally limited facilities within ALC schools in the region, which affected academic development, enrolment, and appreciation for literacy programmes. School buildings (classrooms), washrooms, and motorbikes were available in the centre but were not adequate(Table 3). Resources such as laboratories, furniture (desks, tables, and chairs), office space, and workshops were available to the centres in very limited quantities. According to the supervisor, the environment within the (ALC) centres in Bungoma south sub county was not conducive for learning. The general use of churches for learning facilities meant that teaching and learning objectives were strained and structured on a provisional basis upon request from the aforementioned churches. This was the case in centres such as Christ the King and Lutungu that had to plan classes to match periods when the halls were not being used for church activities. However, some centres had one or more facilities that were adequate. For instance, unlike Sinoko that had one toilet used by basic and post literacy learners, Lutungu and Kibabii had adequate sanitary facilities, with Kimukung'i having an ample playing ground for learners. However, students in Kimukung'i were forced to study under a tree since the centre did not own learning facilities or land. Akin to the situation noted in Kimukung'i, particular centres such as GK prison, Kibabii, Bukembe and Mayanja had to borrow resources such as furniture from external sources. Overall, the general outlook of facility and environment adequacy was found to be low, with all centres having to rely on external parties such as churches, donors, and the community to provide missing resources.

3.2 Quality of learning facilities and environment

Conclusive results revealed that there was a common inadequacy within the adult literacy education centres, with the quality of facilities and learning environments being generally poor within most of centres. This correlated with findings that school buildings (classrooms), washrooms and motorbikes may have been available in some centre, but are not adequate (table 3). In Sinoko centre, the classroom was small and poorly, ventilated, with students using benches that were not comfortable. The problem of

unconducive furniture was common in almost all facilities reviewed during the study. In addition, centres such as Kimukung'i that did not have classrooms meant that students were exposed to dusty and noisy learning environments. Facilities in the GK prison centre are generally good, but learning is still disrupted often by erratic transfer of learners and educators within the prison system. However, Habari Njema provided a contrasting outlook by having well-structured classrooms, albeit some minimal concerns on the quality of furniture. The quality of washroom facilities was investigated, with the results indicating that they were either absent or dilapidated within most centres, with the exception of Lutungu and Kibabii that offered a more positive outlook. However, there were concerns for security and safety of the people and resources within Lutungu centre. Overall, the quality of facilities and learning environments was considered low, which compounded the problems of inadequacy. The 1988 Report of the Presidential Working Party on Education and Manpower Training for the next Decade and Beyond, noted that aspect such as learning facilities and environments that are encompassed in education resources should be planned in an effective manner to ensure efficient provision of quality and relevant education. Wamahiu *et al*, (1992) affirmed the importance of the quality and adequacy of learning spaces and facilities in their study on the educational situation for the Kenyan girl, which established that poor learning environments in public schools restricted curriculum implementation and knowledge acquisition.

3.3 Teaching and learning resources

3.3.1 Types of learning Resources and their relevance towards improving adult literacy

The study identified key teaching and learning resources to include teaching aids stationery, books (writing materials) text and reference books, chalk and blackboards, as well as well as audiovisual aids such as computers and other technology aids. The importance of each of the aforementioned components (including others that may be of relevance) has been articulated by Armitage et al (2007) with relevance on the tools being designed and intended for by a teacher or trainer to enable, enhance, or extend his or her teaching. Learning resources are also important for students since they support academic knowledge acquisition as well as and simplify comprehension of curriculum content. In addition, the availability of teaching and learning resources aids in enforcing motivation and appeal towards academic and literacy development. Armitage et al (2007) cited the availability and good quality of teaching and learning resources as positive primers for knowledge acquisition through enabling students to demonstrate and practice activities, hence improving their mental and psychomotor outlooks. Teaching and learning resources may help learning to continue after the initial contact in the student's own time, or in subject-structured learning sessions. A learning resource acts as a third party in a teaching and learning situation. In general, teaching and learning resources were distinguished to include projected (for instance computers) and non-projected aids (for instance chalk and blackboards).

3.3.2 Adequacy of learning resources

Adequacy of teaching and learning resources was considered important to actualize goals of education transfer and development within the adult literacy programme. The study identified the limited or complete lack of particular resources, exhibited through the sharing of some resources, borrowing of some resources or lack of necessary materials such as writing aids. One interesting observation was that all eight centres lacked a computer, despite the prevailing change to techno-based learning within the education sector. Further, there was a need to create uniforms to match and easily identify learners from the centres. Conclusive results revealed that there was a common inadequacy within the aforementioned parameters. The Bungoma South Sub County Report (2012) on adult literacy established that few adult literacy centres (for instance, Mayanja (ABC) and GK Prison) that were completely self-reliant, although resource availability was not consistent. In Sinoko and Kibabii centres for instance, research conducted revealed the limited availability of writing aids (pens/ pencils) and the limited writing surfaces (exercise books) were torn. The learners used 32 page exercise books, which they individually bought. The adult

literacy centres have limited audiovisual teaching/learning resources (Table 4) as affirmed by other studies as well (Sifuna and Otiende, 2006; Robertson 2007; Archer 2005; Pearce, Korach & Fourmy 2009; and Mulkeen & Chapman 2007). The trend of limited resources was similar in other institutions, with the exception of institutions such as the GK prison that received resources through donations from the Fr. Grol's Welfare Trust as well as the Prisons Department. Litungu centre also borrowed blackboards from the local women group, with a similar trend in borrowing reading materials noted among various centres reviewed during the study. However, the resources were not supplied on a regular basis, which was an impediment to effecting teaching and learning within the facility. The availability of teaching and learning resources was generally low, except in situations where teachers improvised by using community-based teaching and learning resources as was evidenced in the case of Bukembe. The results correlated to earlier studies by Ngau (1997) that affirmed the inadequacy of teaching and learning resources within the larger education system. In particular, Ngau (1997) noted that it is not easy for an adult learner within the suggested education programme to acquire the relevant teaching and learning resources needed to effect academic development. Understanding that many adult literacy centres face challenges in the availability of resources prompted teachers to resort to using expository teaching strategies as an alternative to the limited or missing the reading/writing resources. In some cases, such as that cited of Mayanja and Mungeti centres as well as other domains, teachers had to use their own money to buy resources. This outcome is consistent with the views presented in the Human development index report (2014) in which lower literacy levels among adults and marginalized groups in Africa are described as a function of limited spending by governments on adult literacy. As a result, formal schools in Kenya are experiencing influx of adult learners who are eager to attend school but cannot be served by adult literacy programmes.

3.3.3 Quality of teaching and learning resources

The quality of teaching and learning resources was considered paramount in effecting the goals of academic development within education institutions. The study based the suggested objective on aspects identified by Curzon (1990) that affirmed the relevance of efficient and effective teaching and learning resources as utilized in the learning environment as advanced organizers or tools that set the scene for the introduction of new topics and encourage students to make connections with their existing knowledge. The study identified the general quality of resources as being low, with particular reference to the use of outdated material within the centres. One respondent in the study indicated that their centre did not have many books and charts, with those that were available being old and torn. The supervisor interviewed for the study gave the example of a book called *obulala buleera Amani* that was generally outdated and failed to meet the needs of the learners. Further, examples provided from Habari Njema revealed that the primers identified were at best irrelevant to the scope of the courses offered, with Kimukung'i centre using textbooks that were outdated for both teaching and student reference. In some cases blackboards purchased by the teachers and learners were broken in some parts. The chalk purchased by teachers had a lot of dust and did not write well on blackboards. An earlier study by Ngau (1997) confirmed results identified in this study, with particular reference to students using small exercise books and old (outdated and tattered) reading material. The study also confirmed that most centres lacked modern technology-based teaching and learning resources that could be instrumental in improving the standards of academic development within the institutions. As one respondent from the study affirmed, the good quality (and availability) of teaching and learning resources influences the ability to achieve teaching and learning outcomes within the adult literacy centres.

3.4 Characteristics of learners

3.4.1 Type of learners

The study interviewed 99 respondents that included 49 male and 50 women. In general, the population of learners within the centers was male dominated, but some domains had a higher enrolment of females as compared to males. The study also found that there was an increasing rate of enrolment of female learners, which could be attributed to a shift in social thinking from a historical perception that girls and women were not expected or required to attend school. On the other hand, the declining rate of male enrolment could be attributed to a similar push in social perceptions, which include people having a generally negative outlook of men within the ALC programme. There were two centers - the GK Prison and the Christ the King - that had only male adult literacy learners. This is because of the policy establishment by the Government of Kenya Prisons Act and the Catholic Church establishment that caters for only male or female learners.

Figure 3 indicates the greatest number of respondents (18) being those aged between 21 and 24 years, and at least three being those aged between 46 and 50 years. There was growing predisposition and preference for adult literacy within the young adult population. One surprising result was the fact that a substantial section of the adult literacy learners (13) were in the age category of children ranging between 11 and 15 years. A plausible explanation for the suggested trend may be that the individuals were either dropouts from primary schools or those who had never attended formal education. The rate of enrolment decreases within age as evidenced from the study. However, a perceived spike in adults beyond 60 years is noted.

Findings of this study revealed further that adult literacy learners are distributed in centers unequally. Some of the centers have higher population than others. Table 2 indicates that 62 (62.63%) of the identified adult learners were currently studying within the post literacy domain. On the other hand, 37 (37.37%) of the respondents were within the basic literacy level. Table 7 indicates most of the respondents (85.86%) as being perceivably new within the adult literacy domain, having been in their present literacy period for less than five years. The other respondents indicated they had been at their literacy level for six to ten years.

3.4.2 Needs and skills assessment

A suggestion was developed on a perceived lack of resources during the past that may have limited accessibility towards some form of education for the respondents. This included socio-economic strife (Poverty), socio-political strife (wars and chaos) or socio-industrial ineptness (lack of personal or institutional drives towards education). The identified respondents seemed to indicate socio-economic strife and socio-industrial ineptness as factors that impeded their previous chances towards normal education. One respondent from Habari Njema however identified conflicts in a previous locale as being the key impediment to gaining education and saw the centre as a second opportunity to gain education. The study equally identified some respondents as having had some form of education, the sojourn having been interrupted by one or more of the factors highlighted in the previous context. This assertion was noted among four respondents from GK Prison, three from Mayanja ABE, and two each from Lutungu and Mungeti centres. For the aforementioned respondents, ALC provided an opportunity through which they could continue with their education, albeit within a new learning regime that is contrary to that in the common education framework.

In general, the demographic characteristics of the learners and their responses to the researcher's interviews confirmed that the motivation to pursue adult literacy originated from diverse situations ranging from personal factors to sociological and teacher-related considerations. Two respondents from

Mungeti, and one each from Kimukung'i, Lutungu and GK Prison centres and four from Habari Njema centre alluded joining ALC within their locale to compensate for the lost opportunities for earlier education. The study identified most respondents implying their choices to join adult literacy classes was guided by the need to gain reading and writing (functional literacy) skills, which would help them understand literature material and be able to communicate effectively. Additional knowledge desired by learners included entrepreneurial and agricultural skills. Occupational skills gained were noted as being of a semi-skilled in nature. Respondents from Christ the King indicated gain in behavioral growth as being pertinent, highlighting the ALC as regressing trends towards drug abuse or social maladjustment. They also considered an improved understanding and level of social awareness and appreciation through activities such as sports and games to be an important aspect of ALC learning. Knowledge on healthcare was also detailed as various gains achieved through ALC. The need to achieve personal (behavioral) growth and social recognition has also been cited as factors or reasons for respondents joining ALC programmes. Knowledge on health care and family planning were also considered important aspects gained from ALC centers. In general, learners attribute ALC programmes as an effective way to gain professional skills that will increase the chances and levels of income generation, with some indicating that it also fosters a stronger sense of patriotism, nationalism, and social inclusion.

3.4.3 Attitudes, perception, and trends towards ALC

The study used parameters of absenteeism and general responses regarding the values of ALC as indicators to learner's responsiveness to the suggested programme. As regards absenteeism, the findings in Table 6 indicate that the rate of absence and perhaps dropout is alarming. Whereas the target population of the adult literacy classes was 226, only 99 (43.8%) attended at the time the centres were visited. Family commitments were cited for this state of affairs. It nevertheless confirmed the view that factors other than teaching/learning resources as asserted by Horner (1973), Obe and Asiedu, (1988) and Omolewa 2008 influenced implementation of adult literacy. The GK prison presented a unique reason for absenteeism and dropouts that are linked to the frequent transfers of learners to other correctional facilities and the negative perceptions societies have on the learners based on their criminal past. The aspect of negative perception has also influenced enrolment rates to ALC centers, with the common perception by most respondents cited in the study being that the general society often has a low (negative) and skewed perception on the importance of adult learning. As such, lack of encouragement from the larger society lowers the morale of learners within ALC centers. However, students within the programme generally have positive perceptions on the values of attaining formal education and literacy, especially in the context of professional development as articulated by a respondent in the study.

3.4.4 Characteristics of adult literacy teachers

3.4.2.1 Type of teachers

The study surveyed educators within the ALC programme, with 10 being male and five female. 53.4% aged of those surveyed were between 51 and 60 years, perhaps revealing longevity and experience being a common factor within adult literacy teaching. The findings, among others are presented in Table 4 also indicate that the superior age also predisposes the educators to have better control and management of students within the ALC classes.

The study identified that adult literacy teachers' qualification characteristics met the minimum threshold, in spite of glaring gaps in the levels of education for 20 percent of the teachers. Information that revealed the academic qualifications for three (20%) could not be established suggest that evaluation and monitoring practices (by education managers) is not effective. The study also indicated that most of the teachers (60%) had more than five years teaching experience with 40% having more than 20 years of

experience. The trend cited in Bungoma South sub County may conform to Knowles' (1980) suggestions that experience is a factor in the success of pedagogy (Freire, 2004) of adult literacy.

However, the quantity of teachers was seen to be low within the larger ALC system, which is direct impediment to effective and efficient delivery of education. The problem was further increased in the context of having teachers multitasking between basic and post-literacy classes. Due to staffing facility (resource) constraints, classes have to be conducted at the same time, yet the teachers tackling this objective lack the required skills set. In Lutungu centre for instance, learning had to be cancelled in case the one teacher identified was absent. Personal commitments also meant that the teachers could not attend classes regularly. The teachers were also poorly remunerated, which affected their drive or motivation towards teaching.

3.4.5 Teaching and assessment methodology

Findings based on the evaluation of centers within Bungoma sub-county revealed that adult literacy teachers predominantly used discussions, lectures, demonstrations, and role-playing as teaching methods to implement the adult literacy programme. This confirmed findings of previous studies by, Gust (2006), Karen and Rogers (2006), and Omolewa (2008) which indicated the prevalence of these methods that they stated led to low achievement levels in adult literacy. Secondly, the findings also revealed that record keeping was only average. Whereas most centres showed evidence of schemes of work, practically all centres had no evidence of assessment. The records did not exist implying that it was doubtful that feedback on learning was obtained by the adult literacy teachers. Thirdly, the continued use of discussions, lectures, demonstrations, and role playing teaching methods did not encourage the use of many locally available teaching/learning resources. The real environment in the countryside and the community around the school were frequently referred to but seldom used by the teachers in providing instruction. These results therefore point at the fact that limited freedom and innovativeness, especially through explorative and inquisitive learning proposed by Freire (1972) and in Knowles (1980) andragogy, were hardly applied by the educators in teaching adults.

3.4.6 Summary of challenges influencing implementation of ALC programmes

Generally, the challenges faced by adult literacy practitioners and learners in Bungoma South resonate with those identified by previous studies including Horner (1973), Obe and Asiedu (1988), Gust (2006), Karen and Rogers (2006), and Omolewa 2008, Archer, (2005) Pearce, Korach and Fourmy, (2009), and Mulkeen & Chapman, (2007), among others. These include limited effective teaching/learning resources, lack of physical Facilities, and negative attitude towards Adult Learning. In addition, challenges such as inadequate teachers for Adult Education, workload insufficiency due to age and excessive responsibilities, and use of outdated and poor quality resources, as well as high levels of absenteeism by both teachers and learners. Poor curriculum developments in Adult Education, personality and frustrations, and lack of seminars and workshops on Adult Education, have also been seen to pose challenges to the implementation of ALC programmes. Additional problems include poor remuneration of educators (especially part time staff), lack of accessibility to emerging resources of relevance such as computers, high dropout rate of learners and environmental problems such as heavy rainfall and diseases.

3.5 Conclusions and Recommendations

The efficacy of adult education within Kenya is largely affected by the availability of relevant resources and attitudes among learners within the suggested programme. The present study aimed to investigate trends and practices regarding teaching and learning resource availability, outlook of learning facilities and environments, and characteristics of both learners and educators, which influence the efficacy of

adult education programmes. Results indicated a general lack of resources and conducive learning environments within the ALC programme, which impeded the ability to achieve objectified teaching and learning objectives. Further, the results revealed that positive behavior and practice adopted by learners and teachers in the ALC programme were instrumental to its success. However, the ALC system is predisposed to various challenges equally articulated under the aforementioned themes. As such, recommendations for continued improvement of the ALC programme include the following:

- The need for education stakeholders to strengthen policies regarding provision of resources as well as learning facilities, improve the teaching rationale and approach adopted by educators (which also includes improve their competency)
- Infuse within the curriculum holistic skills development among students by letting them embark on and participate in project work supervised by adult literacy teachers
- Training implementers of adult literacy on the criteria for selecting and using learner friendly and responsive resources to maximize teaching and learning experience
- Adopt the community-based model in implementing adult literacy.

There is need for further research to understand the impact or relevance of factors such as age, gender, motivation, and harmonization in influencing the success of ALC programmes.

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Appendix 1

List of figures and tables

Table 1 Demographic information for Adult Literacy Teachers

1.Gender	Frequency	Percent
Male	10	66.7
Female	5	33.3
Total	15	100.0
2.Age Brackets	Frequency	Percent
25-30 years	3	20.0
31-35 years	3	20.0
46-50	1	6.7
51-55	7	46.7
56-60	1	6.7
Total	15	100.0
3.Level of Education	Frequency	Percent
Not stated	3	20.0
Diploma Level	3	20.0
O Level & Certificate in Adult Education	1	6.7
Certificate	5	33.3
O Level	2	13.3
K.C.S.E	1	6.7
Total	15	100.0
4. Teaching experience in adult literacy curriculum in Bungoma south sub county.	Frequency	Percent
Less than 5 years	6	40.0
5-10 years	3	20.0
Over 20 years	6	40.0
Total	15	100.0

Table 2: Demographic Information for Adult Literacy Learners

1. Gender	**Frequency**	**Percent**
Male	49	49.5
Female	50	50.5
Total	99	100.0
2. Level of Education	**Frequency**	**Percent**
Basic Literacy	37	37.37
Post Literacy	62	62.63
Total	99	100.0

3. Distribution of Adult Literacy learners by Duration of time the Learners Spent at their Current Levels.

Duration Bracket	Frequency	Percent
Less than 5	85	85.86
6-10	14	14.14
Total	99	100.0

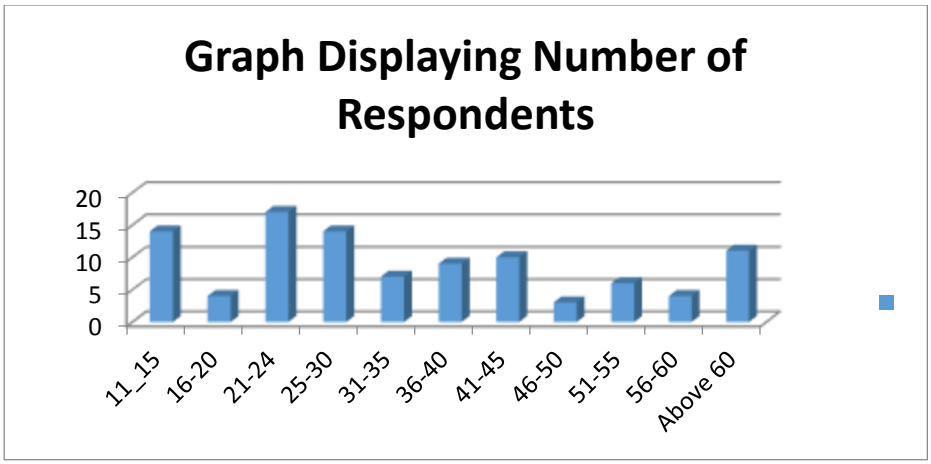

Figure 1: Graph displaying age distribution

Table 3 Physical facilities available for implementation of adult literacy curriculum in Bungoma South Sub County

	Very adequate f (%)	Adequate f (%)	Not Adequate f (%)	Not at all Adequate f (%)	Total f (%)
School Buildings		5 (33.3)	8 (53.3)	2 (13.3)	15 (100.0)
Classrooms		6 (40.0)	6 (40.0)	3 (20.0)	15 (100.0)
Washrooms			6 (40.0)	9 (60.0)	15 (100.0)
Laboratories			1 (6.7)	14 (93.30)	15 (100.0)
Desks		4 (26.7)	7 (46.7	4 (26.7)	15 (100.0)
Tables		3 (20.0)	7 (46.7)	5 (33.3)	15 (100.0)
Chairs		2 (13.3)	9 (60.0)	4 (26.7)	15 (100.0)
Playground		3 (20.0)			15 (100.0)
			6 (40.0)	6 (40.0)	
School garden		1 (6.7)	3 (20.0)	11 (73.3)	15 (100.0)
Motorbikes			1 (6.7)	14 (93.30)	15 (100.0)
Office space		1 (6.7)	6 (40.0)	8 (53.3)	15 (100.0)
Workshop	1 (6.7)	2 (13.3)	1 (6.7)	11 (73.3)	15 (100.0)
Computers			1 (6.7)	14 (93.30)	15 (100.0)

Legend: Percentages in parentheses

Table 4 Readings and writing resources available for influence of the on the implementation of adult literacy curriculum

A. Reading and Writing materials	**Not stated f (%)**	**Adequate f (%)**	**Not Adequate f (%)**	**Not at all Adequate f (%)**	**Total**
Exercise books	-	-	9 (60.0)	6 (40.0)	15 (100.0)
Text/reference books	1(6.7)	1(6.7)	12 (80.0)	1(6.7)	15 (100.0)
Chalkboard	-	4 (26.7)	6 (40.0)	5 (33.3)	15 (100.0)
Manila papers	-	1 (6.7)	4 (26.7)	10 (66.7)	15 (100.0)
Newsprint	-	-	2 (13.3)	13 (86.7)	15 (100.0)
Primers	-	2 (13.3)	11 (73.3)	2 (13.3)	15 (100.0)
B . Visual aids:					
Maps	1 (6.7)	1 (6.7)	3 (20.0)	10 (66.7)	15 (100.0)
Diagrams	-	1 (6.7)	3 (20.0)	10 (33.3)	15 (100.0)
Models	-	-	3 (20.0)	12 (80.0)	15 (100.0)
Radios	-	-	1 (6.7)	14 (93.3)	15 (100.0)
Television set	-	-	3 (20.0)	12 (80.0)	15 (100.0)
Films	-	-	-	15(100.0)	15 (100.0)
Slide projectors	-	-	-	15 (100.0)	15 (100.0)

Influence of Principals' Management Competencies on Supervision of Instruction in Public Secondary Schools in Homabay County, Kenya

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Abstract

Principals' supervision of instruction is vital as it ensures that all planned teaching and learning activities in a school are implemented and educational objectives achieved. Despite its importance, principals' supervision of instruction in Homabay County over the years hasbeen below expectation as evidenced by poor performance in Kenya Certificate of Secondary School Examinations (KCSE). This paper examines the influence of principals' management competencies on supervision of instruction in public secondary schools in Homabay County, Kenya. The study adopted the descriptive survey research design. A sample of 6 Sub County Quality Assurance Officers (SCQASOs) and 204 Heads of Departments (HODs) selected using purposive, proportionate and simple random sampling techniques were involved in the study. Data was collected using the HODs questionnaire and SCQASOs interview guide. The two instruments were validated and piloted for reliability before they were used to collect data. The influence of principals' management competencies on supervision of instruction was determined using simple regression analysis. The results of the study revealed that the relationship between principals' management competencies and supervision of instruction was significant ($R = .429$, $p < .05$). The results also revealed that a significant proportion of variance in supervision of instruction was explained by principals management competencies ($ß = .426$, $p < 0.05$). It is expected that the findings of this paper will provide school administrators and government education officers with an insight on the role of principals' management competencies in supervision of instruction. The results may also be used by principals to develop policies and practices that enhance quality of supervision of instruction in their respective schools.

Key words: *Competencies, Influence, Instruction, Management, Supervision*

1.0 Introduction

Management of secondary schools is becoming more complex because of the dynamic environment in which they operate (Bouchamma, Basque, Marcotte, 2014). Schools require competent leaders and managers ifthey are to provide quality education to learners. Principals as heads of these institutions are central to successful management of schools and realization of their objectives. The quality of education offered by schools depends on the nature of leadership provided by principal, his/her ability to control, direct and guide teachers and students (Kiptum, 2016). It also depends on the principal's ability to organize and supervise implementation of the approved school curriculum (Wango, 2009).

The term "supervision" literally means to "watch over" or "to oversee" (Amannuel, 2009). It is concerned with aspects of administration which are geared towards human resource with an aim of achieving organisational goals. Wanjohi (2005), conceptualized supervision as "overseeing" and "helping", where overseeing has a connotation of a task oriented that involves directing, controlling, coordinating and reporting. In educational cycles, it is more concerned with supervision of instruction. According to Ayeni (2012), instructional supervision is an internal mechanism adopted by principals for school self-evaluation, geared towards helping teachers and students to improve on their teaching and learning activities for purposes of achieving educational objectives. The purpose of supervision of instruction is not to judge the competencies of teachers, nor is it to control them but rather to work cooperatively with them. Its main objective is to improve teachers' instructional practices, which

may in turn improve student learning. It provides teachers with information about their teaching so as to develop instructional skills to improve performance

Supervision of instruction is one of the most important management activities in schools as it facilitates learning and supports teachers in bringing about effective teaching (Gregory, 2011)). In Kenya, supervision of teaching and learning was conducted by inspectors from the Ministry of Education (Ministry of Education, 2009).This mode of supervision was referred to as inspection, it has been phased out and the function left to the principals (Ministry of Education, 2011). Instructional supervision provides principals with the opportunity to make observations and evaluate shortcomings in the classroom. Data generated by these observations is used to determine whether a school and its educational offerings are effective or ineffective (Republic of Kenya, (2005) Sessional Paper No. 1). Macharia, Thunguri and Kiongo (2014) assert that instructional supervision ensures that goals of the school are well articulated; learning environment is safe; teachers' efforts are focused on teaching and improving their professional skills; and classroom teaching.

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Studies have shown that supervision of instruction is affected by several factors. Sergiovani (2009) noted that possession of three basic skill domains; technical, human and conceptual is key to supervision of instruction. Wawira (2011) observed that principals' job and teaching experiences influence teachers' perception towards the principal's instructional supervision practices. Studies done in Kenya by Nyandiko (2008) and Kirui (2012) found that principals' experiences have a positive influence on implementation of curriculum change and instructional supervision practices. Attitudes (Mbithi, 2007), school size (Bays, 2010) and workload (Kamindo, 2008) are some of the determinants of instructional supervision. Studies have also shown that principals' management competencies contribute significantly towards their supervision of instruction (Makokha, 2015). Babayemi (2006) is of the view that a school principal must not only be trained in the act of administration but must be well-acquainted with the principles that guide and control administrative processes.

Supervision of instruction is one of the several techniques employed in achieving educational objectives (Bendikson, Robinson & Hattie, 2012) Supervision of instruction is important because it is a means of advising and stimulating interest in teachers, pupils, help to improve teaching and learning situations in educational institutions (Oyewole & Alonge, 2013). Despite its importance supervision of instruction is not effective in most schools (Kieleko, 2015). This study sought to establish the influence of principals' management competencies on supervision of instruction in public secondary schools in Homabay County, Kenya. It tested one null hypothesis at an alpha level of significance of 0.05 which states:

> ***HO_1: Principals' management competencies do not significantly influence supervision of instruction.***

2.0 Methodology

This study was conducted among public secondary schools in Homabay County between February and March 2016. It adopted the descriptive survey research design. The design was selected because it is ideal for examining the nature of prevailing conditions and practices as they existed without manipulation of variables (Wiersma & Jurs, 2005).

This study was conducted among public secondary schools in Homabay County. The county has a total of 298 secondary schools (County Director of Education [CDE], 2015). The schools are categorises as, National (2), Extra County (11), County (43) and Sub County (242).

The target population of the study was 4,795 public secondary school teachers in the county and the 6 Sub-County Quality Assurance and Standards Officers (SCQASO). The accessible population was 803 Head of Department (HODs) and the 6 SCQASOs. The HODs were selected because they coordinate department activities and assist the principals and their deputies to manage schools (Wango, 2009). The SCQASOs were chosen because it is their mandate to ensure that quality education is provided to students in their respective sub-counties.

Purposive sampling was used to select the 6 SCQASOs who took part in the study while the sample size of the HODs was determined using Slovin's formula (Dionco-Adetayo, 2011)

$$n = \frac{N}{1+NE^2}$$

Where: n = sample size
N = population size
E = margin of error or error tolerance (5%)
1 = is a constant value

The sample size of HODs was 267 given that their accessible population was 803. The number of HODs drawn from the various school categories was determined using purposive, stratified, proportionate and simple random sampling techniques. Purposive sampling was used to select all the 104 HODs from national and extra-county schools to ensure these school categories were included in the study. Stratified and proportionate sampling procedures were then used to determine the number of HODs drawn from the county and sub-county schools.

The study used the Head of Departments' (HODs) questionnaire and SCQASOs interview schedule to collect data. A questionnaire was chosen because it is efficient, practical, allow use of a large sample and administration and scoring is straight forward (Borg & Gall, 2003). It is especially useful in surveying people who are dispersed over a wide geographical area and the travelling demands on an interviewer would be excessive (Salkind, 2009). The interview was chosen because respondents can seek clarification whenever need arises and interviewers can explain questions (Sekaran & Bougie, 2010). The HODs questionnaire and SCQASOs interview schedule were validated by 5 experts in the Faculty of Education and Human Resource, Kisii University before they were used in the field to collect data. Thereafter, the questionnaire was piloted and its reliability coefficient estimated using the Cronbach Alpha method. The reliability coefficient of the HODs questionnaire was 0.81. The instrument was deemed reliable given that its coefficient was above the recommended 0.7 threshold (Fraenkel & Wallen, 2000).

The principals' management competency was measured using data generated by the HODs questionnaire. The variable was measured with respect to its five dimensions namely: planning, organizing, coordinating, supervising and controlling. A set of 22 close ended items constructed using a 5 points (1: Very Poor to 5:Very Good) scale was used to measure the variable. The responses to the items were averaged and transformed into indices of the five management competencies dimensions. The overall index was derived from the indices of the five dimensions of management competencies and used as the measure of principals' management competencies.

The principals' supervision of instruction was also measured using data gathered using the HODs questionnaire. The construct was measured with respect to three aspects of instruction supervision, namely; planning, delivery and evaluation. 17 close ended items based on the frequency (1 Not at All to 4: Very Often) of supervision of instruction activities were used to measure the variable. The HODs responses to the items were averaged and transformed into the supervision of instruction index.

The influence of principals' management competencies on supervision of instruction was determined using simple regression. The procedure was selected because it is ideal for establishing causal relationship between variables and explaining the power of the independent variable in accounting for variations in the outcome (Field, 2010). The association between the two constructs was established by regressing the principals' management competencies index against that of supervision of instruction.

3.0 Results and Discussions

The principals' management competencies were measured with respect to planning, organizing, coordinating, supervising and controlling. The indices of the 5 aspects of management and the variable index are given in Table 1

Table 1: Planning, Organizing, Coordinating, Supervising, Controlling and principals Management Competencies Indices

Management Dimension	n	Mean	SD
Planning	197	3.84	0.54
Organising	195	3.87	0.48
Coordinating	196	3.74	0.38
Supervising	193	3.92	0.48
Controlling	194	4.09	0.13
Management competency index	**199**	**3.90**	**0.40**

The results in Table 1 reveal that the means of the 5 dimensions of management ranged from 3.74 (SD = 0.38) to 4.09 (SD = 0.13) while the principals management competencies index was 3.90 (SD = 0.40). The means of the 5 aspects of management and principals management competencies indices were high given that they were out of a maximum of 4. This is an indication that principals are competent managers

Data generated by the QASOs interview schedule indicated that the principals' management competencies levels were high. Two of the QASOs noted that principals have good working relations in their schools while three reported that principals involve stakeholders in management of the schools. Two of the SQASOs reported that most of the schools were well organized as they have well laid structures with clear lines of responsibilities. One QASO observed that most principals in old schools had well-kept records. The observations of the QASOs is an indication that principals practice aspects of management aspects of management organizing, delegation and team work.

3.1 Principals' supervision of instruction

Principals' supervision of instruction was measured with respect to three aspects of instruction supervision, namely; planning, delivery and evaluation. The supervision of instruction index was M = 3.17 (SD = 0.60) out of a maximum of 4 and was rated good.

Data generated by the QASOs interview guide revealed the principal's management competencies were good. The QASOs pointed out some of the weak areas that commonly featured during their inspection. They pointed out, some of the issues they come across during inspection were; schemes of work which were not up to date; records of curriculum delivery not endorsed; and monitoring systems not in place.

3.2 Testing the hypothesis

Simple regression was used to test the study hypothesis which stated that principals' management competencies do not influence supervision of instruction (Table 2)

Table 2: Regression Model showing Association between Principals' Management Competencies and Supervision of Instruction

Model	Unstandardized Coefficients		Standardized Coefficients	t-value	p-value
	B	Std. Error	Beta		
(Constant)	1.870	.201		9.302	.000
Principals' management competencies	.352	.053	.429	6.629	.000

$R = .429$, $R^2 = .184$, Adjusted $R^2 = .180$, $F(1, 195) = 43.947$, $p < 0.05$

The results in Table 2 reveal that the relationship between principals' management competencies and supervision of instruction was positive and significant ($R = .429$, $p < 0.05$). The results further reveal that principals management competencies explained a significant variation in supervision of instruction, $R^2 = .184$, $F, (195) = 43.947$, $p < 0.05$. These results imply that principals' management competencies influence supervision of instruction. On the basis of these results the study hypothesis which states that principals' management competencies do not influence supervision of instruction was rejected.

This paper examined the influence of principals' management competencies on supervision of instruction. The results indicated that the relationship between principals' management competencies and supervision of instruction was positive and statistically significant. The results support those of Olaleye (2013) who observed that the success of schools systems depend on principals abilities to plan, organize, direct and coordinate, staff and evaluate. Accomplishment of school objectives depend solely upon the principal's administrative and management skills. The results are in harmony with those of a study conducted by Adegbemille (2011) in Nigeria. The study demonstrated that the principals require planning, organizing, communication, personnel and leadership skills to supervision to effectively supervise operations in school.

4.0 Conclusions

The results of the first hypothesis test revealed that the relationship between principals' management competencies and supervision of instruction was positive and statistically significant. It also revealed that principals' management competencies explained a significant variation in supervision of instruction. On the basis of these observations, it was concluded that principals' management competencies positively influence supervision of instruction.

4.0 Recommendations

This paper has shown that principals' management competencies positively influence supervision of instruction On the basis of the results, it is recommended that principals' management competencies be enhanced through workshops and seminars, post graduate training in school management and skill upgrading short courses. It is also recommended that supervision of instruction in schools be strengthened through planning, organising and motivation of educators and parents by principals.

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Appendices

Principals' management competencies index

Statement	N	Mean	SD
Planning			
Shaping school mission and vision	162	3.04	1.45
Sharing the schools core values with all the stakeholders	197	4.14	0.98
Preparing plans for school curricula and co-curriculum activities	197	4.01	1.09
Drawing the school's annual budget	192	4.17	1.01
Planning index	**197**	**3.84**	**0.54**
Organizing			
Designing a framework for implementation plans for achieving school objectives	190	4.06	1.08
Has put in place effective communication channels in the school	167	3.16	1.47
Makes adjustments in the school's academic programmes whenever need arises	190	4.23	0.96
Organizing repairs and maintenance of school's physical facilities	195	4.03	1.07
Organizing index	**195**	**3.87**	**0.48**
Coordinating			
Selecting and recruiting qualified of competent staff	163	3.23	1.59
Deploying staff for effective execution of school programmes	189	4.01	1.06
Consulting subordinates before making decisions	192	3.54	1.24
Coordinating repairs and maintenance of school's equipment plant	196	4.19	0.92
Coordinating index	**196**	**3.74**	**0.38**
Supervision			
Overseeing the preparation of procurement plan for purchase of goods and services for the school	160	3.11	1.49
Continuously monitors and evaluates all school's teaching-learning activities	195	4.10	1.13
Oversees the collection of all school revenue	194	4.10	1.03
Supervises utilization of school finances	192	4.36	0.90
Overseeing school's participation in co-curricular activities	189	3.93	1.15
Supervision index	**193**	**3.92**	**0.48**
Controlling			
Directing implementation of curriculum	192	4.30	0.92
Promptly deals with problems	194	4.04	1.04
Motivates student and staff	194	3.97	1.17
Ensures there is a favourable climate for change in the school	194	4.03	1.40
Is a team player	196	4.09	1.11
Controlling Index	**194**	**4.09**	**0.13**

Principals Supervision of Instruction Index

Statement	N	Mean	SD
Monitoring curriculum delivery by attending class during lessons	194	2.87	1.19
Rating preparation of work/lesson plans by the end of the term	193	3.76	0.49
Monitoring purchase and delivery of instruction materials	197	3.72	0.49
Examining quality of teaching-learning materials	192	3.80	0.61
Visiting classroom to ensure teaching and learning takes place in a conducive environment	192	3.18	0.93
Checking whether teachers mark and prepare students progress report promptly	189	3.57	0.77
Examining teachers records of works to ensure they filled and checked by HODs	191	2.80	0.65
Checking whether teachers are present in class and teaching during lesson	191	3.40	0.91
Going through students work books as a way of ensuring assignments are given and marked by teachers	196	2.74	0.93
Make visits as way of ensuring science teachers prepare laboratories and run practical lessons with students	182	3.19	1.01
Overseeing provision of remedial teaching by ensuring time is allocated and teachers assigned those responsibilities	193	3.40	0.90
Monitoring syllabus coverage by inspecting teachers record of work	184	3.68	0.68
Ensuring teachers cover the syllabus at the end of the 4 year cycle	193	3.34	0.66
Monitoring class attendance by examining registers	184	2.88	0.86
Involving parents in supervision of learning	189	2.97	0.85
Conducting regular inspection to ensure teaching and learning equipment are in good working condition	188	3.19	0.90
Attending class during lessons and holding staff meeting to as a way of monitoring syllabus coverage	187	3.65	0.73
Principals' supervision of instruction index	**190**	**3.17**	**0.60**

Educational Influence of the 5-8 Year Olds Children Aggression

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Abstract

The study was to investigate educational influence of 5-8 year olds children's aggression. Aggressive behaviours include the behaviours that are directed in harming others and tend to be a nuisance to many people. The study was guided the Social Cognitive Learning Theory by Albert Bandura-learning by observation and modelling and Social Constructivism Learning by Lev Vygotsky-learning through interaction. The objectives of the study were to: determine the factors that contribute to aggression among children in Mwingi Central Sub County and determine the effect of children's aggression on their educational progress. It was a descriptive survey in Mwingi Central Sub County in Kitui County. Through stratified sampling, the researcher picked 10 schools (5 private and 5 public) out of 104 total schools. In each school purposive sampling was used to pick aggressive children from nursery to class three. Thereafter with the help of the class teachers, two most aggressive children identified for observation. All the teachers in preschool and lower primary (4 teachers per school = 40 in total) were issued with questionnaires while 40 parents of the aggressive children were randomly selected for interviews. The District Centre for Early Childhood Education (DICECE) officer and the district special education officer were purposively picked and issued with questionnaires. Checklists were used to collect information on children's behaviour. In order to understand children's academic performance, children's progress records were scrutinized. The instruments validity was ensured through review by the early childhood experts and the reliability was ensured through test retest method with a consistency of 0.80 established. Permission from NACOSTI was sought before data collection. Data collection took 32 days; 3 days per school where observations were conducted first followed by interviews then analysis of the children's academic progress records and finally administration of the questionnaires. Thematic content analysis with excerpts was used to analyse qualitative data. Descriptive statistics was used to summarise data while quantitative data was analysed through and linear regression. The study established that there is no significant relationship between aggressive behaviours and academic performance. However children with aggressive behaviours have low class participation and task completion. They show poor school attendance but rarely drop out of school. Children with aggressive behaviours face challenges in their academic progress. There is need for increased funding and research to help these children. Child guidance and counselling programme in schools is highly recommended.

Key Words: *Aggressive Behaviour, Aggressive Child, School Drop Out, Academic Performance.*

1.0 Background

Aggressive behaviour is a behaviour directed toward causing harm to others either physically for example fighting or socially for example spreading malicious rumours (Gasa, 2005). Moeller (2001) gave a clear picture of the early warning of signs of potential future aggressive behaviour. These warnings include: social withdrawal; low school interest and poor academic performance; expression of violence in writings and drawings; uncontrolled anger; patterns of impulsive and chronic hitting, intimidating and bullying; intolerance of differences and prejudicial attitudes; drug and alcohol abuse; affiliation with gangs; serious physical fighting with peer or family members; severe destruction of property; detailed threats of lethal violence; unauthorized possession of and/or use of firearms and other weapons and self-injurious behaviour or threats of suicide. Sajeda (2012) points out other signs especially in young children which include, grabbing objects, biting and kicking others, answering back to adults, challenging instructions, swearing, offensive comments and name calling.

These children manifest such characteristics as overt or covert hostility, disobedience, physical and verbal aggressiveness, quarrelsomeness, vengefulness and destructiveness. It also includes spreading rumours, telling lies, giving dirty looks, gossiping, being insulting, and humiliation (Botha, 2014). The problems that affect aggressive children affect their school performance and how they perceive themselves in the world. These children are more likely to do poorly at school as compared to their peers.

Behaviorally disordered children for a long time were labeled as insane or idiots and were committed to adult institutions (Pursue University, 2008). By mid 19thcenturyeducation begun to be organized for such children teaching methods such as individual assessment; structured environment; functional curriculum and life skills training were developed (University of Michigan, 2012). In America the United States Education for All Handicap Children Act (Public Law 94-142) mandated that all children with handicaps including the emotionally disturbed receive a free appropriate public education and which emphasizes special education and related services designed to meet their unique needs. Each handicapped child should be placed in segregated settings only when their education cannot be achieved in the regular classrooms.

For a long time, behaviorally disordered children have been underserved; many children who qualify for service have not received yet according to Botha (2014), aggressive behaviors tend to impact negatively on individual's emotional well-being. It may lead to deterioration in children's school work, loneliness, anxiety, fear of social situations, negative emotions, depressions, poor socials kills, failure to develop new friendships, becoming suspicious of their peers, emotional development, continual absenteeism, and hostility towards peers, emotional stress, low self-esteem, adjustment difficulties, poor relationship and friendship skills. Botha, (2014) reveals that aggression impedes negatively on learners' social and academic development and well-being of children. This jeopardizes the schools' endeavors to effectively socialize learners

Aggressive adolescents in South Africa (Gasa, 2005) and in Ghana (Owusu-Banahene & Amedahe2000) were found to lack core abilities for satisfying social relationships. These include; developing and maintaining sound friendship, sharing laughter and jokes with peers, knowing how to join an activity; skillfully ending a conversation and interacting with a variety of peers and others in class and in the playground. They thus miss out on peer and group learning which are key methods of instruction thus negatively hurting their academic progress.

In a study on "Aggressive behaviour among Swazi upper primary and junior secondary students: implications for ongoing education reforms concerning inclusive education", Mundia (2006) indicated that aggression was one of the many conduct disorders cited. According to the study, there were more students with aggressive tendencies in government schools than other types of schools. These students lived mainly with biological parents. Furthermore teachers relied mainly o n punishment to deal with aggressive students. The study recommended that teachers skills in handling aggressive cases need to be enhanced by both pre-service and in-service courses. School counsellors need to be appointed to provide suitable psychological interventions.

Studies in Kenya also point indicate the influence of aggressive behavior on children's learning and development. For example Wawira (2008) says that children with aggressive behaviors interrupt learning activities and lack focus on activities in class. This is likely to hurt teacher, child relationship hence making the learning process difficult. This is because the child may fail to follow instructions during the teaching process and miss out on scaffolding that is necessitated in a warm teacher-pupil relationship.

Although there is inadequate data concerning children with aggressive behaviors in Mwingi Central District some studies have been done in the neighboring region. One study by Meitcher (1979) in Mackakos showed children with aggressive behaviors less nurturing and responsive to others. They are unfriendly and not willing to cooperate with teachers and peers. This leads to poor interaction between the teacher and the children which is likely to affect their educational achievements. The current study established that aggressive tendencies influence educational progress of the children which this study did not address adequately.

Strands have been made toward education for all including free primary education launched in 2003 in Kenya. However there are quality issues and many children are not progressing well according to Uwezo report (2013). Mwingi region is one of the worst performing according to the report. The report indicates that some children in standard seven are not able to perform a standard one task. This could be due to poor quality of the education system right from preschool years especially if the needs of various children are not catered for. One of the challenges in education is special needs children issues where the ordinary curriculum may not be able to address the needs of such children. The same region is exposed to aggression from the pastoralist invasion from the north eastern region and from Somalia. Some families are forced to live in the forest in fear of the attack. Learners are likely to be socialized aggressively through social learning and frustration. The study thus contends that one of the contributions of poor academic performance is aggressive tendencies socialized in these children. Inadequate support services for such children are most likely to make their education progress low.

The contention of the current study was that if children with aggressive behaviors are not supported adequately, their educational progress is at great risk. In order to find out more about this contention, the following areas were investigated in the study: children's academic performance, task completion, school attendance and school dropout. The study also sought to find out strategies that are used to help children with aggressive tendencies in Mwingi central district.

1.1 Statement of the problem

Substantial efforts have been made by different researchers to establish the influence of aggressive tendencies on children's learning and development. The University of Quebec (2011) showed that children with aggressive behaviours have fewer play mates. On the other hand Aggressive adolescents have been found to be poor in social skills and tend to perform poorly in education. As revealed in the background, extreme aggressive behaviours in children are an indicator of future behaviour problems that is in adolescence and adulthood (Banahene and Amadehe, 2005)

Furthermore children with aggressive behaviours are found to be less helpful in nurturing and responsive to others. However, there is need to establish whether this can affect the children learning. Therefore there was a need to find out the strategies to tame the problem of aggression in children. While Hudley (2013) points out those aggressive behaviours that affect development and learning, the current study sought to establish details on how these aggressive behaviours affect academic progress.

The gap that the current study filled was how aggression influences children's educational progress with specific focus on school attendance, task completion, academic performance, class participation and school dropout which were not adequately brought out in other reviewed studies. In addition the strategies employed by teachers when handling these children in Mwingi Central District were a point of concern. The study was to investigate the challenges faced by teachers in handling children with aggressive behaviours in Mwingi Central District, Kitui County. Teachers' training and administrative challenges were investigated. These challenges were not adequate in the available studies.

1.2 Purpose of the study

The purpose of the study was to find out the effects of aggression on children's educational progress. The study also aimed at investigating how aggression in children affects their school attendance, task completion, academic performance class participation and school dropout rate.

1.3 Objectives of the study

The objectives of the study were to:

1. Find out the factors that contribute to aggression among 5-8 year old children in Mwingi Central district.
2. Find out the effect of children's aggression on their educational progress.
3. Find out the challenges encountered by teachers when dealing with children having aggressive behaviour
4. Find out the intervention strategies teachers use to assist children with aggressive behaviours

1.6 Research Questions

The study intended to answer the following broad questions.

What factors contribute to aggression in 5- 8year old children in Mwingi Central District?

How do aggressive behaviours in children affect their educational progress?

1.7 Hypothesis

The following hypothesis was tested:

Ho1: Children's aggressive behaviours negatively affect their academic performance

2.0 Methodology

The study employed a descriptive design. According to Orodho and Kombo (2002) cited in Kombo and Tromp (2006), this design enables the researcher to find out people's views, opinions on aggression and education progress. The design enabled the researcher to get opinions and views of teachers, children officers and DICECE officers concerning the issue of children with aggressive behaviour and its consequences in Mwingi Central District and describe the state of affairs as it exists and form important principles of knowledge and solution to this significant problem of aggression in children.

2.1 Variables

The independent variable is the aggressive behaviours in children. This was measured by observing the aggressive tendencies such as, fighting others, bullying, taking other children's property without permission, throwing objects, grabbing objects, biting and kicking, head banging, interrupting activities and frequent temper tantrums. It is also inferred through, answering back, challenging instructions, and swearing, offensive comments, name calling, threatening others and cursing others.The dependent variable is educational progress. This was measured by assessing children's school attendance (coming to school regularly), classroom participation (actively engaged in lessons), task completion (accomplishing tasks on time), temporary school dropout (missing out of school for one term) and academic performance.

2.2 Location of the study

The study was carried out in Mwingi Central District, Kitui County Kenya. The families in the region have been exposed to aggression as a result of inter-tribe war between the native Akamba and pastoralists from Tana River district, Dujis and Somalia. Many children are thus exposed to violence right from their young age some families are forced to live in the bush where some children are born. The region is also one of the worst performing according to Uwezo report, 2013.

Target Population. The study targeted all aggressive children between the age of five to eight years, their parents and teachers in all the schools in Mwingi Central District. DICECE officers and special education department officers were also included in the study. The aggressive children were identified using the observation checklists with the help of the class teachers.

2.3 Sampling technique and sample size

The study sampled primary schools using stratified sampling so as to give chances to both public and private schools to be part of the study. Thus the schools were divided into private and public before randomly selecting schools from each stratum. The names of schools in each stratum were written on the papers, folded and mixed and five picked from each stratum. Through the class teacher, the researcher purposively selected aggressive children. However, the children were never separated from others. On the same note the researcher minimised direct interaction with the identified children. Teacher Observation of Classroom Adaptation- Revised (TOCA-R) as provided by Werthamer-Larsson, Killiam(1991) and Buss Durkee Hostility Inventory (1957) were used to develop the checklist for aggressive tendencies in children.

The class teachers of the classes selected (nursery to class three) were included purposively in the study. Parents of aggressive children were interviewed randomly with the help of class teachers. In each school the names of the parents were written on the pieces of paper, folded and only four out of eight picked randomly. DICECE programme officer and Special Education Officer in the district were purposively selected and given questionnaires.

Sample Size: Out of the 104 schools (40 private and 64 public) in the district the researcher picked a sample of ten (five private and five public) schools. This sample was picked with consideration of the researcher's budgetary and time limits. Four (preschool and three lower primary) teachers in each school were given questionnaires. Two most aggressive children from each class were picked for observation with the help of the class teachers thus eight children in each school and eighty children in total. Forty parents (four per school) of the aggressive children were interviewed while one DICECE and one special education officer were selected and given questionnaires.

2.4 Research Instruments

This study employed several research instruments:

Questionnaires used to collect data from preschool teachers, DICECE officers and the Special Education Officer. There was separate questionnaire for each category. The questionnaires contained both open and closed ended items. The teachers, DICECE officer and the Special Education Officer are literate therefore they were able to respond to the questionnaires without much assistance.The instrument was applied in the natural school environment. The researcher was personally involved in the administration of the instrument in order to clarify misunderstanding. The questionnaire was handed to each respondent individually and instructions were read out and explained. Respondents were told to ask for clarity. Most respondent completed the test instrument within forty five minutes. Secondly; **Observation Checklist** used to gather information concerning the behaviours of the children with aggressive behaviour characteristics. This gave the researcher a chance to get first hand and detailed information about the children. Teacher Observation of Classroom Adaptation- Revised (TOCA-R) as provided by Werthamer-Larsson, Killiam (1991) and Buss Durkee Hostility Inventory(1957) were used to develop the checklist for aggressive tendencies in children. The scale indicated 10 items describing disobedient and aggressive behaviour problems. These included, throwing objects, bullying other, fighting other, grabbing others' property, biting and kicking, head banging, interrupting activities challenging instructions, cursing others, threatening others and calling others names. For each item, teachers rated each child using five point scale to describe the frequency of the problem behaviours ranging from 1(never) to 5(very often).

Total scale scores were averaged to present each child's level of aggressive-disruptive behaviour out of each point (grades 1-5) and to assess classroom level of aggression. Using this tool children with highest score were selected for study.

In the observation, behaviour occurring more than five times was indicated as most often while four times was often. Behaviour indicated as rarely had a frequency of three while that of very rarely occurred one or two times. Never behaviour meant behaviour was not observed.
Thirdly; **Interview Schedule** used to gather information from parents. Each parent was interviewed by the researcher using the interview schedule. The researcher recorded the responses in each interview schedule.

2.5 Pilot study
Pilot study was to ensure reliability and validity of the instruments. All the instruments were tested during the study and necessary adjustments and reconstructions were done. Validity early childhood experts including lecturers in the early childhood studies department in Kenyatta University helped to establish the validity of the instruments. They went through the instruments and reviewed all of the items for readability, clarity and comprehensiveness. The questionnaires, interview schedule and the observation schedules were scrutinized by the experts. Adaptation- Revised (TOCA-R)) and Buss Durkee Hostility Inventory were used to develop observation checklists. After the administration of the instruments during the pilot study, further review was done to identify and clarify ambiguities of the items. Some items were reframed while others were removed especially those that elicited different and sometimes confusing responses. Furthermore the length of the instrument especially the questionnaire for teachers was reduced to focus on the purpose of the study and Reliability of the reliability of the questionnaires was established using test-retest method. In this method, the same instrument was given to the same respondent after two weeks. Consistence was determined using spearman's rank coefficient where a correlation coefficient of 0.80 was established. This was calculated using the Statistical.

2.6 Data collection techniques
Before formal data collection, the researcher introduced himself to the head teachers and the teachers. The purpose of the study was explained and the meaning of aggressiveness in children elaborated. The researcher also built rapport with teachers before administration of research instruments. An informed consent from the children's parents was also sought before data collection. Data collection took 32 days, 30 in schools, 1 at DICECE office and 1 at District Special Education Office. In each school, information on children's behaviours was collected in the 1st day with the help of the class teachers. Observations were made in one day in each school and each observation lasted for 30 minutes per child. Teachers were issued with questionnaires on the 2nd day while four parents were interviewed on the 3rd day. The questionnaires for DICECE and Special Education Officers were issued on the 31st and 32nd day respectively.

The researcher scrutinised past performance records of children selected in lower primary classes while progress records of preschool children were used to gain information on their academic performance. The scores from the records were averaged and recorded for comparison.

2.7 Data analysis
Qualitative data was analysed through content analysis where the contents of the instruments were analysed in order to identify main themes that emerged from responses given by respondents. Thematic content analysis was employed to determine the frequency of factors contributing to aggression in children, the strategies used to help these children and the challenges encountered when handling

aggressive children. Tables, charts and graphics were used to present data. Descriptive statistics (mean, median, variance and standard deviation) and inferential statistics that is linear regression were used to analyse quantitative data.

3.0 Results and Discussions

3.1 Aggressive behaviours in children

Almost all the teachers (97.5%) reported having aggressive children in their class. Some of the teachers noted that there is a problem of aggression in the class. They felt that aggression is present and teachers and learners are affected by it. One of the teachers in School X noted:

Aggression exists…. Some children still fight, quarrel with and bully one another.....

Another teacher interviewed in school X noted a similar concern:

Some of our learners are involved with bullying others and stealing…

The problems highlighted by the teachers can be linked to Table 4.3 below. Some of the children do not feel happy at school and their life at school is characterized by negativity. This is according to some teachers' comments. This may stimulate aggressive behaviour that affects their school performance

Some learners are said to engage in aggressive behaviours by means of spreading rumours, telling lies, making threats, giving dirty looks, gossiping, being insulting, subjecting learners to social isolation and humiliating them. They experience usually aggressive when there is little or no supervision by teachers, specifically during their break times or when a teacher was not in the classroom.

The following teachers' comments indicate how children experience aggressive behaviours:

"This child enjoys spreading lies, fighting and bullying others" (teacher 4)

''she likes to spread stories about others, abusing others and calling them names like monkey, dog and cow''. (Teacher5)

Other aggressive behaviours reported were: throwing of objects, bullying of others, fighting with others and interrupting activities. This data is presented in table 4.3. These aggressive behaviours were more often exhibited by more than 60% of the children as can be seen in the 'very often' and 'often' row in table 4.3.

Myburgh and Poggenpoel (2009) further says that aggression experienced as physical actions takes the form of bitting, pulling hair, kicking, hitting, pinching, pushing, scratching, spitting, destroying personal property, rolling eyes and pulling faces. When it comes to verbal, aggression takes the form of swearing, threatening calls, intimidating, threats, teasing, racist remarks, sexual remarks, gossiping, spreading untruths, sending nasty SMS, sending insulting letter, sending nasty e-mails, making insulting and belittling remarks(Myburgh & Poggenpoel 2009) Wawira (2008) also found that aggressive children interrupt activities in class.

Table 3.1: Aggressive Behaviours in Children

Variable	Frequency (%)					Mean (SD)
	Very often	Often	Rarely	Very rarely	Never	
Scores	**5**	**4**	**3**	**2**	**1**	
Throwing objects	23 (28.8)	33 (41.3)	9 (11.3)	8 (10.0)	7 (8.8)	3.7 (1.2)
Bullying others	21 (26.3)	35 (43.8)	10 (12.5)	8 (10.0)	6 (7.5)	3.7 (1.2)
Fighting others	25 (31.3)	28 (35.0)	14 (17.5)	7 (8.8)	6 (7.5)	3.7 (1.1)
Grabbing objects	20 (25.0)	21 (26.3)	21 (26.3)	9 (11.3)	9 (11.3)	3.4 (1.2)
Biting and kicking	13 (16.3)	28 (35.0)	18 (22.5)	7 (8.8)	14 (17.5)	3.2 (1.3)
Head banging	8 (10.0)	13 (16.3)	21 (26.3)	15 (18.8)	23 (28.8)	2.6 (1.3)
Interrupting activities	21 (26.3)	28 (35.0)	15 (18.8)	9 (11.3)	7 (8.8)	3.6 (1.1)
Cursing others	6 (7.5)	24 (30.0)	20 (25.0)	8 (10)	22 (27.5)	2.8 (1.3)
Threatening others	10 (12.5)	32 (40)	8 (10)	14 (17.5)	16 (20.0)	3.1 (1.4)
Calling others names e.g. snake	18 (22.5)	21 (26.3)	17 (21.3)	7 (8.8)	17 (21.3)	3.2 (1.4)

3.2 Factors Contributing to Aggression in Children

This section describes both the teachers' and parents' opinions on the causes of aggressive behaviours in children

3.2.1 Teachers' views and opinions on causes of aggressive behaviours

In order to establish the contributing factors to aggressive behaviours in children the researcher collected the opinions of teachers. The teachers were preferred because they are the link between the child and the society especially the parents. They also spend most of the time with the children, thus the assumption that they can give reliable information concerning the children. Their opinions are presented in table 4.4. The opinions of the teachers was measured on a scale of 1 to 4; with scale 1 referring to an agreement that the factor was very often associated with development of aggressive behaviour while 4 meant the factor did not contribute to the behaviours

Table 3.2: Teachers' views and opinions on causes of aggressive behaviours

Variable	Frequency (%)				Mean (SD)
	Most often	Often	Rarely	Never	
Score	**1**	**2**	**3**	**4**	
Aggression can be traced to other family members	6 (15.0)	19 (47.5)	13 (32.5)	2 (5.0)	2.3 (0.8)
High levels of domestic conflicts in the homes of aggressive children	12 (30.0)	8 (20.0)	12 (30.0)	8 (20.0)	2.4 (1.1)
Aggressive tendencies are more in children with inadequate basic needs	8 (20.0)	13 (32.5)	5 (12.5)	14 (35.0)	2.6 (1.2)
Parents of aggressive children abuse drugs	2 (5.0)	10 (25.0)	21 (52.5)	7 (17.5)	2.8 (0.8)
Aggressive behaviours are as a result of peer influence.	6 (15.0)	6 (15.0)	15 (37.5)	13 (32.5)	2.9 (1.0)
Aggressive children are orphans	4 (10.0)	6 (15.0)	8 (20.0)	22 (55.0)	3.2 (1.0)
Home environment is aggressive	8 (20.0)	4 (10.0)	10 (25.0)	18 (45.0)	3.0 (1.2)
The aggressive children are victims of abuse	7 (17.5)	11 (27.5)	8 (20.0)	14 (35.0)	2.7 (1.1)
Parents of aggressive children not strict in discipline	7 (17.5)	16 (40.0)	8 (20.0)	9 (22.5)	2.5 (1.0)
There is terminal illness at the home of the aggressive children	3 (7.5)	6 (15.0)	11 (27.5)	20 (50.0)	3.2 (1.0)
Aggression among children is increased by poor teaching and learning materials in school	2 (5.0)	6 (15.0)	15 (37.5)	17 (42.5)	3.2 (0.9)
Poor role modelling from community members contribute to aggression	1 (2.5)	18 (45.0)	12 (30.0)	9 (22.5)	2.7 (2.8)

The teachers felt that aggression stems from drug abuse, peer pressure, family neglect and misunderstanding, school's harsh discipline, relaxation of disciplinary measures, lack of morals among family and community members.

One of the teachers had this to say about the causes of aggression in among learners:

Some of them (learners) are encouraged by their friends. The use of drugs is also a problem and lack of discipline from parents. Teachers are also causing problems..... Some of them still use corporal punishment.

Another teacher also concurred with the above statement by saying:

Most of these children are brought up in homes where there is no discipline.....alcohol easily obtainable to them (learners). Disciplinary measures (towards learners) have been relaxed by the government.

Another teacher agreed with the above statements:

Another thing that causes aggression is alcohol and extended family.....they (learners) say they have rights.

Another teacher had this to say about the causes of aggression:

The things that are happening in our community...like stealing, raping innocent children and elderly people, abusing children and women, robbing and killing innocent people.... Another problem that is causing aggression is alcohol.....

The problems expressed by the teachers are concur with the table 4.4above which showed that some (15.0%) of the children's aggressive behaviours are due to peer influence. The table shows that 45% of the respondents often associate poor role modelling in community members to aggressive. Majority of the teachers, more than 50%, had the opinion that aggression in children is caused by having other family members with such behaviours, parents not being strict in discipline, homes where there is lack of basic needs and families with high levels of domestic conflicts. In general, the teachers tended to associate aggressive behaviours in children to other family members, domestic conflicts at home, lack of basic needs, absentee parenting, being victim of abuse, lack of strict discipline from parents and drought in the area.

The study findings show that most often domestic violence relates to aggressive behaviours in children. This concurs with a study by Gasa (2005), who found that family climate is responsible for aggressive behaviours. A violent climate in homes facilitates imitation of aggressive behaviours by children as discussed in the theoretical framework. As revealed by various studies (Gitau, 2002; Ndirangu, 2001; Wakanyua, 1995), aggressive children were also found to come from broken homes and most of them came from difficult situations. This further agrees with Ndoga (1987) who points out those children from larger families, from families which the parents had low levels of education, from low socio-economic status, from families in which parents rarely visited their children and from families which had a low level of religious commitment shows higher levels of delinquent behaviours.

Most teachers agreed that aggressive children's parents are poor in disciplining the children. In her thesis on the provision of psychosocial support to children traumatized by the 2007-2008 postelection violence in Kibera Kenya, Njuguna (2012) indicates that exposure to violence is associated with a variety of aggressive and otherwise maladaptive behaviour. This agrees with Brannon (2010) who revealed that children who are spanked frequently by parents are likely to be aggressive.

3.2.2Aggressive tendencies at home

Some parents were interviewed to check the extent of aggressive behaviour that learners might be exposed to at home. The parents' their opinions are summarised in table 4.5.

Table 3.3: Characteristics of the Families

Variable	Responses	Frequency (%)
Alcohol and drugs abuse a home	Yes No	30 (75.0) 10 (25.0)
Child conflict with the parents	Yes No	33 (82.5) 7 (17.5)
Size of household's main house	Big(two roomed and above) Small(one roomed)	26 (65.0) 14 (35.0)
Parent bought the child's school uniform	Yes No	34 (85.0) 6 (15.0)
Does child express interest in school matters?	Yes No	32 (80.0) 8 (20.0)
Children witness Conflict among parents	Yes No	32 (80.0) 8 (20.0)
Has the child refused to attend school in any moment?	Yes No	21 (52.5) 19 (47.5)

Three-quarters (75%) of the homes of the aggressive children reported alcohol and drug abuse. There was also enough food in a majority of the households at 82.5%. About a third of the parents (65%) indicated that the main house was big. A majority of the parents, (85%), bought the child's school uniform. Majority of the parents reported having a conflict with the child at home.

The interview showed that aggression at some homes occurs frequently and learners are affected by it. One of the parents in School X noted:

We usually fight with my husband; sometimes a small issue becomes a big one. The children usually take sides. Most of the matters are solved by fighting because most of them (extended family) cannot reason because they drink too much.

Another parent in School X concurred:

He (my husband) drinks a lot and insults everyone around. My children are sometimes rude and stubborn.....

The issues that the interviewee has expressed are confirmed by table 4.5above that some children witness conflict between their parents and their fathers drink excessively. This also confirms earlier arguments by teachers that domestic violence and alcohol abuse causes aggression in children.

Some parents expressed their frustrations when handling their children who have aggressive behaviours. One parent in school Y said this:

'Am usually overwhelmed and confused on what to do with the child….the child is very stubborn and likes conflict…I don't know what to do'

Another parent asked for support in order to deal with her child. This is what she said:

'Please advise me on how I can handle my child because he is very difficult for me… he does not follow my instructions, do not like school…please help me"

Aggressive behaviours can be traced from home. Parents influence these behaviours and they in turn are affected by their children's aggressive behaviours. These views are supported by table 4.5 which shows that 80% of the aggressive children did not express interest in school matters while at home. Those participants indicating that the children had refused to attend school were slightly high (52.5%) than those who indicated their children had not refused (47.5%).

3.3 Influence of aggressive behaviours on academic progress

The study intended to assess the educational progress of aggressive children. The educational progress comprised of the following variables; academic performance, school attendance, class participation, task completion and drop out. The findings are presented in the following section.

3.3.1 Aggressive Behaviours academic performance

Hypotheses testing

In order to establish whether aggressive behaviours had an effect on the children academic progress, the following hypothesis was tested.

Ho 1: Aggressive behaviours in children lower their academic performance

In order to find out the academic performance of the children, their academic scores records were reviewed in seven subjects. Table 4.6 shows the mean scores of the children in subjects examined in all the schools.

Table 3.4: Academic Performance of Aggressive Children

Subject	Mean (SD)
Mathematics	60.5 (17.2)
Language; Kiswahili or English	55.9 (18.9)
Science	59.4 (16.5)
Creative art	61.3 (16.1)

Music	58.4 (15.3)
Social studies	58.2 (18.3)
Religious studies	56.6 (16.9)
Overall mean score	59.0 (14.0)

The children included in this study scored above average in all the subjects in school. Their overall mean score was 59%.

Each child's aggressive behaviours were related to their academic performance. That is to find whether frequency of aggressive behaviours affected their performance. Using linear regression analysis, the findings presented in figure 4.1 were realised.

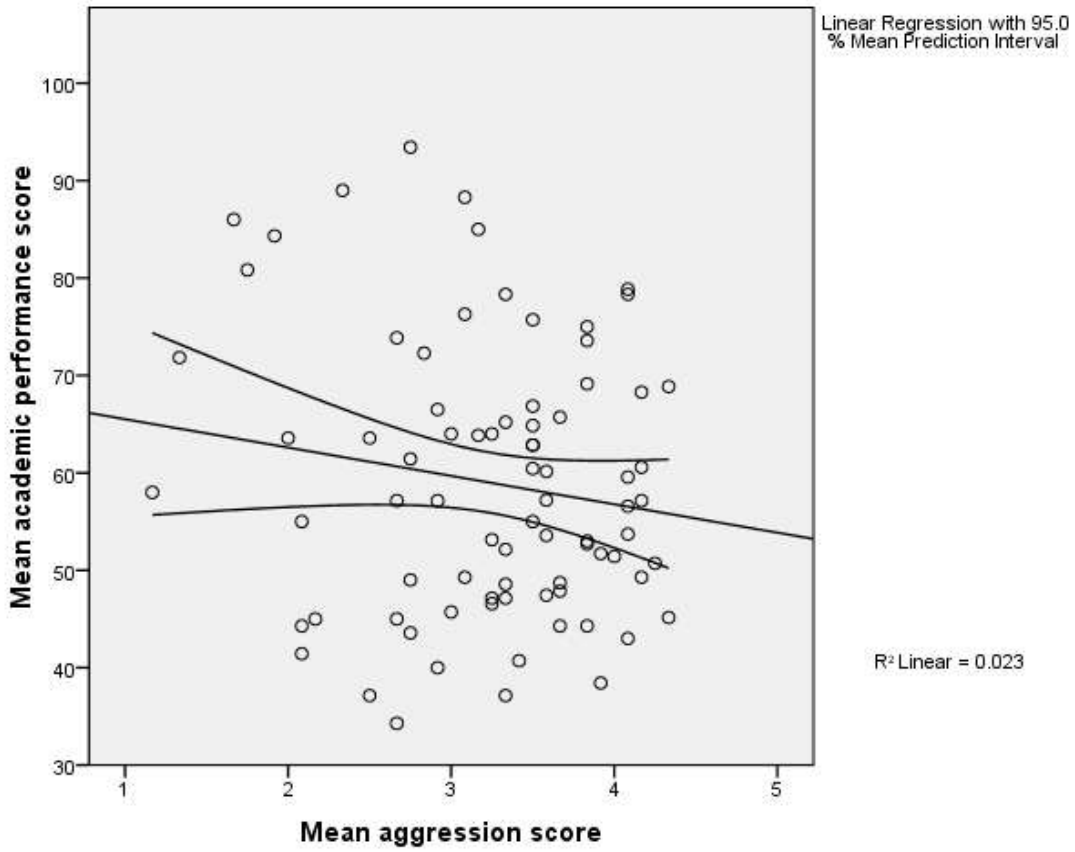

Figure 3.1 Relationships between Aggression and Academic Performance

Table 3.6: Relationship between Child Aggression and Academic Performance ǀMean Scores (Linear Regression)

Statistic	Value
Pearson correlation coefficient, r	-0.153
β_0 (constant)	68.4
β_1	-2.9
95% CI of β_1	-7.2, 1.3
P value	0.176

There was a negative correlation (r=-0.153) between child aggression and academic performance mean scores as shown in Figure 4.1. There was a 2.9 score reduction in academic performance associated with every unit increase in aggressiveness (β_1 = -2.9 [95% CI -7.2 -1.3]). However, the relationship between the

aggression and academic performance was not statistically significant (p=0.176). This finding indicates that aggressive behaviours in a child do not greatly lower the child's academic performance. However there is an indication of reduced academic scores with increased aggression. To some extend the findings concurs with other findings. For instance, Hudley (2013) and McEvoy and Welker(2012), pointed out that highly aggressive children are perceived as less academically successful, more behaviourally disruptive and less motivated in class. Learners' schoolwork is negatively affected by their experience of aggression. Learners are found to be pre-occupied because of their negative feeling, diseases and reactions as a result of experienced aggression. Some even distrust teachers and don not believe that the teachers can help them.

Njuguna (2012) says that if children are exposed to violence, they develop aggressive and maladjusted behaviours that may interfere with school adaptation including their academic performance. This deviation could be a result of the differences in teachers' methodology, the kind of examinations and the relationship between the children and teachers. However, the academic performance of these children was rated as mostly average, (65%) according to their teachers as shown in table 4.8.

The fact that the aggressive children's academic performance is above average points to the fact that their behaviours do not result to retardation. As matter of fact, giftedness may present itself also in high energy levels and extreme curiosity that can frustrate both child and parent or caregiver alike (Steven & Media, 2014). Steven and Media reports that in America, 20-25% of gifted children experience emotional or social issues. This could be due to boredom in the curriculum and school activities. Most gifted children act out when they are unchallenged. They therefore become aggressive when they are frustrated and especially young children who have not yet learned how to channel their energy and cannot express dissatisfaction in the way an older child might. They are thus more vulnerable to poor social difficulties. They get goals for themselves that are impossible to reach, which causes them to wrongly perceive themselves as failures.

3.3.2 Class participation, task completion, school attendance and drop out

Teachers' Opinions on Effects of Aggressive Behaviour

Variable	Frequency (%)
Academic Performance of aggressive children	
Very good	2 (7.5)
Good	12 (30.0)
Average	22 (65.0)
Poor	5 (12.5)
Very poor	1 (2.5)
Class activity participation	
Very high	5 (12.5)
High	11 (27.5)
Low	18 (45.0)
Very low	2 (15.0)
Task completion in class	
Very high	4 (10.0)
High	6 (15.0)
Low	21 (52.5)
Very low	9 (22.5)
School drop out	
Very high	6 (15.0)
High	4 (10.0)
Low	14 (35.0)
Very low	16 (40.0)

The teachers expressed concern about children with aggressive behaviours. One of the teachers in school

W commented as follows:
'The children are very stubborn in class… when the child is given work, it takes a lot of time to complete since he does not concentrate on the task…instead he is concerned with disturbing…'
Another teacher concurred in the following comments
Whenever the child is given tasks the child usually delays to complete it…
Teachers felt that children with aggressive behaviours are very low in participating in class activity. One teacher in school X said that
'The aggressive child is usually off the activities in class…when we are singing for example, he rarely sings with other….sometimes the child is seen beating and pinching others'
The teachers expressed their frustrations as seen from one of the teacher's comments
The child's behaviour is very irritating…when you give instructions and the child does the opposite, it is very frustrating…
This comment imply that the behaviour of the children in class affect the child's relationship with the teacher. This may impact negatively children's learning. Teachers may end up hating the child and thus rarely work closely with that child. That is why many teachers rate children's academic performance as average.
On the teacher in school W said this
'Whenever I give them test the child scores averagely (50%)…even the child seems to have a higher potential, he usually score below their potential '
Another teacher in school S had this to say
This child is not serious in the performance….he has a lot of play… if he is serious, he can do well
Another one described as follows ***'I can say that the child's performance is average…he is usually scoring in 50s whenever I give them a test. The concentration of the child is usually low even when doing tests… the child lacks seriousness in doing tasks including the tests…'***

Children with aggressive behaviours have issues with school attendance. The children tend to miss school regularly. One teacher commented as follows
The child is irregular in coming to school…misses up to three days per week…sometimes he misses for the whole week…when asked why he missed school, he does not have a serious reason…and sometimes he does not respond.

Another teacher in school Y commended as follows
This child comes to school only twice per week……
Another one in school W said
He comes to school only during examination time…they only do the exam and end up not doing well…
These comments agree with earlier comment of a parent that aggressive children often refuse to attend school. Absenteeism has a negative effect on the children's academic progress. They miss out on many things taught and when a test is given they will then fail. Teachers also revealed that aggressive children are preoccupied with negative feelings which negatively influence their academic progress.
The views and opinions of the teachers are summarised in table 4.8. The table shows that most teachers (65%) rated the performance of aggressive children as average. The teachers were also opinion that these children had low class participation (45% of the teachers) and their task completion in class was also low (52.5% of the teachers). However, their opinion on the children's school dropout rates was that it was mostly very low (40%). Three quarters of the teachers, had not observed the children fail to attend school in the past term.
These results agree with the findings in the literature. For instance, according to Hudley (2013) and McEvoy and Welker (2012), aggressive children are usually off tasks and fail to accomplish them in time within the class. They are also poor in doing their homework. In addition, Wawira (2008) argues that

aggressive children are less attentive in class which may cause poor class participation and task completion. Hudley (2013) and Wawira (2008) however also state that children who display aggressive behaviours exhibit poor school attendance and drop from school more often. This contradicts the findings of the current study as the teachers indicated the aggressive children in their classes had low or very low dropout rates.

4.0 Conclusion

Aggressive behaviours in children do not greatly lower their performance. However, there is an indication that aggressive behaviours affect their general academic progress. Their task completion and class participation is negatively affected. Aggressive children's academic performance was average and they showed low class participation and task completion. In addition, their school dropout rate was low. The teachers handling aggressive children were found to have limited knowledge and skills concerning aggressive children. This is due low percentage of those who have attended trainings concerning aggressive children. This is corroborated with the DICECE officer's confession that the syllabus is not comprehensive enough. Teachers lacked sufficient support from the parents, community and DICECE office in helping children with aggressive behaviours. The role model in the community was lacking and also there was increased violence in the community. The DICECE and Special Education Officers also experienced challenges including financial constraints, poor road transport and lack of cooperation from the caregivers. This made their work difficult.

5.0 Recommendations

Teachers should go for further training on how to handle children with aggressive behaviours. This will help them know how to identify and handle such children. They will not be in a state of confusion when encountering such children. This can be done through attending seminars, workshops and conferences that discuss about children with aggressive behaviours. Even if there is no formal organisation by the relevant authorities, teachers could take an initiative of organising for training either at an intra-school or interschool level. Teachers should further be sensitized to the nature, causes and effects of aggression in schools. The staff member responsible for discipline at school or psychologists can talk to the teachers about aggression in order to give them an understanding of phenomenon and how it manifests (Botha, 2014)

Teachers should treat children with aggressive behaviours with care and love even if they are sometimes annoying. Teachers need to exercise patience and always love these children unconditionally. This may reduce the aggression in these children since they will feel loved and accepted. It is important to cater for the needs of the children through individual instruction as opposed to group instruction. The teacher should asses the intelligent levels of children and work with them according to their level. For example children who tend to be gifted should be given adequate and more challenging tasks. This reduces boredom and disruptive behaviours in such children. The researcher agrees with Botha (2014) on the importance of emphasising the value of taking care of one's effective communication and social relationships in teaching and learning activities. Teacher should use the curriculum like life skills to develop social and emotional skills development. Furthermore, the learners can be given opportunities to share their feelings and develop their own personal and social skills for establishing and maintain constructive relationships.

School administrators on the other hand need to work together with the teachers and parents concerning children who display aggressive behaviours. There should be no victimisation whenever teachers identify children who tend to be aggressive. The administrators need to organise forums where parents can be sensitised about children with aggressive behaviours. School neighbours should also be included in the strategy in dealing with deviant behaviours like aggression.

Parents should be willing to work with teachers to improve the behaviours of their children. Parents should respond positively when called by teachers so to discuss the way forward for the children. They should be ready to accept they have aggressive children and agree to look for solutions. They should be guided to realise the importance of being close to the children. Those who are unable to provide basic needs for the children because of poverty, they should be empowered through training on how to be economically stable which will translate to care and support for their children. Parents should get involved fully in the children's schooling process so as to guide them where necessary. They should be role models to their children, showing them how go about things and situations as well as motivating them to continue with school and always ttend school. Family guidance and counselling programs should be initiated and implemented in the country, it should be include in policies that touches on family and parenting.

Parents are supposed to use all means possible to provide adequate basic needs for their children. These include shelter, food and clothing. They should provide a safe and caring environment at home instead of violence, child abuse or drugs and substance abuse. They should also use alternative methods for punishment for instance instead of caning, they can use withdrawal of privileges. Parents are also encouraged to read articles, newspapers, magazines and journals about children so as to gain an insight on how to improve their parenting skills.

District centres for Early Childhood Education and Special Education Offices should organise as many training sessions as possible to enlighten caregivers on how to handle children and especially those with aggressive behaviours. Where finances are a challenge, they should organise for alternative source of funds including income generating activities and fundraising. They should write proposals for funding to both governmental and nongovernmental agencies. Parental training, family guidance and counselling and community mobilisation strategies towards supporting children should be included in their scope of operation.

The government, both national and county governments should consider enough budgetary allocation to children's programmes. The Ministry of Education in conjunction with the Ministry of Finance should work together. Apart from budgetary consideration, it is important for the government to develop a comprehensive policy framework on children with emotional problems part of which will address children with aggressive behaviours in detail. This will include identification of these children and the programmes for them. One of the proposed programmes is guidance and counselling for young children. Teachers will be trained on how to counsel young children through techniques like play therapy. The government through the Teachers' Service Commission should ensure there is an appropriate teacher-pupil ratio from pre-primary to primary schools. This will enable the teachers to attend to all the children. The teachers' remuneration should also be improved to enhance teacher's motivation. The researcher is in agreement with Moindi (2014) that the government should employ teacher counsellors in schools and have a comprehensive guidance and counselling workshops, conferences and in-service programmes for teachers. The government through the Kenya Institute of Curriculum Development (KICD) should review the syllabus for training preschool and primary school teachers. This should be done to include comprehensive information on children with emotional problems and especially aggressive children. On the same note the curriculum and education system should be reviewed regularly to make sure that it is interesting and meaningful for the learners. This will enable the teachers to be equipped with necessary knowledge and skills to handle children with aggressive behaviours.

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Moral Education and Societal Development: Is the Reintroduction of Social Education Ethics the Panacea for Society's Moral Challenges?

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Abstract
Societies worldwide are faced with the challenge of increased social ills that were previously unheard of. Commonly reported in the media are cases of drug abuse, suicide, homicide, rape, teenage pregnancy and rampant engagement in corruption, an indicator that something is amiss in the value system of the young people. While some scholars have argued that these activities may be a rational response to social conditions, it is the contention of this paper that if young people were equipped with moral education, perhaps they would make moral decisions. Traditionally the role of providing Moral Education (ME) was the preserve of parents and society but this has changed with the times and so school is increasingly being looked at to provide solutions in terms of imparting a value system to the young people. Currently in the Kenyan school system, values are given very little attention while subjects like religious education for both the Christians and Muslims are relied on to offer more in terms of moral education. Yet despite the existence of both Islamic religious education and Christian religious education as subjects in the education system, moral standards have consistently deteriorated. This positional paper makes a case for the re-introduction of Social Education and Ethics (SEE) as a subject at all levels of education to specifically focus on moral education. The paper will argue out this thesis informed by literature and studies. The discussion will provide useful information for Education policy developers concerning moral education and the development of society. It is hoped that a re-introduction of a subject focusing on moral education will equip young people with the right predispositions, attitudes and reasoning that will lead them to develop a sense of right and wrong.

Key words:*Moral Education, Values, Social Ills, Social Education and Ethics, Moral Development*

1.0 Introduction

The phenomenon of Moral Education has been an issue of concern in Kenya from as far back as pre-independence times. The interest in this issue is evident in the varied Education Commissions and reports that addressed this issue among other issues, like the Ominde Commission (1964), the Gachathi Report (1976) and the Koech Report (1999). These commissions concurred on the idea that despite moral education being taught to young people using Christian religious education as a discipline, moral standards did not seem to improve, painting a grim picture of a future society replete with people who have no moral standards. Commonly reported in the media are cases of juvenile crimes, suicide, homicide, rape, teenage pregnancy and rampant embezzlement of public funds, an indicator that something is amiss in the value system of the young people. These are cases that were unheard of in the past. As Wepukhulu (2001) points out, a child in the traditional African society was brought up under rules of avoidances, prohibitions and permission which were accepted as ethical by the community. These rules were passed on from elders to the younger generation and any deviation from what was considered right was dealt with through some system of punishment, while right actions were encouraged through a variety of methods. Bull (1969) cited in Devine (2006) posits that a child is not born with a moral conscience, but a natural, purposive capacity that can make him a potential moral being. This implies that given some instruction, formally or informally, the child will most probably acquire the correct disposition, attitudes and reasoning that will lead them make moral decisions that define a moral being.

Traditionally, imparting Moral Education (ME) was the sole duty of parents, with the child finding opportunities to practice what they learnt in their interactions with family and society, as well as seeing morally accepted behavior being modeled by people around them (Ivor, 1988). With an increasingly individualistic society and families which are fragmented, many children have to learn more in school, thus the "silent' delegation of ME to schools. Although this new role of the school has raised contentions

about what, how and who to teach ME, it is the contention of this paper that school is best suited to partner with parents and the church in imparting ME because of the following reasons:

First, schools have the mandate to produce a person who will exist harmoniously with the environment and fellow beings. An examination of the national goals of education in Kenya reveals among others; the authority to "promote sound moral and religious values" (MOEST, 2005, p.iv). This implies that officially, the education system can adopt its curriculum to include the provision of moral education to the learners so as to ensure that school leavers will co-exist harmoniously with others in the society. It is a truism that students begin their ME at home, but before they grasp much, they join school and thus the need for school to continue from where parents had reached. The assumption in both the parents and school is that a causal relationship exists between knowing what is right and refraining from crime and thus the efforts by both groups to equip the learner with the ability to think and act morally (Tubb, 2003)

Secondly, school is a vehicle of direct instruction, with the teacher as the model of morality (Oladipo, 2009). The formal curriculum in schools includes subjects like religious education and social studies which have long been associated with the issues of what a society upholds as right or wrong and whose content is geared to helping the learner to fit in society. For the learner whose day is spent in school in interaction with peers and teachers, their learning can emanate from school/classroom rules and regulations, school ceremonies, visual aids containing moral content and academic subjects infused with moral issues. The teacher may provide scenarios which can be discussed for moral lessons or exploit emerging situations like a fight between learners, to address the issue of how conflicts should be resolved and the need to exercise justice and fair play in such circumstances.

Thirdly, school serves as a strong agent of socialization. School is by design a place where children expand their social circle and where they get to meet a variety of fellow learners and teachers. School allows the learners to operate within the confines of the school rules and regulations by putting into practice some of the moral values that they have learnt in the course of interacting with fellow students and teachers. Agreeing with this, Berkowitz (1998) asserts that the school ideology, behavior of adults, governance structure, rules made and enforced, open discussions of moral issues, exposure to different perspectives and peer norms as found in a school, are a means of learning morals. This is important for two reasons: morality is seen in the way we treat others and secondly, it demystifies the expectations of a moral society by moving ME from the realm of theory to practice. Children learn more from what others do and lessons learnt in this way remain in their sub-conscious for a lifetime, acting as a reference point unless changed by a more impressionistic or powerful view.

Lastly, school provides numerous opportunities for the learner to possibly observe and make moral decisions. This is especially so if the person the student is observing is the teacher or peer they admire or respect, irrespective of if what is modeled is right or wrong. This is important because it provides an example of what right or wrong means, in consideration of what has been learnt in the classroom lessons. Teachers are obligated to provide a leading role in terms of exercising what they teach, so that learners can emulate them. While a good number of adults can speak enthusiastically about the positive things they learnt from their teachers, an equal number would associate their character to what they saw and copied from their teachers. However, teachers have not always modeled what is right as seen in an article by Nyingi (2009) where the writer quotes a joint study by Teachers Service Commission (Kenya) and a Centre for Right Education and Awareness which revealed that teachers abuse more than 12,000 girls in the country each year! In view of such revelations, one realizes that teacher, parents and even society are only guides to point the young people to the way, but ultimately the choice to take an action that is moral or immoral is with the individual. Therefore the need for moral education so that young people are

equipped to make a moral choice and to develop a moral sense (Mbae, n.d). Piaget cited in Nucci (2008) views moral development as resulting from interpersonal interactions through which individuals work out resolutions which they deem to be fair, as they draw on the foundation that enable them to make judgment in the course of encountering moral variants within society.

The above reasons provide a rationale why school is well placed to ensure the moral development of the children within it. This is not to dismiss the other vehicles of ME that include parents, religious organization and culture, since the concerted effort of all these avenues could help the young people of this century to develop a sense of what is right and wrong. For a nation like Kenya, it is important to refer to the wisdom in the words of Chairman Gachathi (Republic of Kenya, 1976) that "A society that cannot define or teach its values will inevitably be subjected to invasion by other values…." For Kenya, the nation must have arrived at the point of being invaded, given the many reports of social ills that are prevalent in the society.

2.0 Moral Development and Societal Development

Oladipo (2009) defines the term moral as the right conduct in social relations while morality as the system of rules that regulate these social relations based on what is regarded as right or wrong, according to the society. Previous efforts at understanding the nature of human beings were dominated by contributions from philosophers like Plato who supported a view of human nature that is now understood as the '*innocent theory'*. This theory proposes that children do not come into this world either good or bad. They come with a neutral nature ready to take any shape from the influences of nature, experiences, upbringing and education. Some philosophers such as Descartes and St.Thomas disagreed with this *innocent theory* andinstead defend the *original sin theory.* This theory teaches that human beings come into the world defiled following the downfall of the original parents: Adam and Eve.

While scholars do not have consensus as to how and when a child becomes immoral, they are however in agreement that young people need to learn rules of social interaction that include justice, trust, welfare and respect for human rights. Traditionally, the role of providing moral education was the preserve of parents and the culture of the community, however, this role has expanded to include religious organizations and school. Oladipo (2009) argues that all these vehicles of ME must work together, driven by the desire to ensure future generations co-exist harmoniously and that society is able to develop in all spheres. For education systems, scholars like Kohlberg provide a framework for structuring the curriculum based on the six stages of a child's moral development, that define the level of reasoning of a child and how they are able to handle a dilemma (Crain, 1985). Additionally, he proposes that the lessons in moral education should be carried out using scenarios that lead to stimulating discussions and decision making.

Arguably, a society like the Kenyan one that is on the path to development requires manpower that is both qualified and moral, if it has to realize development and sustain it. Reports abound in the media of officers in public service whose academic achievements were celebrated by the community but who come back to misappropriate public resources, leaving the people suffering. As a nation, our reputation globally is not one to be proud of courtesy of a few people who lack the moral code to guide their conduct in the workplace and with the wider society. Kenya needs to urgently address the issue of the value system of the young people of this nation, if there is to be hope of a future which we will all be proud of.

3.0 A Case for the Re-introduction of Social Education and Ethics in Kenya

Social Education and Ethics (S.E.E) was introduced in the education system in 1986 after several education reports revealed the inability of religious education to serve as a vehicle for moral education (Ominde commission -Republic of Kenya, 1964; Gachathi report- Republic of Kenya, 1976; Koech report – Republic of Kenya-1999). The reports identified the key weakness of Christian religious education as the fact that it seemed to promote values and doctrines of Western Christianity and not values based on the African social system. S.E.E was thus proposed as a separate vehicle through which to impart ethics while separating it from religion, in order to address social issues irrespective of one's beliefs. S.E.E was intended to provide a more focused means of addressing social problems instead of piecemeal discussions across the curriculum.

A review of literature on moral education in Kenya, reveals a convergence on the view that S.E.E is a necessary discipline now more than before because the Kenyan society is faced with more social ills than those experienced two decades ago (Wepukhulu, 2001; Bennars, 1990; Shiundu, 1990). While the rationale for this agreement is undisputed, a number of studies exist that reveal that the acceptance and implementation of S.E.E as a separate subject from C.R.E faced opposition majorly from teachers of C.R.E and religious organizations, for a number of reasons. For the teachers of C.R.E who were expected to teach S.E.E, the contention was lack of training to equip them to handle this subject that was suddenly added to their work load (Makori, 1998). Secondly, the teachers felt that the subject content of S.E.E was complex and vague and an intrusion into the traditional position of established subjects like C.R.E (Bennars, 1990). For the religious organizations like the Catholic Secretariat and the National Council of Churches of Kenya (NCCK), the introduction of S.E.E was perceived as a means of doing away with religious education in the school curriculum and introducing controversial topics like sex education to the youth, leading to further deterioration of morals.

In her study that examined the attitudes of the Christian church and teachers in Bungoma District towards S.E.E as a discipline in secondary schools, Wepukhulu (2001) established that the Quaker church perceived S.E.E as an important subject, unlike their Catholic counterparts. She however counters the argument by the Catholic Church by pointing out that the syllabus of S.E.E does not address issues of sex education. Additionally, she argues that there exist other avenues through which the youth could be exposed to immoral behavior.

However, an examination of the objectives of S.E.E could reveal the good intentions that are underpinned by the need to promote social justice, morality and socially desirable ethics. During the introduction of S.E.E, the objectives of the subject were stated as follows:

a) To develop a harmonious ethical and moral relationship between the youth and the home, the school, the neighborhood, Kenya and other nations;
b) To appreciate the necessity and dignity of moral education in Kenya and other societies;
c) To base decisions on sound ethical principles as an integral part of personality development;
d) To develop a rational attitude and outlook towards life;
e) To acquire, appreciate and commit oneself to universal values and virtues that cement unity and understanding among the various ethnic communities in Kenya;
f) To rationally sort out conflicts arising from traditional, extraneous and inner-directed moral values;
g) To understand and appreciate the social fulfilment and moral rewards accruing from cultivating and adopting virtues and values offered by moral and ethical education.

From the objectives above, it is evident that S.E.E is a subject that will provide the moral education that Kenyan youths require. The benefits of S.E.E will be threefold: first, to the individual, the subject will instil the right attitudes, impart values for family and the workplace, train them in social obligations and responsibility and encourage them to be diligent (Wepukhulu, 2001). For the society, S.E.E will hopefully produce members who value unity, harmony, hard-work and all other moral principles that can lead to a harmonious co-existence. For the Nation, she will benefit from citizens who value democracy, rule of law, are loyal, respect public property and are committed to the prosperity of their motherland. These indeed are key pillars of a nation that is forging ahead in terms of development.

4.0 Implications for Policy and Practice

The re-introduction of S.E.E as a discipline in the Kenyan Education system has implications for policy and practice. For curriculum developers, there will be a need to re-examine the objectives and content of the subject in order to make them clear and achievable. According to teachers who were interviewed in a number of studies like that of Itolondo (1998), teachers felt that the objectives were vague and the content widely borrowed. There is also a need to ensure that the subject is taught at all levels of education since moral development is a process that takes place across the ages but with varying levels of complexity. Additionally, teachers who will handle the subject should be given training to equip them with interesting techniques of teaching the subject and examining the acquisition of knowledge.

For practice, it is evident that moral education is a life skill subject that will impart values to the youth. This will necessitate that teachers are trained to develop a repertoire of teaching strategies that will make it interesting and meaningful. S.E.E as a discipline dealing with real issues in life cannot be taught like Christian religious education that seeks to develop values alongside great amounts of information that is historical in nature. It will also be important to develop strategies of examining its application in the life of learners, that is, apart from using paper and pencil exams. For a subject whose application is in real life situations, examiners should identify strategies of establishing if learners have grasped the content or not.

5.0 Conclusion

From the discussion above, it is clear that moral education for the youth is a time tested means of ensuring a nation where people live in harmony because of engaging in moral actions. While C.R.E has been the medium of moral education in Kenya, evidence of increasing social ills in the current Kenyan society point to its ineffectiveness in instilling the moral codes that can enable an individual to make moral choices. This brings up the issue of a subject/discipline that will focus specifically on dealing with the moral education of young people in a way that is practical and interesting, while offering youth the chance to make moral decisions. Social Education and Ethics(S.E.E) is a subject whose objectives can help Kenya to meet the need for moral education. While its first appearance in the Kenyan curriculum was faced with resistance, it is the contention of this paper that its objectives, content and implementation should be re-examined to avail this important knowledge to the Kenyan youth. All the parties that found contentious aspects of the subject should be brought on board to ensure that all grey areas are cleared. S.E.E is without doubt a discipline that will offer moral education without the bias for a specific religious group, as in the case of C.R.E for Christians or IRE for the Muslims. Indeed if Kenya is to take her place among the respected nations of the world, then she must have citizens who espouse moral uprightness. This can be achieved through school being mandated to teach moral education through a subject like S.E.E.

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An Assessment of Features of Schoolculture Influencing Student Deviance in Schools within Bungoma County, Kenya

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Abstract

Whereas many schools have been known to exhibit strong school cultures that seem to drive academic excellence, deviant behaviour in schools continues to be a matter of global concern. Knowledge of the role school culture plays in mitigating deviance is vital for any prevention programme yet this has been missing. The purpose of this study was to address this gap by examining influence of features of school culture on student deviant behaviour in secondary schools of Bungoma County, Kenya. A sample size of 79 was used from a study population size [N] of 504 composed of school management staff in secondary schools of Bungoma County. The mixed research design that comprised of concurrent triangulation, correlation and phenomenology was employed. Multiphase and stratified sampling was used to select schools. Purposive sampling was used to select school management staff. The data for the study was obtained through questionnaires and interviews. Descriptive statistics: cross-tabulations and frequency tables together with inferential statistical analyses: Chi square and simple linear regression analyses were used to analyze the data. The study established that all the sampled features of school culture were being applied in schools within Bungoma County. Chi-square tests revealed a significant relationship between features of school culture and student deviant behaviour prevalence in Bungoma County schools. Regression analysis revealed a weak to moderate relationship between features of school culture and deviance levels. The study concludes that school culture influences student deviant behaviour prevalence. The study recommends that alleviation of student deviant behaviour in Bungoma county schools requires formulation of school cultures that ensure engagement of partnerships both within school and family environments as prescribed by Bronfenbrenner's model. The findings give an empirical backing to educational policy makers in addressing school culture as an important variable among contributors to student deviance.

Key Words: *School Culture, Features, Student Deviance, Secondary, Bungoma County*

1.0 Introduction

School culture from an organizational perspective refers to patterns of shared values, attitudes, assumptions and beliefs over time which produce behavioral norms that are adopted to guide day to day activities within an organization (Odongo, 2013; Schein, 2004). It therefore shapes organizational procedures, unifies organizational capabilities into a cohesive whole, and provides solutions to the challenges faced by the organization, thereby hindering or facilitating the organization's desire to minimize deviance (Ahmad, 2012; Ng'ang'a & Nyongesa, 2012). The role of school culture in minimizing deviance is well articulated by Richwood (2013) who posited that a school culture where academic success and the motivation to learn is expected, respected, and rewarded naturally motivates students to learn and issues of deviance are minimal. They further noted that a strong or effective school culture characterizes an effective school which is characterized by an atmosphere where students, for example, learn to love learning for learning's sake, especially insofar as it evolves into academic achievement. Citing Blum (2005) and Libbey (2004), Richwood (2013) asserted that an effective school culture facilitates school connectedness, that is, members' sense of belonging to a school, school involvement, or school attachment and has therefore a minimization effect on deviance given the enhanced adaptability into their school's social fabric. This assertion is supported by Gilman, Meyers, & Perez (2004) and Angus, Doris & Steve (2009) together with Caspi & Moffitt (1995). Other than being heterogeneous in terms of

socio- economic profile and rated the third most populated County after Kakamega and Nairobi respectively (CRA, 2011), Bungoma County has a poverty prevalence rate of 53%, a scenario likely to drive many youth both in and out of school into deviance (ROK, 2013b). This deplorable state is worsened by the fact that Bungoma County is rated among five Counties with largest numbers of deprived children (UNICEF, 2013) and that education standards in the county have been fluctuating based on the national examination: KCPE and KCSE ranking (Munda & Odebero, 2014; KNEC, 2012; 2013). Studies by Simatwa (2012) and Chumbe et al. (2015) on management of student discipline in secondary schools confirmed that Bungoma County, previously the larger Bungoma District, was among regions in Kenya that were experiencing many cases of student deviance in schools. Deviant behaviour is harmful for the school and students in all its forms (Appelbaum, Iaconi & Matousek, 2007). There was therefore serious need to empirically interrogate this County's scenario in terms of school culture and how its features impacted on deviance prevalence. As posited by Angus, et al., (2009), citing DuFour & Eaker (1998), sustainable optimal student achievement in schools is realizable under effective schools on the premise of a strong school culture. This study was an empirical attempt to fill this gap as it sought to examine how features of school culture within the context of school environment influenced deviance among students in secondary schools of Bungoma County.

2.0 Methodology

The research paradigm that informed this study was a Pragmatic approach which is a philosophical underpinning for mixed methods studies (Creswell, 2012; Cohen, Marion & Morrison, 2011). The study was conducted using mixed methods research design that comprised of concurrent triangulation, correlation and phenomenology to address the study objective. Schoolculture, bynature, isamulti-faceted, complexandmultidimensionalphenomenonthatcanbe betterexploredwhenseveraldifferent methods areapplied (Bahar & Esin, 2013;Schein, 2004). Bronfenbrenner's model was used to guide the study. A sample size of 79 composed of school management staff from 252 schools was used. A mixture of sampling techniques was used, that is, multiphase and stratified sampling was used to select schools while purposive sampling was used to select school management staff. The data for the study was obtained through questionnaire, interviews, document analysis and direct observations. Descriptive statistics: cross-tabulations and frequency tables was used to analyze the data while inferential statistics was mainly by chi-square and simple regression. The schools selected were based on the following strata: rural and urban schools; national, extra County, County schools.

3.0 Results and Discussion

School cultures as posited by Hongboontri and Keawkhong (2014) are not only unique and distinctive but also have an influential effect in terms of shaping and re-shaping what people do, think and feel. Citing Peterson (2002) and Barth (2002), Bahar and Esin (2013) averred that school culture aids learning of both staff and students above all known agents of learning. This assertion is supported by Brinton (2007) and Detert et al., (2001) who argued that school cultures' unique and distinctive characteristics distinguished by shared basic assumptions, norms and values drive schools' performance especially when anchored on proper guidance of staff and students' behaviour. School cultures have been variously classified along a continuum of application as either weak/bad/toxic/negative or moderate/neutral or strong/good/health/positive (Ghamrawi, 2013; Kaplan & Owings, 2013; Stoll, 2000). In this study, the researcher sought from the respondents their ratings along this continuum.

The sample selected comprised of school management staff segmented into head teachers and deputy headteachers. Proximal processes as posited by Christensen (2010) and situational perspective (Tudge et al., 2009) of seeing behaviour necessitated the analysis by positions in schools so that the study brings out perspectives of each player. The school management was asked to evaluate application of 10 listed

features of a positive school culture in their respective schools. The selected features were modeled on best schooling practices and culture from reviewed literature that other previous studies had relied upon (Cotton, 2000; Hongboontri & Keawkhong, 2014). Tables 1.1 and 1.2 capture their responses.

Table 3.1: School Management's Self Evaluation on Application of Listed Features of School Culture

Feature of a Positive School Culture	Rating of Features of School Culture			Total
	Least Applicable	Applicable	Most Applicable	
An inspiring vision, backed by a clear, and challenging mission	0 (0)	21(27)	58 (73)	79 (100)
A curriculum, modes of instruction, assessments and learning opportunities that are clearly linked to the vision and mission and tailored interests of the students	0 (0)	29 (37)	50 (63)	79 (100)
Sufficient time for teachers and students to do their work well	8 (10)	23 (29)	48 (61)	79 (100)
A pervasive focus on student and teacher learning, coupled with a continual, school-wide conversation about the quality of everyone's work	8 (10)	55 (70)	16 (20)	79 (100)
Many opportunities and venues for creating culture, discussing fundamental values, taking responsibility, coming together as a community and celebrating individual and group success	8 (10)	37 (47)	34 (43)	79 (100)

Source: Field Data, 2016; Note: Thefigures in parentheses are percentage frequencies n=79

Table 3.2: School Management's Self Evaluation on Application of Listed Features of School Culture

Feature of School Culture	Rating of Features of School Culture					Total
	Not Applicable	Uncertain	Least Applicable	Applicable	Most Applicable	
Close, supportive teacher-student and student-student relationships	0 (0)	8 (10)	24 (30)	25 (32)	22 (28)	79 (100)
Leadership that encourages on-the-job learning and adaptation to change	24 (30)	0 (0)	0 (0)	29 (37)	26 (33)	79 (100)
Data-driven decision-making systems about progress toward the vision and organizational change	0 (0)	13 (17)	24 (30)	24 (30)	18 (23)	79 (100)

Unwavering support from parents	0 (0)	0 (0)	13 (17)	66 (83)	0 (0)	79 (100)
County support for multiple school designs visions and missions	0 (0)	8 (10)	8 (10)	38 (48)	25 (32)	79 (100)

Source: Field Data, 2016; Note: Thefigures in parentheses are percentage frequencies n=79

The weights given to the options were: score zero for "not applicable", score 1 for "uncertain", score 2 for "least applicable", score 3 for "applicable" and score 4 for "most applicable". The sample segment for the study subjected to this question was school management comprised of head teachers and their deputies which was 79 respondents. Hence the lowest score, being for "not applicable" is zero (0× 79) and the highest score, being for "most applicable" is 316 (4× 79) while grand total score for applicability rating of school culture was 711 (0+158+237+316). Uncertain response was excluded on the applicability rating continuum because it does not reflect applicability. In terms of percentage for positive response in the context of applicability ratings, maximum score for least applicable is 22.2% (2×79= 158; 158/711 × 100%); maximum score for applicable is 33.3% (3×79= 237; 237/711 × 100%); maximum score for most applicable is 44.4% (4×79= 316; 316/711 × 100%) and summation of weighted score being 100% (22.2%+33.3%+44.4%). The higher the percentage score respondents gave was interpreted as more applicability of that feature of school culture within the school setting of the county. However, based on weighted scales, between 1% and 22% was interpreted to mean that feature of school culture was least applicable, between 23% and 33% was interpreted to mean that school culture feature was applicable while between 34% and 44% was interpreted to mean that school culture feature was most applicable. Whereas all the ten listed features of positive school culture were applied in schools of Bungoma County in varying intensity or scale of applicability, only five were in the cluster of most applied. This can be interpreted to mean schools had a between moderate to strong school culture being practiced or applied.

As shown in the tables 1.1 and 1.2, the columns reflect the numbers and percentage rating of respondents for each listed feature of school culture. The most applicable features with over 40% rating of applicability were an inspiring vision, backed by a clear, limited and challenging mission at 73%; a curriculum, modes of instruction, assessments and learning opportunities that are clearly linked to the vision and mission and tailored to the needs and interests of the students at 63%; sufficient time for teachers and students to do their work well at 61% and many opportunities and venues for creating culture, discussing fundamental values, taking responsibility, coming together as a community and celebrating individual and group success at 43%. The scaled calculation and subsequent ratings along an applicability continuum is as shown in Table 2. As captured in the table, the top five features were rated 34% and above. This was interpreted to mean they were most applicable within schools in study area, while the rest fell into the rating cluster of applicable. This can be interpreted to mean a moderate school culture as an influencing element within school set up from the perspective of Bronfenbrenner's model applied to this study.

Table 3.3: Rating on Applicability Continuum of listed features of School Culture by School Management

Feature of School Culture	Scaled Weighted rating %	Rank
An inspiring vision, backed by a clear, limited and challenging mission	41.49	1
A curriculum, modes of instruction, assessments and learning opportunities that are clearly linked to the vision and mission and tailored to the needs and interests of the students	40.37	2

Sufficient time for teachers and students to do their work well	38.95	3
A pervasive focus on student and teacher learning, coupled with a continual, school-wide conversation about the quality of everyone's work	34.46	5
Many opportunities and venues for creating culture, discussing fundamental values, taking responsibility, coming together as a community and celebrating individual and group success	36.99	4
Close, supportive teacher-student, teacher-teacher and student-student relationships	29.68	8
Leadership that encourages and protects trust, on-the-job learning, flexibility, risk-taking, innovation and adaptation to change	26.87	10
Data-driven decision-making systems that draw on timely, accurate, qualitative and quantitative information about progress toward the vision and sophisticated knowledge about organizational change	27.01	9
Unwavering support from parents	31.51	7
County flexibility and support for multiple school designs, visions, missions and innovations	32.34	6

Source: Field Data, 2016; Note: Thefigures in parentheses are percentage frequencies n=79

The study further tested the following hypothesis:

There is no significant influence of features of school culture being practiced on student deviant behaviour in Bungoma County Schools.

To test this hypothesis, chi square ($\chi 2$) tests were done to compare the features of school culture being practiced and various variables/types of deviance as an indicator of student deviant behaviour in Bungoma County Schools. Two features with weighted average rated above 40% as captured in Table 2 were picked for tests against student deviant behaviour. Tables 3 and 4, present a summary of the Chi-square test coefficients, degrees of freedom and the significance values for each of the variables.

Table 3.4: Results of Chi-square Tests on Association between Inspiring Vision with Clear Mission and Student Deviant Behaviour

Type of Deviance	Chi-square Value	df	Sig.
Drug, alcohol and substance abuse	77.38	6	0.00
Theft	81.23	8	0.00
Property Vandalism	1.33	6	0.00
Promiscuity	1.25	8	0.00
Class boycotts	35.12	6	0.00
Exam cheating	88.54	8	0.00
Sneaking	1.70	6	0.00
Rudeness	1.82	8	0.00

Source: Field Data, 2016

As indicated in Table 3.4, the results of the Chi-square tests showed that there is a statistically significant relationship between student deviant behaviour and an inspiring vision with clear mission as a feature of positive school culture that affects deviant prevalence in schools. All the listed eight types of deviant behaviour showed a statistically significant relationship. Thus, drug, alcohol and substance abuse(χ^2= 77.38, df=6, p<0.05); theft(χ^2= 81.23, df=8, p<0.05); property vandalism (χ^2= 1.33, df=6, p<0.05); promiscuity (χ^2= 1.25, df=8, p<0.05); class boycotts(χ^2= 35.12, df=6, p<0.05); exam cheating (χ^2= 88.54, df=8, p<0.05); sneaking (χ^2= 1.70, df=6, p<0.05); rudeness (χ^2= 1.82, df=8, p<0.05). On the basis of these tests, it is conclusive that there is a statistically significant relationship between student deviant behaviour and an inspiring vision with clear mission as a feature of positive school culture. The null hypothesis was therefore rejected.

Table 3.5: Results of Chi-square Tests on Association between a Curriculum that is well executed Besides Alignment to Vision of the School and Student Deviant Behaviour

Type of Deviance	Chi-square Value	df	Sig.
Drug, alcohol and substance abuse	80.59	6	0.00
Theft	57.95	8	0.00
Property Vandalism	1.06	6	0.00
Promiscuity	1.01	8	0.00
Class boycotts	27.56	6	0.00
Exam cheating	74.41	8	0.00
Sneaking	1.28	6	0.00
Rudeness	1.34	8	0.00

Source: Field Data, 2016

As indicated in Table 3.5, the results of the Chi-square tests showed that there is a statistically significant relationship between student deviant behaviour and an inspiring vision with clear mission as a feature of positive school culture that affects deviant prevalence in schools. All the listed eight types of deviant behaviour showed a statistically significant relationship. Thus, drug, alcohol and substance abuse(χ^2= 80.59, df=6, p<0.05); theft(χ^2= 57.95, df=8, p<0.05); property vandalism (χ^2= 1.06, df=6, p<0.05); promiscuity (χ^2= 1.01, df=8, p<0.05); class boycotts(χ^2= 27.56, df=6, p<0.05); exam cheating (χ^2= 74.41, df=8, p<0.05); sneaking (χ^2= 1.28, df=6, p<0.05); rudeness (χ^2= 1.34, df=8, p<0.05). On the basis of these tests, it is conclusive that there is a statistically significant relationship between student deviant behaviour and a curriculum that is well executed besides alignment to school's vision as a feature of positive school culture. The null hypothesis was therefore rejected.

The null hypothesis was further explored by conducting a simple regression analysis to predict strength and direction of relationship between features of school culture and prevalence of student deviant behaviour using specific variables. The findings are as captured in Tables 5 to 8.

Table 3.6: Regression of Inspiring Vision with Clear Mission Feature of Positive School Culture against Drug, alcohol and Substance Abuse

Single R	0.08
Adjusted R square	0.07
Std. Error	1.02

Variable of Student Deviant Behaviour

	df	Sum of squares	Mean square	F	Sig. of F
Regression	1	33.86	33.86	32.63	0.00
Residual	398	413.01	1.04		

Variables in the Equation

Variables	B	Standard error of B	Beta	t	Sig. of t
Drug, alcohol and substance abuse	0.15	0.03	0.28	5.71	0.00
Constant	1.84	0.06		32.38	0.00

a) Predictor/independent Variable: Inspiring Vision with Clear Mission

b) Dependent Variable: Drug, alcohol and substance abuse

As indicated in Table 3.6, R^2_{adj} was 0.07, F = 32.63, p< 0.05; beta weight = 0.28. The results of the regression indicated that inspiring vision with clear mission is a significant predictor of student deviant behaviour, which is explained by 7% of the variance. By examining the beta weight in Table 5, it is evident that although the variance in student deviance was significantly accounted for by inspiring vision with clear mission as a feature of positive school culture, this is a weak relationship as it is less than the decision criterion of coefficient range 0.3 to 0.7. In spite of the weak strength in relationship, it is evident

and therefore conclusive that inspiring vision with clear mission positively influences student deviant behaviour on the account of drug, alcohol and substance abuse. The null hypothesis was therefore rejected. The results suggest existence of other variables in the school setting that explain the remaining 93% of the variation in student deviant behaviour prevalence.

Table 3.7: Regression of Inspiring Vision with Clear Mission feature of positive School culture against theftas a variable of Student Deviant

Single R	0.06
Adjusted R square	0.05
Std. Error	0.86

Behaviour

	df	Sum of squares	Mean square	F	Sig. of F
Regression	1	17.22	17.22	22.95	0.00
Residual	398	298.53	0.75		
Variables in the Equation					
Variables	B	Standard error of B	Beta	t	Sig. of t
Theft	0.11	0.02	0.23	4.79	0.00
Constant	3.02	0.05		62.60	0.00

a) Predictor/independent Variable: Inspiring Vision with Clear Mission

b) Dependent Variable: Theft

As indicated in Table 3.7, R^2_{adj} was 0.05, F = 22.95, p< 0.05; beta weight = 0.23. The results of the regression indicated that inspiring vision with clear missionis a significant predictor of student deviant behaviour, which is explained by 5% of the variance. The results suggest existence of other variables in the school setting that explain the remaining 95% of the variation in student deviant behaviour prevalence. By examining the beta weight in Table 6, it is evident that although the variance in student deviance was significantly accounted for by inspiring vision with clear mission as a feature of positive school culture, this is a weak relationship as it is less than the decision criterion of coefficient range 0.3 to 0.7. In spite of the weak strength in relationship, it is evident and therefore conclusive that inspiring vision with clear mission positively influences student deviant behaviour on the account of theft. It is probable that the significant relationship could be explained by curvilinear relationship between the two variables as asserted by Kutner, et al. (2005). The null hypothesis was therefore rejected.

Table 3.8: Regression of Inspiring Vision with Clear Mission feature of positive School culture against Property Vandalismas a variable of Student

Single R	0.12
Adjusted R square	0.11
Std. Error	0.86

Deviant Behaviour

	df	Sum of squares	Mean square	F	Sig. of F
Regression	1	39.12	39.12	52.14	0.00
Residual	398	298.63	0.75		
Variables in the Equation					
Variables	B	Standard error of B	Beta	t	Sig. of t
Property Vandalism	0.15	0.02	0.34	7.22	0.00
Constant	2.27	0.05		47.02	0.00

a) Predictor/independent Variable: Inspiring Vision with Clear Mission

b) Dependent Variable: Property Vandalism

As indicated in Table 3.8, R^2_{adj} was 0.11, F = 52.14, p< 0.05; beta weight = 0.34. The results of the regression indicated that inspiring vision with clear missionis a significant predictor of student deviant behaviour, which is explained by 11% of the variance. By examining the beta weight in Table 7, the beta weight value reveals a moderate relationship that is within the decision criterion of coefficient range 0.3 to 0.7. It is evident that the variance in student deviance was significantly accounted for by inspiring vision with clear mission as a feature of positive school culture. It is evident and therefore conclusive that an inspiring vision with a clear mission positively influences student deviant behaviour on the account of property vandalism. The null hypothesis was therefore rejected.

Table 3.9: Regression of Inspiring Vision with Clear Mission Feature of Positive School Culture against Promiscuityas a Variable of Student

Single R	0.11
Adjusted R square	0.11
Std. Error	0.88

Deviant Behaviour

	df	Sum of squares	Mean square	F	Sig. of F
Regression	1	39.40	39.40	51.10	0.00
Residual	398	306.87	0.77		
Variables in the Equation					
Variables	B	Standard error of B	Beta	t	Sig. of t
Promiscuity	0.16	0.02	0.34	7.15	0.00
Constant	1.80	0.05		36.82	0.00

a) Predictor/independent Variable: Inspiring Vision with Clear Mission

b) Dependent Variable: Promiscuity

As indicated in Table 8, R^2_{adj} was 0.11, F = 51.10, p< 0.05; beta weight = 0.34. The results of the regression indicated that an inspiring vision with a clear missionis a significant predictor of student deviant behaviour, which is explained by 11% of the variance. By examining the beta weight in the Table 8, the beta weight value reveals a moderate relationship that is within the decision criterion of coefficient range 0.3 to 0.7. It is evident that the variance in student deviance was significantly accounted for by an inspiring vision with a clear mission as a feature of positive school culture. It is evident and therefore conclusive that aninspiring vision with a clear mission positively influence student deviant behaviour on the account of promiscuity. The null hypothesis was therefore rejected.

4.0 Conclusion and Recommendations

This study found that although on a varying intensity or scale of applicability, all the ten listed features of positive school culture were rated positively on an applicability continuum at a threshold of 23%, implying that they were all being applied in schools within Bungoma County. The study also established that Bungoma County schools had a between moderate to strong school culture. Out of the ten, five were in the category of applied indicating a moderate culture while the remaining five were in the mostly applied category as per the ratings of respondents. The five features that were rated highly indicate existence of a strong and/or a positive culture within schools of Bungoma County. It was also evident that school members were tuned into acting in compliance with school features and enforcing strategies outlined to guide the school operations. These findings corroborate with those of Angus et al. (2009) on health schools driven by positive school cultures besides being in agreement with Kilmann et al. (1985) as cited by Maslowski (2001) on weak cultures. Features of school culture could positively predict student deviant behaviour. The evident prediction could be linked with what Boisnier and Chatman (2002) together with Valentine (2004) averred that strong cultures create stability and improve bottom-line performance of students through minimized deviance. However, the small percentage of R^2 adj. together

with a weak and moderate relationship based on Beta weight values pointed to existence of other factors within the school system that influenced deviance among students (Borbara, 2005; Stoll, 2000). The study recommends that in order to mitigate prevalence of student deviant behaviour in Bungoma County schools, there is need to establish and embrace school culture features that interface "within" school and "outside" school environments as prescribed by Bronfenbrenner's model.

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An Investigation of Prevention Strategies Applied to Minimize Student Deviant Behaviour in Secondary Schools within Bungoma County, Kenya

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Abstract

Whereas many schools have been known to exhibit strong school culture practices that drive academic excellence, rampant theft and exam cheating in schools across counties in Kenya have stood out as a unique trend of deviance that could be reflecting absence of a well executed deviance prevention curriculum. Knowledge of the emerging trends in kinds of deviance being indulged in presupposes an effective rollout of preventive strategies within school cultures yet this has been missing. The purpose of this study was to address this gap by investigating prevention strategies being applied to minimize student deviant behaviour in schools within Bungoma County. A sample size of 400 was used from a study population size [N] of 155,796 composed of students, teachers and school management staff in secondary schools of Bungoma County. The mixed research design that comprised of concurrent triangulation, correlation and cross sectional survey was employed. Multiphase and stratified sampling was used to select schools, students and teachers. Purposive sampling was used to select school management staff. The data for the study was obtained through questionnaires and interviews. Descriptive statistics: cross-tabulations and frequency tables together with inferential statistical analyses: Chi square and simple linear regression analyses were used to analyze the data. The study established that all the nine listed preventive strategiesestablishedto minimize student deviant behaviour in schools within Bungoma County were being applied. Chi-square tests revealed a significant relationship between preventive strategiesand student deviance prevalence in Bungoma County schools. The study concludes that while most of the preventive strategies are highly applied within school cultures in Bungoma county, effective prevention curriculum as a core component of preventive strategies is poorly applied. The study recommends establishment and enforcement of a deviance prevention curriculum anchored on school-wide positive behaviour support systems.

Key Words: *Prevention Strategies, School Culture, Student Deviance, Secondary, Bungoma County*

1.0 Introduction

Deviant behaviour in secondary level schools continues to be a matter of great concern globally; though it is a more worrying trend in developing countries like Kenya (Adegun, 2013; Masese, Nasongo, & Ngesu, 2012; UNODC, 2012). These acts negatively influence the learning and teaching process as they undermine the purpose of education (Agboola & Salawu, 2011). In secondary schools, deviant behaviour is caused by an interaction of different factors that can be traced within and outside school as two distinct yet overlapping environments where the student is socialized into deviance (Carlson, 2012; Carra, et al., 2009). According to academic literature reviewed for this study, family factors that contribute to deviance include a history of drug and alcohol abuse, poor parent- child relationship, violence and socio-economic status of the family (Malayi, Mauyo, & Nassiuma, 2013; Mbuthia, 2013; Carlson, 2012). As for school factors, the size of the school, an unsafe school physical environment, inappropriate classroom management, teachers humiliating remarks and teacher- pupil relations that are too strict have been cited (Richwood, 2013). According to Hirschi (2002), although deviant behaviour may show a small degree of specialization, there is a strong tendency for persons who engage in one type of delinquent behaviour to engage in other types as well. In this vein, the researcher posited that it was imperative that deviance is examined as a phenomenon with multifaceted causes that demand a blend of strategies to mitigate it; be they preventive or corrective.

Minimizing deviant behaviour demands that prevention strategies be embedded in the organizational culture and work processes (Greenwood, 2008). These Prevention strategies are those which generally reduce the likelihood of engaging in deviant behaviour (UNODC, 2012; Victory, 2005). As posited by Greenwood (2008), the environment and situational factors play a critical role in shaping behavior hence several programs have been shown to produce significant effects in mitigating deviancy among youths. This study focused on the information-based programmes and life skills prevention strategies practiced within secondary schools of Bungoma County. An information-based programme is a prevention strategy based on the premise that youth in secondary school, a majority of whom are adolescents, indulge in deviance because they are unaware of the consequences. Provision with information will therefore assist them refrain from deviant behaviour (UNODC, 2012). Guidance programmes are an integral part of discipline enforcement within schools. Within a school set up, it is an authoritative direction given to a student through directing, giving opinion, explaining so that theyknow who they are, enhance personal development, achieve physical maturity and attain an assertive ego (Lutomia, 2007). As for the life skills prevention strategy, the focus is inculcation of a range of social skills. The underlying assumption is that deviant behaviour is at least partly due to poor social coping strategies, undeveloped decision making skills, low self esteem, and inadequate peer pressure resistance skills, among others (Baldry, 2004).

In view of the above argument, prevention strategies if well embedded in the school organizational culture manifest as programmes that can facilitate both academic and socio-emotional learning. They are universal since they target the whole class and student fraternity. Preventive strategies have broadly been categorized based on family factors; educational factors and individual characteristics together with personal and social competence (UNODC, 2012). This study explored whether some of them exist within the school organizational culture and their role in minimizing prevalence of deviant behaviour among students in secondary schools of Bungoma County. This study was guided by Bronfenbrenner's Bioecological Theory of Human Development which stresses process-person-context-time interrelatedness (Bronfenbrenner, 2001). As averred by Case (2006), the novelty in this theory is not the identification of environmental influences, but rather the interactions among the influencing entities and their impact on the individual. The researchers used this theory in guiding their investigation into preventive strategies as a deviance mitigation factor among students within Bungoma County schools.

2.0 Methodology

The research paradigm that informed this study was a Pragmatic approach which is a philosophical underpinning for mixed methods studies (Creswell, 2012). The study was conducted using mixed methods research design that comprised of concurrent triangulation, correlation and cross sectional survey to address the study objective. Deviant behaviour, bynature,isamulti-faceted, mutative andmultidimensionalphenomenonthatcanbe betterexploredwhenseveraldifferent methods areapplied (Bahar & Esin, 2013). A sample size of 400 composed of students, teachers and school management staff from 252 schools was used. A mixture of sampling techniques was used, that is, multiphase and stratified sampling was used to select schools, students and teachers while purposive sampling was used to select school management staff. The data for the study was obtained through questionnaire, interviews, document analysis and direct observations. Descriptive statistics: cross-tabulations and frequency tables was used to analyze the data while inferential statistics was mainly by chi-square and simple regression. The schools selected were based on the following strata: rural and urban schools; national, extra County, County schools.

3.0 Results and Discussion

Citing Gruenert (2005) among other previous studies, Engin et al. (2014) in concurrence with Brandy (2006) posited that school culture as a concept within educational administration imply a system of behaviours that evolves dynamically within given school settings and is embraced by members of that school. Bahar and Esin (2013) amplified the value of culture in school set-up within their assertion that survival of school is closely related to the behaviours of its members especially students and teachers. As asserted by Ayse and Musa (2013) culture transforms people's behaviour, attitudes and organizational effectiveness which could impact on the level of performance and deviance in a school setting which was the focus of the study. The researchers were keen on how preventive strategies as characteristics of positive school culture were being practiced in schools as perceived by all respondents. Table 1 captures their responses on a five-likert scale of excellent, very good, good, fair and poor.

Table 3.1 Preventive Strategies of a Positive School Culture practiced in Schools as rated by all Respondents

Preventive Strategies of Positive School Culture	Rating of Strategies as practiced in Schools					
	Excellent	Very Good	Good	Fair	Poor	Total
Goals focus	153(38)	95(24)	88(22)	64(16)	0(0)	400(100)
Communication adequacy	80(20)	95(24)	160(40)	24(6)	(10)	400(100)
Cohesiveness	128(32)	136(34)	96(24)	40(10)	0(0)	400(100)
The school has a vision of success with broad support in the school and community	176(44)	96(24)	120(30)	8(2)	0(0)	400(100)
A healthy school culture that promotes student bonding to school	72(18)	135(34)	128(32)	65(16)	0(0)	400(100)
School leaders are engaged and committed to prevention of deviance	63(16)	184(46)	129(32)	24(6)	0(0)	400(100)
A strong academic program that promotes success for students of all ability levels	184(46)	136(34)	72(18)	4(8)	0(0)	400(100)
Effectiveness of the Disciplinary committee in handling deviancy	45(11)	129(32)	134(34)	56(14)	36(9)	400(100)
Effectiveness of the G/C committee in handling deviancy	28(7)	116(29)	143(36)	75(19)	38(10)	400(100)

Source: Field Data, 2016; Note: Thefigures in parentheses are percentage frequencies n=400

Respondents were asked to evaluate application of the 9 listed preventive strategies of a positive school culture practiced in their respective schools. The selected strategies were sampled out of those used in previous studies on school culture and tested for reliability analysis for Cronbach's alpha coefficient. All had a coefficient of over 0.93 and the nine averaged at 0.965. Testing instrument reliability in this manner is an acceptable approach in social sciences (Lane et al., 2013; Dalal, 2005; Durrand, 2002). As indicated in Table 1, goal focus which in the context of school culture implies the ability for the school to exhibit goals and objectives that are clear, acceptable and supported by all members was rated along the practice continuum at 38% excellent, 24% very good and 22% good. This reflects an overall positive rating of good and above at 84%. Such a high rating could be associated with Government rules and regulations that clearly guide school operations and routine. Implementation of school curriculum anchored on attainment of Education goals and objectives could also be alluded to that high score. The 16% could be attributed to poor staffing and infrastructure in some schools that makes it hard to achieve set goals and objectives. Communication adequacy as a school culture denotes quality and quantity of information flow both vertically and horizontally within school systems. It was rated at 20% excellent, 24% very good, 40% good, 6% fair and 10% poor. On aggregate 84% rated it good and above although the 10% poor

rating raises a concern because sharing of information or communication generally within a system is very critical for posting good performance and mitigating deviancy. School organizational structures along departments and class teachers could explain the high rating while bureaucracy could account for the 10% poor rating. Cohesiveness is about having a school culture where there is a clear sense of identity and members of the school feel attracted to membership and have a strong sense of belonging. It was rated at 44% excellent, 24% very good and 30% good. On aggregate, it rated at 98% above good on the practice of good culture continuum. This high rating could be attributed to the fanatical wave of formulating vision and mission statements for all schools since the year 2000 as part of strategic and performance based management paradigm within Government circles. A healthy school culture that promotes student bonding to their school was also highly rated on the positive school culture practice continuum. Although only 18% rated it excellent, 34% and 32% rated it very good and good respectively. That puts the aggregate also at 84%. School leadership engagement and commitment on preventing deviance also scored lowly on excellence at 16% just as it was the case with effectiveness of the disciplinary committees together with that of Guidance and counseling at 11% and 7% respectively. Generally however, respondents reported that on a practiced continuum, school leadership was engaged and committed to prevention of deviance at 46% very good and 32% good. Effectiveness of the disciplinary committee in handling deviancy was rated at 32% very good and 34% good, while effectiveness of the Guidance and counseling committee in handling deviancy was rated at 29% very good and 36% good. The rating for effectiveness of disciplinary together with Guidance and counseling committees at 9% and 10% poor respectively is indicative of failure by the school culture to systematically address deviancy because such lapses could allow mutation of vices within the system.

The weights given to the options were: score 1 for "poor", score 2 for "fair", score 3 for "good", score 4 for "very good" and score 5 for "excellent". The sample for the study was 400 respondents. Hence the lowest score, being for "poor" is 400 (1× 400) and the highest score, being for "excellent" is 2000 (5× 400) while grand total score for positivity rating was 6000 (400+800+1200+1600+2000). In terms of percentage for positive response in the context of positivity/effective ratings, maximum score for poor is 6.7% (1×400= 400; 400/6000 × 100%); fair is 13.3% (2×400= 800; 800/6000 × 100%); maximum score for good is 20% (3×400= 1200; 400/6000 × 100%); maximum score for very good is 26.7% (4×400= 1600; 1600/6000 × 100%); maximum score for excellent is 33.3% (5×400= 2000; 2000/6000 × 100%) and summation of weighted score being 100% (7%+13 %+20%+27%+33%). The higher the percentage score respondents gave was interpreted as more presence of that preventive strategy within the school culture in the school setting of the County. However, based on weighted scales, between 1% and 7% was interpreted to mean that preventive strategy of school culture was poorly applied, between 7% and 13% was interpreted to mean that preventive strategy of school culture was fairly applied, between 14% and 20% was interpreted to mean that preventive strategy of school culture was good in being applied, between 21% and 26% was interpreted to mean that preventive strategy of school culture was very good in being applied, while between 27% and 33% was interpreted to mean that preventive strategy of school culture was excellently being applied. The scaled calculation and subsequent ratings along an applicability continuum is as shown in Table 3.2.

Table 3.2: Rating on Practice Continuum of Preventive Strategies of Positive School Culture by all Respondents

Preventive Strategies of Positive School Culture	Scaled Weighted rating %	Rank
Goals focus	25.6	4
Communication adequacy	22.0	7
Cohesiveness	25.9	3
The school has a vision of success with broad support in the school and community	27.3	2
A healthy school culture that promotes student bonding to school	23.6	6
School leaders are engaged and committed to prevention of deviance	24.8	5
A strong academic program that promotes success for students of all ability levels	28.1	1
Effectiveness of the Disciplinary committee in handling deviancy	21.6	8
Effectiveness of the G/C committee in handling deviancy	20.3	9

Source: Field Data, 2016; n=400

As indicated in the Table 3.2, apart from effectiveness of the Guidance and Counselling committee in handling deviancy that was rated good in terms of being applied, those ranked number 3 to 8 were within the very good cluster of application. Those ranked 1 and 2 besides being scored excellent in application were presence of a strong academic program that promotes success for students of all ability levels and usage of school has a vision of success with broad support in the school and community. On overall, this can be interpreted to mean presence of a moderate to good application of school culture preventive strategies.The weighted rating for effectiveness of disciplinary committees in handling deviancy was at 22% meaning very good and a reflection of a positive school culture. On the hand, the study found that on a weighted average, deviance prevalence in Bungoma schools was within least severe segment. This could be explained by strict ministerial and Teachers Service Commission (TSC) directives on zero tolerance to corporal punishment and respect for child rights as stipulated in the Basic Education Act (RoK, 2013a). This finding is corroborated by Adelman and Taylor (2005) and NCSE (2012) on learning and behaviour problems (out of either severe emotional disturbance or behaviourial disorders) that where disciplinary mechanisms are used to manage misbehaviour using reasonable, fair and non-denigrating guidelines, positive results on reduced deviance will be achieved. The researcher was keen to find out evaluation of some other two preventive strategies from first tier of school management where head teachers and their deputies are targeted and their feedback corroborated with that of students. Table 3 is a cross tabulation capturing their responses.

Table 3.3: Preventive Strategies practiced in Schools as rated by School Management and Students only

Preventive Strategiesof School Culture	Position in School	Rating of Preventive Strategies of School Culture					
		Excellent	Very Good	Good	Fair	Poor	Total
An integrated continuum of strategies that serves students and families with multiple levels of need	School Management	13 (4)	44 (15)	17 (6)	5 (2)	0 (0)	79 (27)
	Students	10 (3)	57 (19)	93 (32)	49 17)	7 (2)	216 (73)
Sub total		**23 (7)**	**101(34)**	**110(38)**	**54 19)**	**7 (2)**	**295(100)**
Problem-solving adequacy	School Management	15 (5)	18 (6)	33 (11)	13 (5)	0 (0)	79 (27)
	Students	0 (0)	15 (5)	138(47)	47(16)	16 (5)	216 (73)
Sub total		**15 (5)**	**33 (11)**	**171(58)**	**60 21)**	**16 (5)**	**295 (100)**

Source: Field Data, 2016; Note: Thefigures in parentheses are percentage frequencies n=295

As indicated in Table 3.3, on an integrated continuum of strategies that serve students and families with multiple levels of need, 19% of school management rated it very good and above while 22% of students rated it good. On aggregate, 41% of a combined rating of school management and students rated it at very good and above while 38% rated it as good. On problem solving adequacy where the school culture enables members to perceive problems and solve them using minimal energy besides sustaining such initiatives, school management rated it at 11% very good and above while students rated it at 5%. On aggregate, only 16% of a combined rating by school management and students agreed that the characteristic was practiced at a very good and above rating. Heads of departments in charge of Guidance and counseling and the class teachers occupy the second tier of management from the perspective of implementing positive school culture characteristics. They were asked to rate the listed two preventive strategies of positive school culture that directly impact on their roles within the system. Their response was as captured in Table 4.

Table 3.4: Preventive Strategies of School Culture practiced in Schools as rated by Heads of Guidance and Counseling together with Class Teachers only

Preventive Strategies of Positive School Culture	Rating of Preventive Strategies of Positive School Culture					Total
	Excellent	Very Good	Good	Fair	Poor	
Optimal power equalization	7(7)	15(14)	55(52)	28(27)	0(0)	105(100)
An effective prevention curriculum or program that is faithfully implemented with all students	0(0)	0(0)	9(9)	35(33)	61(58)	105(100)

Source: Field Data, 2016; Note: Thefigures in parentheses are percentage frequencies n=105

Heads of departments in charge of guidance and counseling and class teachers are critical players at second tier of school management who if not well resourced in terms of supply and coordination may not only be frustrated but may experience high burn out from the perspective of mitigating deviancy (Dunber ,2004; Lane et al., 2013). Students learning in resource starved environments are more vulnerable to anti social behavior (Dunber, 2004) which was perceived in the study as deviance. The two categories of respondents were asked to rate the listed three preventive strategies of positive school culture that directly impact on their roles within the system. These were optimal power equalization, an effective prevention curriculum or program that is faithfully implemented with all students and resource utilization. Optimal power equalization as a preventive strategy of school culture demands that the school culture allows a relatively equitable distribution of influence between members of the school and management. With regard to resource utilization as a preventive strategy of school culture, emphasis is on coordination of resources to allow effective operations with minimal strain. Applicability rating for these strategies was at 66% and 80% respectively good and above. It implies that heads of department and class teachers were given some leverage to deal with student deviancy within their jurisdictions. This could have accounted for a least severe weighted average verdict (of between 1% and 22%) on deviance prevalence within the study area. This finding is corroborated by Adelman and Taylor (2005) in their application of transaction model to explain student deviance particularly on the assertion that each part of school environment transacts with others to affect overall outcome; positive or negative. This is further confirmed by Simon (2013) on building student resilience when he affirms the strategic role of empowered teachers in helping students attain high level performance regardless of risk factors.

On optimal power equalization, their rating was at 14% for very good and above, 52% for good and 27% for fair. As for an effective prevention curriculum that is embraced by all students, the score was at 9% good, 33% fair and 58% poor. As a preventive strategy of school culture resource utilization denotes a

school setting where both human and physical resources are well coordinated to allow effective operations with minimal strain. Table 4 is a cross tabulation capturing their responses.

Table 3.4: Preventive Strategies of Positive School Culture practiced in Schools as rated by Teachers (HODs &Class Teachers) and Students only

Preventive Strategies of Positive School Culture	Position in School	Rating of Preventive Strategies of Positive School Culture					Total
		Excellent	Very Good	Good	Fair	Poor	
Resource utilization	Teachers	8(3)	23(7)	54(17)	20(6)	0(0)	105(33)
	Students	61(19)	39(12)	72(22)	36(11)	8(3)	216(67)
Sub total		**69 (22)**	**62 (19)**	**126 (39)**	**56(17)**	**8(3)**	**321(100)**

Source: Field Data, 2016; Note: Thefigures in parentheses are percentage frequencies n=321

As indicated in Table 3.4, resource utilization was rated at 10% for very good and above by teachers, (Heads of departments and class teachers) while 31% of the students rated it at very good and above. However 17% of the teachers rated it at good in terms of it being practiced in their schools compared to 22% of the students. On overall, 27% of the teachers rated it at good and above while 53% of the students rated it at good and above. Teachers who rated it at fair were 6% compared to 11% of the students. Further 3% of the students felt that this aspect of school culture was poorly practiced in their respective schools. In terms of weights, utilization was rated at 6.93% by teachers while students rated it at 15.73%. This yields a combined rating of 22.66%. Table 6 reflects an aggregate weighted rating of all preventive strategies as evaluated by segmented respondents based on their positioning in schools.

Table 3.5: Rating on Practice Continuum of Preventive Strategies of Positive School Culture by Respondents

Preventive Strategies of Positive School Culture	Scaled Weighted rating %	Rank
Goals focus	25.6	4
Communication adequacy	22.0	8
Cohesiveness	25.9	3
The school has a vision of success with broad support in the school and community	27.3	2
A healthy school culture that promotes student bonding to school	23.6	6
School leaders are engaged and committed to prevention of deviance	24.8	5
A strong academic program that promotes success for students	28.1	1
Effectiveness of the Disciplinary committee in handling deviancy	21.6	10
Effectiveness of the G/C committee in handling deviancy	20.3	11
An integrated continuum of strategies that serves students and families with multiple levels of need	21.8	9
Problem-solving adequacy	16.4	13
Optimal power equalization	20.1	12
An effective prevention curriculum or program that is faithfully implemented with all students	10.0	16
Resource utilization	22.7	7

Source: Field Data, 2016

The study further tested the following hypothesis:

There is no significant influence of prevention strategies within school culture in minimizing student deviant behaviour in Bungoma County Schools.

To test this hypothesis, chi square (χ^2) tests were done to compare the prevention strategies within school culture being practiced and various variables/types of deviance as an indicator of student deviant behaviour in Bungoma County Schools. Top two preventive strategies with weighted average rated above 27 % as captured in Table 6 were picked for tests against listed student deviant behaviour. Tables 7

and 8 present a summary of the Chi-square test coefficients, degrees of freedom and the significance values for each of the variables.

Table 3.6: Results of Chi-square Tests on Association between a Strong Academic Program Promoting Success of All Students and Student Deviant Behaviour

Type of Deviance	Chi-square Value	df	Sig.
Drug, alcohol and substance abuse	77.71	9	0.00
Theft	94.31	12	0.00
Property Vandalism	91.55	9	0.00
Rudeness	3.72	12	0.00
Exam cheating	1.47	12	0.00
Sneaking	1.12	9	0.00

Source: Field Data, 2016

As indicated in the Table 3.6, the results of the Chi-square tests showed that there is a statistically significant relationship between student deviant behaviour and a strong academic program promoting success of all students as a preventive strategy within school culture that affects deviant prevalence in schools. All the listed six types of deviant behaviour showed astatistically significant relationship. Thus, drug, alcohol and substance abuse(χ^2= 77.71, df=9, p<0.05); theft(χ^2= 94.31, df=12, p<0.05); property vandalism (χ^2= 91.55, df=9, p<0.05); exam cheating (χ^2= 1.47, df=12, p<0.05); sneaking (χ^2= 1.12, df=9, p<0.05); rudeness (χ^2= 3.72, df=12, p<0.05). On the basis of these tests, it is conclusive that there is a statistically significant relationship between student deviant behaviour and a strong academic program promoting success of all students as a preventive strategy within school culture that affects deviant prevalence in schools. The null hypothesis was therefore rejected.

Table 3.7: Results of Chi-square Tests on Association between a Vision of Success with Broad Support Base of Stakeholders and Student Deviant Behaviour

Type of Deviance	Chi-square Value	df	Sig.
Theft	1.18	12	0.00
Property Vandalism	1.01	9	0.00
Rudeness	91.87	12	0.00
Exam cheating	1.81	12	0.00
Sneaking	98.97	9	0.00

Source: Field Data, 2016

As indicated in the Table 3.7, the results of the Chi-square tests showed that there is a statistically significant relationship between student deviant behaviour and a vision of success with broad support base of stakeholders as a preventive strategy within school culture that affects deviant prevalence in schools. All the listed five types of deviant behaviour showed a statistically significant relationship. Thus, theft (χ^2= 1.18, DF=12, p<0.05); property vandalism (χ^2= 1.01, df=9, p<0.05); exam cheating (χ^2= 1.81, df=12, p<0.05); sneaking (χ^2= 98.97, df=9, p<0.05); rudeness (χ^2= 91.87, df=12, p<0.05). On the basis of these tests, it is conclusive that there is a statistically significant relationship between student deviant behaviour and a vision of success with broad support base of stakeholders as a preventive strategy within school culture that affects deviant prevalence in schools. The null hypothesis was therefore rejected.

This null hypothesis was further explored by conducting simple regression analyses to assist the researchers predict strength and direction of relationship between preventive strategies within school culture and prevalence of student deviant behaviour using specific variables. The findings are as captured in Tables 9 to 10.

Table 3.8: Regression of Cohesiveness as preventive strategy within school culture against Rudeness as a variable of Student Deviant Behaviour

Single R		**0.09**			
Adjusted R square		**0.09**			
Std. Error		**0.96**			
	df	**Sum of squares**	**Mean square**	**F**	**Sig. of F**
Regression	**1**	**38.07**	**38.07**	**41.41**	**0.00**
Residual	**398**	**365.93**	**0.92**		
Variables in the Equation					
Variables	**B**	**Standard error of B**	**Beta**	**t**	**Sig. of t**
Rudeness	**0.32**	**0.05**	**0.31**	**6.43**	**0.00**
Constant	**1.83**	**0.11**		**15.89**	**0.00**

a. Predictor/independent Variable: Cohesiveness

b. Dependent Variable: Rudeness

As indicated in the Table 3.8, R^2_{adj} was 0.09, F = 41.41, p< 0.05; beta weight = 0.31. The results of the regression indicated that cohesiveness as preventive strategy within school cultureis a significant predictor of student deviant behaviour, which is explained by 9% of the variance. By examining the beta weight in the Table 9, the beta weight value reveals a moderate relationship that is within the decision criterion of coefficient range 0.3 to 0.7. It is evident that the variance in student deviance was significantly accounted for by cohesiveness as preventive strategy within school culture. It is evident and therefore conclusive that this preventive strategy within school culture positively influenced student deviant behaviour on the account of rudeness. The null hypothesis was therefore rejected.

Table 3.9: Regression of Goal Focus as Preventive Strategy within School Culture against Rudeness as a Variable of Student Deviant Behaviour

Single R		0.13			
Adjusted R square		0.13			
Std. Error		0.94			
	df	Sum of squares	Mean square	F	Sig. of F
Regression	1	52.88	52.88	59.95	0.00
Residual	398	351.11	0.88		
Variables in the Equation					
Variables	B	Standard error of B	Beta	t	Sig. of t
Rudeness	0.33	0.04	0.36	7.74	0.00
Constant	1.79	0.10		17.34	0.00

a. Predictor/independent Variable: Goal focus

b. Dependent Variable: Rudeness

As indicated in Table 12, R^2_{adj} was 0.13, F = 59.95, p< 0.05; beta weight = 0.36. The results of the regression indicated that goal focus as preventive strategy within school cultureis a significant predictor of student deviant behaviour, which is explained by 13% of the variance. By examining the beta weight in the Table 10, the beta weight value reveals a moderate relationship that is within the decision criterion of coefficient range 0.3 to 0.7. It is evident that the variance in student deviance was significantly accounted for by goal focus as a preventive strategy within school culture. It is evident and therefore conclusive that this preventive strategy within school culture positively influenced student deviant behaviour on the account of rudeness. The null hypothesis was therefore rejected.

4.0 Conclusion and Recommendation

Preventive strategies that were rated highly across schools were: strong academic programs that are inclusive for all cadres of students; vision of success that is rallied to by school members; cohesiveness and goal focus at weighted rating of 28%, 27%, 26% and 26% respectively. However, effective prevention curriculum as a component of preventive strategies was poorly rated. Only 9% of respondents rated it good in regard to how it's practiced in schools while a majority at 58% rated it poor and 33% of respondents rated it as fair. This result essentially means most schools in Bungoma County lacked a school-wide positive behaviour support system yet this has empirically been known to offer an effective framework for creating school environment that mitigates deviancy among all students (McKevitt & BraaKsma, 2008; McGoey et al., 2016). This view is corroborated by Hansen et al. (2014) study on teacher perception and positive behaviour intervention with regard to managing deviance in schools. The study recommends that secondary schools should deliberately embrace a comprehensive prevention curriculum that is anchored on a school-wide positive behaviour support system within their school culture in order to mitigate deviance prevalence which could otherwise escalate to levels that academic performance and learning in schools will be compromised.

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Quality Assurance in Higher Education: A Critical Review of Use of Internal Measures in Universities in Kenya

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Abstract

An audit report by the Commission for University Education between January and February 2017 established that many universities in Kenya do not adhere to a number of quality guidelines put in place. Consequently, it was against this background that the study sought to investigate the application of internal measures of quality assurance in universities in Kenya.Its specific objectives were to:explore internal measures used to ensure quality in student intake in universities in Kenya; investigate internal measures used to ensure quality in evaluation of student learning experiences in universities in Kenya; and finally describe internal measures used to ensure lecturer quality in universities in Kenya. The study applied a descriptive survey design and it targeted all the 70 public and private universities in the republic. Out of this population, 21 public and private universities were purposefully sampled to take part in the study. Respondents were sampled randomly. They comprised of 210 members of academic staff from various faculties. The researcher engaged the services of 21 research assistants who were responsible for administering questionnaires in the sampled institutions. Validity and reliability of the instruments was tested by piloting them in one university which was not included in the final study. Quantitative data from the questionnaire was coded into categories based on the study objectives and fed into SPSS computer software version 20 which analyzed it using percentages and frequencies. Data was presented in frequency tables. The study established that although internal quality assurance mechanisms exist in universities, most of them are flawed. In student intake for instance, some universities issue students with admission letters without first of all authenticating their certificates. Things are not any better in other stages of quality assurance such evaluation of students' learning experiences and teaching staff's quality. In some universities, once students evaluate their lecturers at the end of the semester, the matter ends there. The reports are not analyzed and feedback communicated to individual lecturers. Besides this, few institutions use feedback from these reports to organize capacity building workshops for lecturers. In staff recruitment, the study found that in some universities, new recruits are not subjected to an elaborate orientation process in order to familiarize themselves with syllabi for various courses, the curriculum and even the administrative structures of the individual universities. In light of this, a number of workable recommendations were proposed to address these challenges.

Key Words: *Internal Measures, Learning Experiences, Lecturer Quality, Student Intake, Quality Assurance*

1.0 Introduction

Concern about the quality of higher education in Africa is on the rise. This comes against a background of a growing recognition of the potentially powerful role of tertiary education for growth, and it's a natural response to public perception that educational quality is being compromised in the effort to expand enrollment in recent years; growing complaints by employers that graduates are poorly prepared for the workplace; and increasing competition in the higher education market place as many private and transnational providers enter the scene (Materu, 2007). Little is available in the literature on what African countries are doing to regulate and improve higher education quality.

In Kenya, an audit report by the Commission for University Education (CUE) between January and February 2017 established that many universities do not adhere to a number of quality guidelines put in place. The report covered all the 70 universities in the country (33 public and 37 private). Its findings were baffling. For two consecutive years a private university was found to have awarded degrees to

candidates who had not qualified as they never met graduation requirements; some admitted students who didn't meet the minimum university entry requirements; some students completed bachelor's degree courses within nine to twelve months – a rare feat because the courses ordinarily take a minimum of four years; another private university got an approval to offer a diploma course in clinical medicine but went ahead to offer degree studies in medicine and surgery, meaning that it admitted and taught the students fraudulently; there were many cases of missing marks; poor supervision of postgraduate students and low completion rates for postgraduate students; others have fragmented courses such that what are typically taught as units have been made full-fledged degree courses, leading to premature specialization; shortage of full time and qualified academic staff; opening up of satellite campuses without adhering to guidelines and quality standards and; flouting guidelines on promotion of academic staff. These findings put to question the quality of education offered to the close to 500,000 students enrolled at this level of education. It was against the background of this situation that the current study emerged to investigate the use of internal measures to ensure quality assurance in Kenyan universities. The specific objectives of the study were to:

1. Explore internal measures used to ensure quality in student intake in universities in Kenya.
2. Investigate internal measures used to ensure quality in evaluation of student learning experiences in universities in Kenya.
3. Describe internal measures used to ensure lecturer quality in universities in Kenya.

1.1 The Concept of Quality Assurance

The concept of quality is hard to define precisely especially in the context of tertiary education where institutions have a broad autonomy to decide on their own visions and missions. Any statement about quality implies a certain relative measure against a common standard. In tertiary education, such a common standard doesn't exist. Various concepts have evolved to suit different contexts ranging from quality as a measure for excellence to quality as perfection, quality as value for money, quality as customer satisfaction, quality as fitness for purpose, and quality as transformation in the learner (SAUVCA, 2002). Depending on the definition chosen, quality implies a relative measure of inputs, processes, outputs or learning outcomes. Institutions, funders, and the general public need some method for obtaining assurance that the institution is keeping its promises to its stakeholders. This is the primary goal of quality assurance.

Quality assurance is concerned with consistently meeting product specification or simply getting things right, first time and every time. Quality assurance in the university system implies the ability of the institutions to meet the expectations of the users of manpower in relation to quality of skills acquired by their outputs (Ajayi and Akindutire, 2007). Furthermore, quality assurance in university education can be said to be the ability of the universities to meet certain criteria relating to academic matters, staff-student ratio, staff mix by rank, staff development, physical facilities, funding, and adequate library services. Adequacy of various inputs in the university systems in terms of quality and quantity exercises tremendously influence on quality assurance in the university system.

1.2 Internal Measures of Quality Assurance in Universities

Internal quality assurance mechanisms, refers to the internal policies and measures of a university or program for ensuring that it's fulfilling its purposes as well as the standards that apply to higher education in general or the profession or discipline in particular (IIEP, 2006). Development and utilization of effective internal quality assurance measures are crucial to successful university education everywhere in the world. Consequently, this underscores the reason why universities design and implement various internal quality assurance measures to ensure that certain agreed standards of performance are being met. On the other hand, Dill (2007) argues that internal quality assurance refers to those policies and

practices whereby academic institutions monitor and improve the quality of their education provision. This type of quality assurance is more formative in nature and likely to lead to continual quality improvement efforts and the development of quality culture in institutions (Wiclund et al., 2003). According to Kahsay (2012), aspects that are focused on in internal quality assurance are academic content, teaching-learning process, student assessment and resources (staffing, facilities and services).
This study assessed higher education quality assurance at the institutional level. Given the large number of universities in Kenya, it was not possible to delve into the specifics of each institution in detail. Therefore, the conclusions and recommendations given here are only intended to act as a guide and would have to be adapted to suit the specific situation of each institution.

Within institutions of higher learning, self assessment and academic audits are gradually being adopted to supplement traditional quality assurance methods for instance use of external examiners. Institutions readily accept self assessment because it empowers them and their staff to take charge of quality of their performance without the pressure that is usually associated with an external review. Self assessment also helps institutions to identify their own strengths and weaknesses while generating awareness of key performance indicators. The capacity building function of self-assessment is particularly important in the countries of Sub-Saharan Africa where capacity remains very weak. In some institutions like University of Dar Salaam, Tanzania, these processes existed long even before the establishment of national Quality Assurance agencies (Materu, 2007). However, Materu notes that expertise in conducting self evaluation is limited within Africa.
Quality assurance within institutions of higher learning takes place thought the teaching and learning process. It includes screening of candidates for admission, staff recruitment and promotion procedures, curriculum reviews, teaching and learning facilities, quality of research, policy development and management mechanisms, students' evaluation of teaching staff, external examiners for students' work, academic reviews, and audits.
Although little information is available in the public domain on the effectiveness of these methods, anecdotal information gathered by Materu (2007) revealed that implementation of some of these processes is weak due to financial constraints, failure to keep up with new approaches to teaching and learning and increased workload resulting from unmatched student numbers. In Tanzania for instance, a quality assurance panel set up by the University of Dar es Salaam recommended a reduction in the frequency of external examiner visits from once per year to once in two or three years. As a replacement, regular tracer studies were recommended to obtain feedback from the labor market (Mihyo, 2006).

Ofojebe, Nwogbo and Nonso (2008) studied internal measures used for quality assurance in public and private universities in the south eastern geopolitical zone of Nigeria. This study established that internal measures for quality assurance were of three broad categories — student intake measures, evaluation of students' learning experience, and teacher quality measures.
Institutional academic reviews are a more recent mechanism for quality in most institutions of higher learning. A study by Materu (2007) in 14 countries across Africa found evidence of institutional academic reviews in less than 20 % of the 52 countries in Sub-Saharan Africa. An academic review provides an opportunity for an institution to: review an academic program or unit's mission and goals; evaluate the quality of the academic program, its faculty and students; establish priorities to develop its curriculum and to improve quality; determine the financial and technical resources required to support the university's and the unit's essential goals and objectives; make recommendations for the action by the program, the administration and others.

1.3 Challenges Facing Internal Quality Assurance in Universities

Inadequate numbers of academic staff with knowledge and experience in conducting self evaluations and peer review; strain on senior academic staff in institutions of higher learning as they have to support both their own internal quality systems as well as external quality assurance processes of their national agencies. This problem exists in virtually all countries even in economically advanced countries like South Africa (Materu, 2007). Assuring the quality of distance learning and new modes of delivery remains a challenge. Although all the agencies reviewed have the responsibility over distance learning, none has yet conducted accreditation in these areas.

To solve the above mentioned challenges, Materu (2007) proposes the following solutions: capacity building efforts should be directed to building a culture of quality within higher education institutions; staff should be trained in self-evaluation and peer reviewing. Involvement of peer reviewers from other institutions within or outside the country in self-assessment exercises; partnership with foreign institutions and quality assurance agencies with sound quality assurance experience can help to supplement local capacity in the short-term and also bring in relevant experience from other regions; technical assistance to develop quality standard especially as regards regulation of e-learning and cross-border delivery of tertiary education since expertise in this area is limited in Africa, external assistance may be required; governments and national agencies are advised to consider reviewing tertiary education funding policies such that allocation of public resources to tertiary institutions is linked to quality factors as a strategy for encouraging institutions to undertake quality improvements.

2.0 Research Design and Methodology

The study applied a descriptive survey design. According to Orodho (2009) a descriptive survey design is a method of gathering data from respondents under settings which have not been controlled or manipulated in any way. This design was suitable for the study since the researcher aimed at gathering respondents' opinions without manipulating any variables by way of experimentation.

The target population was all the 70 public and private universities in the republic. A target population refers to the number of real hypothetical set of people, objects or events to which the researcher wishes to generalize their findings (Borg & Gall, 1989). Out of this population, a total of 21 universities (8 public and 13 private) were purposefully sampled to take part in the study. The latter were more because they are more in the population. This sample represented 30 % of universities in Kenya. On the other hand, respondents were sampled randomly. They comprised of 210 members of university academic staff from various faculties.

The researcher engaged the services of 21 research assistants who were responsible for administering instruments in the sampled institutions. The main research instrument was a questionnaire. According to Bryman (2008) a questionnaire is the most suitable tool to use in circumstances where respondents are scattered in a population and also when there is need to safeguard their anonymity. Since the study involved many respondents from different universities, a questionnaire was perceived to be the most suitable tool to use. The tool had closed ended items which were intended to limit respondents to specific choices that were pre-determined by the researcher.

Before the actual study was conducted, the researcher tested the validity and reliability of the instruments by carrying out a pilot study in one university which was not included in the final study. Validity refers to the extent to which theory and practical evidence supports the interpretation of test scores (Nachmias, 1996). In this study, the researcher validated his research instruments in terms of content and face validity. Validation of questionnaire items was done by seeking expert opinion from two Kenyatta University lecturers namely,Dr. Violet Wawire and Dr. Salome Nyamburawho are specialists in educational research. They advised on the appropriate length of the questions, suitability of language

used and also the comprehensiveness of the content of the questions. The researcher adopted their recommendations to improve the validity of the instruments.

Reliability of the instruments was ascertained during piloting. According to Mugenda and Mugenda (2003), reliability is a measure of the degree to which an instrument used in research gives consistent results after a repeated trial. This exercise involved administering the questionnaires twice within a span of two weeks and doing a correlation of results. Responses given from the two sets of questionnaires were coded and fed into the SPSS version 20 computer software for correlation. Using Pearson's Product Moment formulae, a correlation coefficient was computed in order to establish the degree to which the content of the questionnaire was consistent in eliciting similar results. The instruments were found to be reliable because they yielded a correlation-coefficient of 0.83. According to Gay (2003), when a correlation coefficient of between 0.7 and 0.8 is established, the research instrument is usually considered to be reliable.

Data analysis began by identifying and discarding all incomplete or ambiguous responses. After this, data was grouped according to the study objectives for analysis. Quantitative data from the questionnaire was coded into categories based on the study objectives and fed into SPSS computer software version 20 which analyzed it using percentages and frequencies. Data was presented in frequency tables.

3.0 Findings

The following were the findings, starting with the demographic characteristics of the study participants.

3.1. Demographic information

Table 3.1: Gender of academic staff

GENDER	FREQUENCY	PERCENTAGE
MALE	136	64 %
FEMALE	74	35 %
TOTAL	**210**	**100**

The statistics above show that the study sampled participants from both genders. This was necessary to avoid gender biases.

Table 3.2: Academic rank of respondents

ACADEMIC RANK	FREQUENCY	PERCENTAGE
Professor	6	2.85 %
Associate professor	11	5.23 %
Senior lecturer	62	29.52 %
Lecturer	88	41.90 %
Assistant lecturer/ Tutorial fellow	43	20.47 %
TOTAL	**210**	**100 %**

As presented above, the study had a mix of faculty by rank. This ensured that findings were not biased towards any particular faculty rank.

Table 3.3: Years worked in current work station

YEARS WORKED	FREQUENCY	PERCENTAGE
Below 2 years	38	18.09 %
3 - 5 years	51	24.28 %
Above 6 years	121	57.61 %
TOTAL	**58**	**100 %**

The findings above show that most of the respondents had worked in their current stations for over six years. This means that they had a lot of experience on use of internal measures of quality assurance, hence providing richer information essential for this study.

3.2: Responses of university academic staff on mechanisms of ensuring quality in student intake

Table 3.4: Measures of ensuring quality in student intake

N= 210	FREQUENCY			PERCENTAGE (%)		
Variables	Yes	No	Not sure	Yes	No	Not sure
1. Lecturers are actively involved in constructing pre-entry examinations for prospective students.	2	207	1	0.95	98.57	0.47
2. Lecturers are involved in the moderation of pre-entry examinations.	2	207	1	0.95	98.57	0.47
3. All lecturers in respective departments are involved in invigilating pre-entry examinations.	2	207	1	0.95	98.57	0.47
4. There is provision of adequate examination halls and sitting arrangements during pre-entry exams.	2	207	1	0.95	98.57	0.47
5. Students are thoroughly vetted before sitting for pre-entry examinations in order to avoid impersonation.	2	207	1	0.95	98.57	0.47
6. Preventing pre-entry examination students from entering examination halls with electronic devices e.g. mobile phones, tables and laptops.	2	207	1	0.95	98.57	0.47
7. Vetting application letters to ensure that only students who meet the minimum admission requirements of a course are admitted.	123	76	11	58.57	36.19	5.23
8. Verification of students' KCSE certificates/result slips to ensure authenticity.	115	65	30	54.76	30.95	14.28

3.3 Discussion

Findings show that most universities do not offer pre-entry examinations before students are admitted for various courses. Consequently, it's in few institutions that quality checks associated with this stage are done. Such measures include setting, moderation and invigilating pre-entry examinations, vetting students' identification documents before they sit for pre-entry exams, providing adequate sitting space when students sit for pre-entry examinations, preventing students from entering examination halls with electronic devices etc. This implies that in circumstances where students cheat in national examinations such as Kenya Certificate of Secondary Education (KCSE) and eventually qualify for university, such students will end up pursuing courses which they are not qualified to undertake in the first place. Besides this, the study established that 58.57 % of respondents said that they usually vet application letters of prospective students in order to ensure that only qualified students are admitted. However, the fact that slightly over a third of respondents said that this is not usually done raises a number of questions on quality assurance at this stage. Related to this, 54.76 % of respondents said that KCSE certificates/result slips of prospective students are thoroughly scrutinized to ensure that they are authentic. However, 30.95 % said that this is not done in their institutions. This breach opens the window for unscrupulous people to enroll in these institutions and subsequently water down quality.

3.3. Responses of university academic staff on measures of ensuring quality in evaluation of students' learning experiences

Table 3.5: Measures of ensuring quality in evaluation of student learning

N= 210	FREQUENCY			PERCENTAGE (%)		
Variables	Yes	No	Not sure	Yes	No	Not sure
1. Communicating assessment criteria to students at the start of every course.	168	32	10	80	15.23	4.76
2. Providing students with opportunities to evaluate	168	32	10	80	15.23	4.76

	learning experiences at the end of every semester.						
3.	Administration of take home assignments to students.	152	36	22	72.38	17.14	10.47
4.	Administration of tests to students.	152	36	22	72.38	17.14	10.47
5.	Administering group assignments to students.	147	42	21	70	20	10
6.	Ensuring that there is appropriate match between learning objectives and various assessment techniques.	136	23	51	64.76	10.95	24.28
7.	Provision of immediate feedback on assessments given to students.	76	132	2	36.19	62.85	0.95
8.	Revising with students returned assignment scripts before sitting for end of semester examinations.	71	125	14	33.80	59.52	6.66
9.	Making provision for students to peer evaluate their learning experiences.	12	136	62	5.71	64.76	29.52
10.	Making provision for students to evaluate their own learning experiences (self evaluation).	16	164	30	7.61	78.09	14.28
11.	Providing enough invigilators when administering end of semester examinations.	86	96	28	40.95	45.71	13.33
12.	Vetting identification documents (student ID, national ID, examination card) before students are allowed to sit for end of semester examinations in order to stamp out cases of impersonation.	86	96	28	40.95	45.71	13.33

3.4 Discussion

The study established that there exist various internal measures used to ensure that there is quality in the evaluation of students' learning experiences. In more than three quarters of the institutions, students are usually familiarized with the assessment criteria of each course at the start of every semester. This is important as it makes them prepared for learning. It was in only few institutions that this was not done. At the end of every semester, a majority of students are given an opportunity to evaluate the learning experiences they had with lecturers. This provides timely feedback to lecturers and subsequently helps them enhance the quality of their teaching. In spite of this, a small percentage said that this is not regularly done in their institutions whereas 4.76 % gave a not sure response. Almost three quarters of respondents said that take home assignments are administered in order to give students an opportunity to do library research and therefore grasp the course content better. Less than a quarter gave a contrary opinion whereas a very small percentage was not sure about this. Similar results were replicated with regard to administration of tests. Group assignments provide an opportunity for students to exchange academic ideas and therefore enrich their knowledge. Because of this, 70 % of respondents said that this is regularly done during teaching whereas slightly below a quarter of respondents gave a contrary opinion. Those who were not sure were also very few. Almost two thirds of respondents said that there is an appropriate match between learning objectives and various assessment techniques. This is good in quality teaching and learning because it ensures that there is fair assessment of students. Small percentages either gave contrary opinions or were no sure. Provision of immediate feedback is crucial in quality learning. Almost two thirds said that this was not regularly done in their institutions whereas 36.19 % said that it is usually done. Very few were not sure on this. In most of the institutions, lecturers do not revise marked assignment scripts with students. This means that students sit for end of semester examinations without knowledge of how they scored in their assignments, something that affects the quality of course content mastery. It was a paltry 33.80 % of participants that said that such revision is done whereas less than ten percent were not sure. Peer evaluation as a strategy of providing students with an opportunity to gauge how well their peers have understood course content is not adequately applied in most institutions. This affects the quality of teaching and learning negatively. The same case applies to self evaluation. The study found out that most lecturers do not provide students with an opportunity to evaluate their own learning experiences, hence denying individual students an

opportunity to seek help in areas of weakness. It was less than 10 % of lecturers who regularly did this when teaching whereas 14.28 % were not sure. Provision of enough invigilators in examination halls is a quality check that guards against cheating. However, the study established that this was only taken seriously in less than half of the institutions surveyed. The same applies to vetting of students' identification documents before they are allowed to sit for end of semester examinations (student ID, examination cards, national ID). Only 40.95 % of respondents affirmed that these documents are thoroughly verified whereas 45.71 % disagreed — an implication that in some institutions cases of impersonation may go on unnoticed since examinees are not thoroughly vetted before being allowed into examination halls.

3.5 Responses of university academic staff on measures of ensuring lecturers' quality

Table 3.6: Measures of ensuring quality in lecturer quality

N= 210	FREQUENCY			PERCENTAGE (%)		
Variables	Agree	Disagree	Not sure	Agree	Disagree	Not sure
1. Subjecting applicants to oral interviews before they are appointed as members of academic staff.	148	36	26	70.47	17.14	12.38
2. Subjecting applicants to written interviews before being appointed as members of academic staff.	26	137	47	12.38	65.23	22.38
3. Orienting new members of academic staff before they formally start work.	160	23	27	76.19	10.95	12.85
4. Encouraging lecturers to regularly carry out research.	160	27	23	76.19	12.85	10.95
5. Offering research grants to lecturers to carry out research.	76	111	23	36.19	52.85	10.95
6. Sponsoring lecturers to attend seminars/conferences locally and internationally.	72	109	29	34.28	51.90	13.80
7. Supporting lecturers financially to publish their researches.	59	22	129	28.09	10.47	61.42
8. Providing in service and capacity building training in pedagogy to lecturers.	59	22	129	28.09	10.47	61.42
9. Creating avenues for peer review of teaching effectiveness.	62	132	16	29.52	62.85	7.6
10. Making provisions for students to evaluate the teaching effectiveness of lecturers.	113	61	36	53.80	29.04	17.14
11. Analyzing and communicating the outcome of students' evaluation of teaching effectiveness to lecturers.	102	96	12	48.57	45.71	5.71
12. Using feedback on students' evaluation of lecturers' effectiveness to organize for capacity building workshops to address areas of weakness.	83	86	41	39.52	40.95	19.52

3.6 Discussion

The study established that there existed various internal measures of ensuring lecturer quality. A majority of respondents affirmed that before one is hired as a member of teaching staff, an applicant is first subjected to an oral interview to interrogate their academic qualifications, work experience and personal attributes. However, when it comes to subjecting interviewees to written interviews, two thirds of respondents said that this is not commonplace in their institutions whereas almost a quarter of them gave a not sure response. For quality purposes, it's good to subject interviewees to both types of

interviews. Slightly over three quarters of respondents said that newly recruited members of academic staff are taken through an orientation process before they formally start work. This is good for quality purposes as it makes them familiar with the curriculum, course syllabus, and even the nature of the administrative hierarchy of an institution. Besides this, it was established that this measure is not observed in some institutions — a breach of quality assurance. Similar results were replicated when it came to encouraging members of academic staff to regularly carry out research. Research is crucial in quality higher education as it ensures that lectures have current knowledge in their disciplines. The study established that most institutions do not offer grants to academic staff in order to enable them carry out research. This affects quality negatively. When it comes to giving financial support to lecturers for them to publish research findings, a majority said that this is not done in their respective institutions, something that affects quality negatively. It was in few institutions (34.28 %) that this was regularly done. Few institutions provide in-service and capacity building courses in pedagogy to lecturers. This implies that some lecturers may not be at par with others as regards to instructional pedagogy, something that raises a number of questions on quality assurance in these institutions. The same was also echoed with regard to providing avenues for peer review of teaching effectiveness. On the other hand, the study established that slightly more than half of respondents said that students are given an opportunity to evaluate the teaching effectiveness of their lecturers at the end of every semester. This is important as it gives feedback to universities' internal quality assurance departments for necessary action. However, the fact that almost a third of respondents gave contrary opinion means that this is not regularly done in some institutions, hence affecting quality assurance negatively. After students assess their lecturers, it is important for this information to be analyzed and be communicated to individual lecturers so as to ensure that they make any necessary improvements. Slightly less than half of respondents said that this is done in their institutions whereas 45 % gave a contrary opinion. Failure to communicate this feedback to individual lecturers affects quality negatively since areas of weakness can't be rectified. Lastly, 39.52 % said that feedback on students' evaluation of lecturers' effectiveness is used to organize for capacity building courses for lecturers whereas 40.95 % disagreed. These findings generally imply that in some institutions, internal quality assurance processes are not conclusive.

4.0 Conclusion

Although internal quality assurance mechanisms exist in universities, most of them are flawed. In student intake for instance, it is quite baffling that in some universities students are issued with admission letters without first of all vetting their qualification certificates. This implies that at times unqualified students may gain entry into these institutions, hence watering down quality. The fact that pre-entry examinations are not mandatory in almost all the institutions studied means that in instances where students cheat in form four examinations and eventually attain the minimum university entry grades, these people end up studying courses they are not qualified to undertake in the first place. Things are not any better in other stages of quality assurance such as evaluation of students' learning experiences and teaching staff's quality. In some universities, once students evaluate their lecturers at the end of the semester, the matter ends there. The reports are not analyzed and feedback communicated to individual lecturers. Besides this, few institutions use feedback generated from these reports to organize capacity building workshops for lecturers. Lastly, in staff recruitment, the study found that in some universities, new recruits are not subjected to an elaborate orientation process in order to familiarize themselves with syllabi for various courses, the curriculum and even the administrative structures of the individual universities. These flaws affect the quality of education offered in these institutions. The following section provides an escape route by suggesting workable recommendations that can help address this problem.

5.0 Recommendations

Based on the study findings, the researcher makes the following recommendations:

i. All universities should subject prospective students to a uniform pre-entry examination before they are formally admitted.
ii. Members of university staff in charge of student admission should thoroughly vet and authenticate certificates of prospective students by confirming their authenticity from the issuing institutions.
iii. Reports generated from students' evaluation of lecturers should be analyzed thoroughly and be used to organize for capacity building courses for individual lecturers.
iv. Internal quality assurance departments in universities should be strengthened with more qualified staff and equipment.
v. Internal quality assurance departments in universities should be inspected regularly by the Commission of University Education and other relevant regulatory bodies to ensure that they are on track.
vi. Legal and administrative actions should be taken against institutions that flout internal quality assurance mechanisms.
vii. Capitation directed towards internal quality assurance in universities should be increased.
viii. New members of academic staff should be oriented before they formally start teaching.

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Income Generation of University Libraries in Kenya: Trends, Lessons and Opportunities in Sustainable Development Education

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Abstract

Sustainability has been elevated from doing to the level of being; involving mission, vision andshared values. The shared values are the Triple, Bottom down approach which is the global agenda. The practice of education for sustainable development (ESD) is diverse and involves pillars, social, economic and environmental. This study seeks to address the economic pillar in the higher education setting, mainly university libraries as its main objective, since higher education is now the change agent for sustainability. The study has used system theory and stakeholder theories using survey design involving, trends from global perspective in knowledge creation, mainly sustainability curriculum as in Sweden and Australia higher education as well as California in the United States of America (USA). Further mention was in the United Kingdom (U.K) and Turkish foundation universities, Malaysia Waqf Universities and the entrepreneurial mindset of the Pakistan higher education. The various hurdles in funding university higher education and libraries mainly on policies and decision is given, like in Nigeria Universities and Jordan Universities and Zambia just like positive examples in Ghana, Botswana, Uganda (Makerere) and Malawi. The study has recommended various sources of income generation for university libraries and adoption of models as in Malawi, during 2008/2009 and 2009/2010, the library raised 7.2% and 5.4% of their income respectively and other innovative models as undertaken by the University of Botswana in Africa besides lessons of innovative models at New Jersey state universities among other global sustainability curriculum trends as in Sweden and Australian Higher Education which can be adapted for university libraries as in Kenya.

Key Words: *Income Generation, Sustainable Development Education, University Libraries*

1.0 Introduction

The library, the staff and a group of students are the three distinguishing marks of a university. Central of the above is the library. A university wherever established is an institution engaged in transmitting and expanding knowledge. The repository of the knowledge is the library. The library is the central organ of a university and this together with good laboratories and faculty are the parameters used to judge a good university (Karbo, 2002) Further, the major aim of the academic library is to support teaching, training and research activities by providing adequate, relevant and materials up to date book and non-book materials to its clientele. Teaching methods in the university vary apart from the normal lecture method they also include tutorials, seminars, workshops, long essays and research (ibid).

In the academic arena, academic libraries have been considered as the most important organ of a university of academic institution. For instance according to C.I.N, (2014) in Nigeria, it was found other education in Nigeria is facing a critical challenge in meeting new demands for the 21st century, with its ever increasing population growth, inadequate library facilities, resource and insufficient funding. Academic libraries and poor funded and this had affected the way libraries offer their services to their users. To this end, libraries have responded to this problem by introducing fee based library and information services (CLN, 2014), CLN (2014). Academic libraries are an integral part of any university system and are established to support activities of learning, teaching and research (Zaid, 2008). Further according to Zaid (2008) libraries in the 21st century have been put under pressure to justify their existence and provide improved, innovative and dynamic services. However, no library has been put

under pressure to justify their existence and provide such services in the face of dwindling financial trend. This paper reveals that academic libraries are underfunded and to this end librarians need to come up with income generating activities in the academic libraries that will make the library service efficient. (Ibid)

Education and sustainable development have gone hand in hand in many aspects. Education influences on sustainability have considered practical citizenship, involvement, commitment, values, clarification, equity based, scientific as well as, rational and abstract – based ideas. Learning therefore has involved capacity building, processes oriented, conscientisation in adult education, children to children amid mutual liberation. In general education, it has involved all years of schooling in awareness, opportunities and responsible patterns of behaviour as evidenced in curriculum council of Wales in Europe (Sterling and Huckle, 2008). Similarly, measuring sustainability on the other hand has involved learning from doing. However, it may include external control measures in quality since lifelong learning is learning to do, learning to know, learning to be and learning to live together (Blewitt and Cullingford, 2004).

Education for sustainable development is therefore the future we want that ought to be substantiated by a combination of elements such as: suitable financial resources; better coordination systems with clear indicators and deliverables that may allow progress to be monitored and addressed, a strong emphasis on best practice that may be replicable and a stronger involvement of the higher education community that may initiate a chain reaction that improves Education for Sustainable Development (ESD) provision in formal, non-formal and informal settings (Walter, Evangelos and Paul, 2014).

1.1 The problem and justification

Academic libraries do consume a substantial amount of their institutions resources such as space, lighting, staff, equipment, books and periodicals. In essence, academic library has to compete internally for funds with other college or university functionaries, while the financial position of most African university libraries are uncertain since most are funded on the basis of percentage of the institutional expenditure (Karbo, 2002). In addition, central grants are rarely known well in advance and library budgets are sometimes in gesticulated until after the academic year has begun (Ibid).

Finance is needed for the cost of materials and equipment, cost of installing and maintaining the new technologies and also the provision of suitable physical infrastructure to house these technologies. In essence then African university libraries must aim to generate income so as to supplement their central income to participate in income generating activities for the good of their parent institutions (Karbo, 2002).

In china budgetary constraints for the purchase of foreign language books had forced many Chinese libraries to rely on donations and the challenge with donations is that the beneficiary institution does not get exactly what it wants and at the line when it needs it (Wang 2011).

Whoever in Nigeria and many African countries, there seems to be little funding and budget dedicated to digitization projects of the library among others. (Basil and Elvis 2009). In the case of Nigeria for instance, about 67.5% respondents mainly library professionals and para-professionals had claimed that there is support from the government/university management. However, from interaction with respondents, the extent to which support had been given was minimal. The Nigerian government seemed then to be less concerned about the state of affairs in the university libraries; hence they did not provide adequate support and was also same with the university management. They did not attach much importance to the library especially since the library was seen not to be a profit making unit (Ibid).

Library activities do get affected due to lack of funds. For instance in purchase of books, subscription to print and electronic journals, book binding and repair as well as staff training in Malawi the impact resulted on the institution relying on book donation more than purchases just like in Project training (donation) like purchase of equipment and computers meaning that there is a link between inadequate funding and heavy reliance donor assistance (Cheputula and Boadi (2010).

In Kenya the lack of reliable financial support seemed to be creating an ever widening challenge to the realization in the university libraries as there is the depreciating ability of the libraries to acquire the declared intentions of the parent universities which affect the quality of leading learning and research in the universities. Similarly, the quality of the products of the universities, both in terms of human resources and literary output also stands the danger of being evenly impaired. (Boadi, 2006). However, increase income generation activities in libraries in Kenya was evident in private universities as they were far in the collection development budgets since they had adequate funds and it was possible to procure the required information resources. In the same manner libraries were also to do a number of collection development activities such as conducting user needs analysis, evaluating the collection, preservation and even weeding it (Kasalu and Ojiambo, 2012). There still stands a bigger challenge in the public universities in Africa and in Kenya and this study is timely to open up the debate so that university libraries provide more income to the university and also library.

1.2 Objective of the study

The objective of the study was to determine income generation of university libraries by examining trends, lessons and opportunities as it applies to sustainable development education

1.3 Theories of the study

Stakeholder theory;this theory was applied in the early period classical business thinkers mainly Henry Gantt (1919), Mary Parker Foiler (1924) and Chester Barnard (1938) had used the term stakeholder to refer to multiple constituent groups served by organizations. Stakeholder was term used formally by Standard Research Institute (SRI) in 1963 as those groups without whose support the organization would ease to exist which was also cited by Freeman 1984:31. Freeman in 1984 gave a formal conceptualization of the term stakeholder which then was gaining ground in both the academic and the managerial communities and laying the foundation for stakeholder theory (Duff, dale, Mario, Stephic and Celine (2013) Friedman in 1970 had the view that there exists a negative relationship between social and financial performance and that firms perform responsibility incur a competitive disadvantage. Friedman and other neoclassical economists argument is that there is few readily measurable economic benefits to socially responsible behaviour, while there are also numerous costs; and the costs on their argument fall directly to the bottom line, reducing profits or returns to the owners and their wealth. In higher education the corporate social responsibility variables have included organizational governance, human rights labour practices, the environment, fair operating practices, consumer (students) issues as well as community involvement and development, Mehran et al (2010), similarly in knowledge partnership in education it has also been used. (Robert, 2009:51)

System and institutional theory; wealth creation in societies is based on social finance with theoretical framework of institutional analysis and development (IAD) which is a useful tool in the public domain where shared resources are involved; since businesses and communities have a mutual interest in the commons and there common-pool resources that concern people everywhere since their welfare is at stake and because people gather together to protect their interests, institutions of every shade and shape are formed, encompassing at one time or another families voluntary associations, businesses, street gangs, elite groups, government departments, labour unions, churches, synagogues and mosques. In any

organization rules are critical and indeed for some IAD theorists that constitute the very meaning of institutions (Suber, 2007, Jones, 2010).

2.0 Design and Materials

He study adopted survey design involving six (6) global regions as its population on strategies adapted in income generation for libraries. Survey design was appropriate because of the research and the ethical concerns that needed to be brought out and its validity, rather than other approaches that may be used (Sapsford, 2004).

Validity and reliability of the study has been based on content, criterion as well as contrust. Content validity must be present before criterion related validity established. Construct validity is based on data used in establishing both contents and criterion relation validity. Content validity assumes that the differences in test performance reflect individual differences in the contrast being measured, which is an element of construct validity, however criterion related validity is meaningless if it is not based on construst validity, hence the three are related (Best and Kann, 2004).

3.0 Results and Discussions

Libraries are non-profit organizations and there mission is to provide service to users (Ajegbomogun, 2010). However, emptiness of the library shelves and dilapidated structures, coupled with obsolete materials and the disappearance of valuable materials from the shelves has led to reduction of library services. In addition, libraries should start generating funds in order to provide adequate services to users. Funding in academic libraries relies heavily on the parent universities; have universities rely on the support of the government, donors, school fees and income generating activities. For effective services in the academic libraries it is important to consider adequate funding for the libraries by the parent universities. There are other ways that libraries can get funds from within the institutions. These funding methods would be the services, typing book sales, binding services fines and over dues on library items. Okiy, (2005), states other alternative income generation sources of libraries as setting up a contract library – where a university library runs a smaller public library, renting conference halls, selling withdrawn books and using friends of the library and alumni associations in marketing endeavours. The importance of funding in providing quality library service cannot be overemphasized. It is the glue that holds the building, collection and staff together and also it allows the library to attain its goals. In a much as money cannot be considered the soul of the library, inadequate funds will impede the effectiveness of libraries (Ibid).

Essentially it is important for a library to possess the resources that will enable it to meet its goals. Beautiful building, trained staff and modern information storage and retrieval systems can only be appreciated if excellent services are rendered to users. These services cannot be provided without adequate finances (Ubogu & Okiy, 2011). The amount of funds that libraries receive will directly influence the quality of the services offered (Ubogu & Okiy, 2011). A study done by (Ajebomogun, 2010) on Nigeria University Libraries showed that the government is not sensitive to the information needs of the society and that the alternative to these problems of under-funding is to explore other means of providing quality information." The importance of funding in providing excellent library service is the glue that holds the building collections and staff together and allows the library to attain its goals. As such, money can be considered the soul of the library (Okiy, 2015).

Financing of libraries is important in public and private universities. In the words of Akporhonor, (2005), every library is supported by three legs a building, its collections, and the staff. However, the tendons supporting these legs, ad what ultimately binds them together, is money. Finance is at the head of any enterprise and if the library is to meet its objectives, money is a necessity. When funds are lacking it is

difficult to organize library services then the efficiency of services will be found to be adversely affected (Ibid).
Globally countries like in the United Kingdom (UK) and the United States of America (U.S.A) financing of libraries is the pre-dominance for public funding in both USA and UK. For instance, 9% of the total funding for libraries comes from secondary sources other than public coffers and the proportion of fundraising has risen from 6% of the total funding in 1990s to about 10% percent in the 2000 meaning there is great shift towards fundraising in libraries (Leach, 2006).

Income generation for libraries can also be in the form of fund-raising. This is practiced in Europe and America and rarely in Africa (Burlingame 1994, Cohen 1999). In America for instance, Olin library at Rollins College, Florida has maintained a 60,000 a year fund for nearly 50 years. The fund is maintained cooperatively by the library and the development office of the college and has been very successful as a development tool. Fundraising can also be done through alumni, the local community and through foundations (Ibid).
In developing countries like Pakistan government sector librarieshave been affected based on the poor economic factors; lack of governor interest in library developed governor interest in library resulting in inadequate and poor collection; cancellation of periodical subscription; staff cuts; poor standards of services among other issues (Manhood, 2005).

In addition alternative funding exists in Pakistanand Malaysia that included international organizations, foundations as well as the individuals (Ibid). While in Jordanian Universities mainly public universities (not for profit organizations) financial resources are limited for instance in Jordan Public Universities could not expand as quickly as private universities would do (Issa, 2000). In addition while each year over 50,000 Jordanian students would qualify for university admission, the public universities would only absorb around helpful this has been common to most developing countries students where the surplus join private universities or go out of the country. This is also common in Turkey where they use Turkish Foundations and in Malaysia, Wagf or foundations and endowments (Ibid).
In West Africa, new forms of income generating for libraries have included, fund-raising could be a source of income from the prominent members of the community, the business and private sectors, professional associations and societies, foundations and organizations.

Foundations and endowment funds that have also been used as a fundraising method in Ghana universities endowment fund was launched in Accra, due to serious degradation that Ghana universities have continued to face. Endowment funds in Ghana have included the Otumfuo Education Fund and the Ghana Education Trust Fund. Similarly, in Botswana foundations have also been launched (Boadi, 2001) besides consultancies and information brokerage and various forums of fundraising. (Ibid)
In southern Africa especially in Botswana the budget allocation for the universities library in the 2004/2005 academic year was about 6.6 percent of the total recurrent budget for the university. The university of Botswana library would proudly boast to being one of the most developed and modern university libraries in Africa with human and material resources that match some of the better university libraries in the developed countries (Boadi 2006, Department of institutional planning (2004).
In Africa, sound financial back-up or management has been at the Botswana Colleges of Education Libraries especially from the Alumni Association of the University of Botswana, for instance, helped in raising funds for the construction of a student's hostel in 1991 to alleviate the acute shortage of students housing at that time. Similarly, Alumni Association of the University of Ghana raised funds towards the construction of residence halls at the university (Chaputula, 2011), Mapulanga (2011). In addition Income generation can also be through the formation of friends of the library and the adaptation periodicals for absorption as well as holding of special events for instance exhibitions that could be used as fundraising

methods. Further operational income activities were from overdue fines, photocopy charges, lost book replacement fines among others, while income generating activities came from endowments consultancies among others. Similarly, underfunding for university library has been evident at the University of Zambia Medical Library (Ibid).

In many other African countries is suggested that income generating activities may involve, offering of professional information or advice or actually performing specified jobs for clients. Areas of great need of consultancy services would be information management, information technology, importations, archives and records management, research and data analysis, legal information, establishment of libraries/documentation centres and training of library and information personnel. (Boadi, 2006). In addition charges for certain services such as incurrent awareness services and literature searches, the sales of special publications and bulletin information can also be sold to supplement the dwindling funding being received from the national governments and parent institutions, otherwise referred to as information consultancy and brokerage (Ocholla, 1998).

In essence information consultancy services may entail, advising a client on matters within the expertise of the consultant, besides developing new skills or knowledge on behalf of a client, receiving and evaluating technologies on behalf of a client as well as performing specific professional tasks based on a consultant's specialized knowledge that may include Including staff selection, education and development (Ocholla, 1999).
Globally alternative funding for libraries have included: taxation at the local, provincial or central government level, besides donations, revenue from commercial activities, user fees and charges for services, sponsorship and lottery funds (Leach, 2006). This has resulted in the inadequate funding has negatively affected purchase of books, subscription of print and electronic journals, book binding and repair, staff training. Besides unreliable internet connectivity which is also a major challenge, and back of property trained staff which faces also the universities (Chaputula, 2006).
In Malawi reduction in funding was due to: general economic recession, growing population, debt burden statistical adjustment policies while in Zambia there has been an increase in fund raising for libraries and donor support for libraries has shifted from collection development towards facilities, technological improvements, researched book collection awards, collection endowments, also class reunion gifts. (Denver, 2006)

Globally innovative funding for libraries has been from innovation technology projects, extension of library hours, facilities improvements and fundraising for publicity. However, other resource of income for the library globally is the internet. Information users through the internet access in the library can take steps to satisfy the demand through internet provision (Dewan, 2012; Olorusola and Adeleke, 2011), besides collection development activities like book binding and repair; weeding the collection at a fee to users and instructions (Ibid). Similarly, there is need to fund academic libraries due to growing lack of donor interests, rising cost of technology, limited support from parent institutions, dwindling levels of funding and rising cost of library materials.

In Africa, innovative income for libraries is required due to changes in the economy that have necessitated that libraries try; fee-based services such as photocopying, inter loans, abstracting, training in online information services, printing, lamination also, desktop publishing (Okojie, 2010). Similarly, besides, employing of professional fundraiser (Reid, 2010), as well as donor fundraising by endowments (Foley, 2005). This has been possible since libraries can be funded overtime and sometimes through their estates, thereby giving the library a long term benefit and also that endowment grow over time, whereas a direct gift for construction or equipment depreciates with time. (Ibid)

Successful case is in Malawi, University of Malawi College Libraries (UNIMA) income generation has been through photocopying, internet fees, overdue fines, external membership fees, loaning out of library equipment, revenue fees for organizing workshops and seminars Chaptula, (2011).

In addition fund raising has been common in government funded libraries besides other income generating activities like overdue fines, missing or lost book files, lost borrower's cards, photocopying service charges, gift private contributions endowments among others. For instance in Malawi, Bunda College Library contributed 21% of the of total income, Chancellor College library 31% of total table, Kamuzu College of Nursing library 23.2% of total income, Polytechnic Library 3% of the total income. Fundraising for UNIMA Libraries has also been common. Fundraising should be advanced to support the strategic vision for the library and learning resources, advance project for which there is no internal funding and develop valuable partnerships on a local national or international scale (Ibid).

For many years in Malawi fundraising and donations reserve Bank of Malawi, World Vision International and American Embassy that would donate computers besides others that included Malawi millennium project, Book Aid International mainly for books and computers. However, other donors have been Rockefeller Foundation, Malawi Government, Sector Wide Approach (SWAP), Donor agencies (NORP, WHO), International Association of Aquatic and Marine Science Libraries and Information Centres (IAMSL), Carter foundation of the USA and University of Michigan besides the introduction of post graduate fee of US$ 100 to post graduate students Chaptula, (2014). In addition a study on private universities; University of Livingstone and Adventist University had indicated that they were funded by the parent university; implying donors were a major source of funding for the institutions (Ibid).

Still in Malawi better funded libraries Kamuzu College of Nursing Library and Mzuzu University Library were better funded. However, the problem of underfunding existed both in public and private university libraries in Malawi. Chaputula, (2014). In other countries of Africa, Nigeria and Uganda especially at Makerere University operational income for the library would come from overdue fines, photocopy charges, lost book replacement, fines, endorsers and consultants (Ackporhonor, 2005, Mugasha 2001).

In Kenya, Kasalu and Ojiambo, 2012 found that majority of private university libraries in Kenya were faring far much better in terms of funding when compared to other public libraries in the African region, which had made it possible for them to procure requisite information resources.

4.0 Recommendations and suggestions

The future of African libraries and librarians in transition is for them to have managerial abilities and skills in order to move from traditional counter-oriented to value driven organizations, which will be causing creativity flexible and visionary librarians who can then function well in a multi-dimension environment without the assistance of tired and virtue methods (Largill and Webb, 1988, Kargo) 2002. It therefore means that the new African University Librarians will not only work with their colleagues in their libraries through cooperative ventures, but will have the courage to take risks, since their visions and values will be prone to constant tests also they will have to enter into partnerships with private enterprises to acquire financial and moral support to sustain their system (Kargo, 2002).

Further, adequate funding should be budgeted and also released to the libraries without bias. However, libraries philanthropists, organizations and donor agencies for digitization projects among other library functions of should be emerging services that would generate revenue (Basil and Elvis 2009).

In addition there is need for inclusion of funding-raising and income generating activities in the teaching curricula of schools and this would help to bring to the attention of future librarians issues such a s the necessity for the supplementation budgetary allocations on accounting of their increasing inadequacy, the philosophy and the increasing strategies for identification, cultivation and solicitation of potential funding sources and the role of effective communication in fund-raising activities. For instance, courses like infoprenuership are being taught in the department of library and information studies at the University of Botswana Gaborone (Boadi, 2006). The future then of practicing librarians should focus on non-formal and continuing education on planned conference workshops and seminars on the subject by the various national library associations as a way of focusing the attention of the profession to the whole question of inadequate and ever-dwindling financial support for libraries and search for possible solutions to this problematic and this has happened in the conference on Lesotho 1996, Kenya 1998 and Namibia among others (Shosenberg, 2001, Boadi 2006). There is also need for consortia networking and the various aspects of resource sharing as an income-generating activity among other strategies to this venture. Further research should be on specific income-generating activities in the Kenyan public universities libraries in place in the growing global trends.

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Impact of Research on Higher Education in Kenya

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Abstract

Research is one of the three main goals of higher education, the others being production of highly skilled manpower and community service. In spite of this fact, little is known on the significance of this goal on the very institutions where it takes place. Consequently, it was this paucity that motivated this study as it sought to investigate the impact of research on higher education in Kenya. Its specific objectives were to: investigate how research impacts on the quality of teaching-learning activities in institutions of higher learning in Kenya; explore how research impacts on collaboration and knowledge sharing among researchers in institutions of higher learning in Kenya; describe how research impacts on production of current knowledge in institutions of higher learning in Kenya. The study applied a descriptive survey design. The target population was all the 70 public and private universities in the republic. Out of this population, a total of 21 universities were purposefully sampled. On the other hand, respondents were sampled randomly. They comprised of 1883 university students. The researcher engaged the services of 21 research assistants who were responsible for administering instruments in the sampled institutions. The main research instrument was a questionnaire. Quantitative data from the questionnaire was coded into categories based on the study objectives and fed into SPSS computer software version 20 which analyzed it using percentages and frequencies. Data was presented in frequency tables. Key findings: Research enables instructors to acquire new knowledge on how to teach using better instructional strategies, know the effectiveness of their teaching as well as enable students learn better and understand course content. On collaboration, research activities enable students and lecturers to exchange ideas with other researchers outside their classrooms and consequently understand realities better. Besides this, research plays a crucial role in knowledge production. A majority of respondents agreed that research helps lecturers keep in touch with current trends in their disciplines, help students acquire current knowledge in the courses they undertake, enables students and lecturers identify and correct mistakes made in prior studies. The study recommends that government capitation of research funds to public universities should be increased, universities should create more income generating activities to raise capital for supporting research and members of university academic staff should be supported to attend international research conferences.

Key Words: *Collaboration, New Knowledge, Research, Teaching-Learning*

1.0 Introduction

Research has a significant role in expanding human knowledge and also to find answers to the persisting problems that face humanity. Consequently, a direct relationship should be found between analytical modern education and research and should not be taken into account as separate matters but rather related domains in the process of learning and construction of knowledge. It was with this understanding therefore that this study sought to investigate the impact of research on institutions of higher learning, with a key interest on universities. This was guided by the objectives below.

1.1 Objectives

The objectives of this study were to:

1. Investigate how research impacts on the quality of teaching-learning activities in institutions of higher learning in Kenya.
2. Explore how research impacts on collaboration and knowledge sharing among researchers in institutions of higher learning in Kenya.
3. Describe how research impacts on production of current knowledge in institutions of higher learning in Kenya.

2.0 Research and the Teaching-Learning Process

According to Grous and Cabulla (2000), the teaching effectiveness of lecturers is influenced by the methodology that they employ along with the knowledge and perceptions that they have. Research is a good way through which lecturers can get a deeper insight on the knowledge in their respective academic fields. The current study filled a gap left by Grous and Cabulla who do not provide empirical data on how research impacts the teaching-learning process.

Research evidence shows that the nexus between research and teaching is strongly significant and helpful to students. According to Jenkins (2000), students learn more and better when they are engaged actively with the didactical material that they are studying. They tend to carry out higher academic tasks when they are allowed to work together in research activities than when they are asked to work individually.

Combining educational research with teaching creates a linear nexus between practice materials and research. According to Jenkins (2000) studies provide a wide ranging proof that research has an influence on individual educators and on their teaching activities in such a way that the significance of such direct linkages between educators and research cannot be ignored. Effective and collaborative communication, knowledge sharing, and interaction between practitioners and researchers and lecturers can be considered to be the significant products of this direct relationship.

Besides this, research output can be used as an instrument of improving the process of transferring new research findings which is a key ingredient of quality teaching. Modern modes of delivery of higher education such as e-learning are good examples of recent findings that support the recent methodologies of instruction that are a result of a number of studies aiming at improving the quality of the teaching process (Mora, 2011). In spite of this, Jenkins and Mora do not base their arguments on empirical data — a gap addressed by the current study.

3.0 Research And Collaboration In Knowledge Sharing

Creation of knowledge within a new learning environment is based on collaboration and expertise sharing. When teaching and research are joined with collaboration, sharing of knowledge happens. Faculty share the last discovered knowledge and make a connection with the student and eventually the students get an opportunity to learn about the latest realities of the phenomenon. Collaborative learning offer students an opportunity to collect, compile, analyze, and evaluate information cooperatively (Gokhale, 1995). Since Gokhale doesn't give empirical evidence to support their argument, the current study emerged to address this gap.

A study by Abbasy, Mprera and Burgos (2010) established that 95% of respondents agreed that research has a direct and effective impact on teaching, learning and knowledge sharing.

Seaberg (1998) used the amount of time teachers spend on their work to explore the importance of teaching and research. The study established that 65% of teachers who worked in graduate school pointed out that the time they spend on teaching and service is longer than on research. The time spent on research came last and it was usually additional work besides teaching and service. Seipel (2003) also found that teaching and service were the main roles of professors and research work was ranked third. However, these two studies didn't focus on the impact of research on higher education — a gap addressed by the current study.

4.0 Research And Current Knowledge

Members of academic staff in institutions of higher learning need to be up to date in their teaching fields. There are a number of ways through which they can achieve this goal. According to Newman (1994) use of research activities among students as a way of instruction made students perceive their courses to be up to date and also gave them an opportunity to see their teachers as real people and to be able to glimpse at what they do, how and why. The current study provides empirical findings that could perhaps strengthen Newman's argument.

A study by Abbasy, Mprera and Burgos (2010) established that a majority of student respondents agreed that researching increases new questions and scientific knowledge hence increasing lecturer knowledge. Besides, 80 % of instructors who took part in this study agreed that research in their didactical materials helps them to keep up to date. On the same note, the study revealed that research enables instructors to acquire essential knowledge for institutional decision making.

Du (2002) argues that the duties of teachers in higher education include teaching, research and administrative service. Besides delivering knowledge, professors need to do research and provide service to produce and share professional knowledge. They need to produce products of their research, connect the research results of their teaching, and offer professional service to society. Empirical data from the current study is likely to strengthen Du's argument.

According to Iqbal and Mahmood (2011), universities are considered as producers of new knowledge. These institutions are considered to be modern entrepreneur engines and generators of knowledge through research. Professors' involvement in research activities always supports teaching. Participation in research polishes their thinking and creative abilities. Writing research papers enables university teachers to quickly understand the originality and quality of research work. However, unlike the current study, Iqbal and Mahmood's study is not empirical.

Research is required for the improvement of general knowledge, enables academicians to understand their own selves and analyze their own abilities. Research also enables academicians to fully understand their disciplines. This is supported by Rashid (2001) who argues that research corrects mistakes, and advances knowledge in a discipline. Since Rashid doesn't back his argument with empirical data, the current study emerged to address this gap.

5.0 Research Design And Methodology

The study applied a descriptive survey design. According to Orodho (2009) a descriptive survey design is a method of gathering data from respondents under settings which have not been controlled or manipulated in any way. This design was suitable for the study since the researcher aimed at gathering respondents' opinions without manipulating any variables by way of experimentation.

The target population was all the 70 public and private universities in the republic. A target population refers to the number of real hypothetical set of people, objects or events to which the researcher wishes to generalize their findings (Borg & Gall, 1989). Out of this population, a total of 21 universities (9 public and 12 private) were purposefully sampled to take part in the study. Purposeful sampling was used so as to ensure that both public and private universities were included proportionally. This sample represented 30 % of universities in Kenya. On the other hand, respondents were sampled randomly. They comprised of 1,883 university students. These were sampled using simple probability by way of tossing a coin. This technique was used in order to avoid cases of biasness. These students were from different levels of study, from diploma to doctorate level. The essence of including students from all levels was to ensure that the study findings give findings that can be generalized to a wider audience.

The researcher engaged the services of 21 research assistants who were responsible for administering instruments in the sampled institutions. A questionnaire with closed ended items was used to collect data. According to Bryman (2008) a questionnaire is the most suitable tool to use in circumstances where respondents are scattered in a population and also when there is need to safeguard their anonymity. Since the study involved many respondents from different universities, a questionnaire was found to be the most suitable tool to use.

Qualitative data was converted into a narrative write up and explained alongside quantitative data as per the study objectives. On the other hand, quantitative data was coded into categories and fed into SPSS computer software version 20 which analyzed it using Pearson correlation analyses, percentages, and frequencies. This data was thereafter presented in frequency tables.

Before the actual study was conducted, the researcher tested the validity and reliability of the instruments by carrying out a pilot study in one public university which was not included in the actual study. Validity refers to the extent to which theory and practical evidence supports the interpretation of test scores (Nachmias, 1996). In this study, the researcher validated his research instruments in terms of content and face validity. Validation of questionnaire items was done by seeking expert opinion from two Kenyatta University lecturers namely,Dr. Violet Wawire and Dr. Salome Nyamburawho are specialists in educational research. They advised on the appropriate length of the questions, suitability of language used and also the comprehensiveness of the content of the questions. The researcher adopted their recommendations to improve the validity of the instruments.

Reliability of the instruments was ascertained during piloting. According to Mugenda and Mugenda (2003), reliability is a measure of the degree to which an instrument used in research gives consistent results after a repeated trial. This exercise involved administering the questionnaires twice within a span of two weeks and doing a correlation of results. Responses given from the two sets of questionnaires were coded and fed into the SPSS version 20 computer software for correlation. Using Pearson's Product Moment formulae, a correlation coefficient was computed in order to establish the degree to which the content of the questionnaire was consistent in eliciting similar results. The instruments were found to be reliable because they yielded a correlation-coefficient of 0.74. According to Gay (2003), when a correlation coefficient of between 0.7 and 0.8 is established, the research instrument is usually considered to be reliable.

Data analysis began by identifying and discarding all incomplete or ambiguous responses. After this, data was grouped according to the study objectives for analysis. Quantitative data from the questionnaire was coded into categories based on the study objectives and fed into SPSS computer software version 20 which analyzed it using percentages and frequencies. Data was presented in frequency tables.

6.0 Findings

This section presents the study's main findings, starting with demographic information of respondents.

6.1 Demographic Information

Table 1: Gender of students

GENDER	FREQUENCY	PERCENTAGE
MALE	809	42.96 %
FEMALE	1,074	57.03 %
TOTAL	**1,883**	**100**

The statistics above show that the study sampled participants from both genders. This was necessary to avoid gender biases.

Table 2: Age of students

AGE	FREQUENCY	PERCENTAGE
19 – 20 Years	402	21.34 %
21 – 23 Years	966	51.30 %
Above 24 Years	515	27.34 %
TOTAL	**1,883**	**100 %**

A majority of respondents were aged between 21 and 23 ears. In most cases, most of these students were pursuing undergraduate programs. There was almost an equal number of students aged over 24 years or between 19 and 20 years.

Table 3: Level of study of students

LEVEL OF STUDY	FREQUENCY	PERCENTAGE
Doctorate Degree	5	0.26 %
Masters Degree	336	17.84 %
Bachelors Degree	1,452	77.11 %
Diploma	90	4.77 %
TOTAL	**1,883**	**100 %**

A majority of respondents were pursuing their first degree whereas a very small number were doctorate students. Sampling students from different levels ensured that the findings had a general applicability.

6.2 Responses of Students on Impact of Research on Teaching-learning

Table 4: Research and teaching-learning

Variables N = 1,883	FREQUENCY			PERCENTAGE (%)		
	Agree	Disagree	Not sure	Agree	Disagree	Not sure
1. Research enables instructors to acquire new and better knowledge on how to teach using better instructional strategies.	401	388	1094	21.29	388	58.09
2. Lecturers can only know the effectiveness of their teaching if they research on it.	606	702	557	32.18	37.28	29.58
3. Students learn better and understand course content when they are allowed to do library/empirical research.	802	781	301	42.59	41.47	15.98

6.3 Discussion

Research has a big impact on the teaching-learning process. Some respondents agreed that research enables instructors to acquire new knowledge on how to teach using better instructional strategies. However, a majority of respondents were not sure about this. Lecturers know the effectiveness of their teaching if they research on it. Almost a third of respondents affirmed this statement. Conversely, slightly over a third gave a contrary opinion whereas 29.58 % were not sure. Students learn better and understand course content when they are allowed to do library/empirical research. Those who agreed with this statement were 42.59 % whereas 41.47 % disagreed. These findings collate with arguments from some authors. For instance, according to Jenkins and Mora (2000) research has an influence on individual educators and on their teaching activities in such a way that the significance of such direct linkages between educators and research cannot be ignored. Effective and collaborative communication, knowledge sharing, and interaction between practitioners and researchers and lecturers can be considered to be the significant products of this direct relationship. In spite of this, Jenkins and Mora do not base their arguments on empirical data — a gap addressed by the current study.

6.8 Responses of students on impact of research on collaboration in knowledge sharing

Table 5: Research and collaboration

Variables N = 1,883	FREQUENCY			PERCENTAGE (%)		
	Agree	Disagree	Not sure	Agree	Disagree	Not sure
1. Research activities enable students and lecturers to exchange ideas with other researchers outside their classrooms and consequently understand realities better.	381	289	301	42.58	41.47	15.98
2. Interdependence in search of knowledge is fostered when students are allowed to carry out research activities together.	533	466	884	28.30	24.74	46.94
3. Research enables students and instructors to assist each other solve research questions that could otherwise be impossible to solve individually.	564	455	864	29.9	24.16	45.88

6.9 Discussion

Research activities enable students and lecturers to exchange ideas with other researchers outside their classrooms and consequently understand realities better. However, few respondents agreed with this. Interdependence between students is forged when students are made to carry out research activities together. However, few students agreed with this whereas a majority gave a not sure response. Research enables students and instructors alike to assist each other solve research questions that could otherwise be impossible to solve individually. Almost a third of respondents agreed with this, another quarter disagreed whereas a majority was not sure about this. These findings find relevance in what others have done elsewhere. According to Gokhale (1995), creation of knowledge within a new learning environment is based on collaboration and expertise sharing. When teaching and research are joined with collaboration, sharing of knowledge happens. Faculty share the last discovered knowledge and make a connection with the student and eventually the students get an opportunity to learn about the latest realities of the phenomenon. However, since Gokhale doesn't give empirical evidence to support their arguments, the current study emerged to address this gap. Seipel (2003) also found that teaching and service were the main roles of professors and research work was ranked third. However, this study didn't focus on the impact of research on higher education, hence presenting a gap that has eventually been addressed by the current study.

6.10 Responses of students on impact of research on current knowledge

Table 6: Research and knowledge production

N= 1,883 Variables	FREQUENCY			PERCENTAGE (%)		
	Agree	Disagree	Not sure	Agree	Disagree	Not sure
1. Research helps lecturers keep in touch with current trends in their disciplines.	1,600	136	147	84.97	7.22	7.80
2. Research among students enables them to acquire current knowledge in the courses they undertake.	1,591	122	170	84.49	6.47	9.02
3. Research enables students and lecturers identify and correct mistakes made in prior studies.	1,442	246	195	76.57	13.06	10.35
4. Research enables students and lecturers raise new questions and polish their thinking and creative abilities.	1,302	211	370	69.14	11.20	19.64
5. Research helps instructors acquire essential knowledge for institutional decision making.	1,007	405	471	53.47	21.50	25.01

6.11 Discussion

A majority of respondents agreed that research helps lecturers keep in touch with current trends in their disciplines. Very few were either undecided or disagreed. Similar results were replicated on the impact of research on helping students acquire current knowledge in the courses they undertake. Besides this, research enables students and lecturers identify and correct mistakes made in prior studies. Research enables students and lecturers alike raise new questions, polish their thinking and creative abilities. This view was supported by 69.14 % of respondents whereas 11.2% disagreed. Less than a quarter were not sure about this. In acquiring knowledge essential for institutional decision making, research comes in handy. Slightly over half of respondents supported this view whereas few either disagreed or were not sure. In support of these findings, a study by Abbasy, Mprera and Burgos (2010) established that a majority of student respondents agreed that researching increases new questions and scientific knowledge hence increasing lecturer knowledge. Besides, 80 % of instructors who took part in Abbasy, Mprera and Burgo's study agreed that research in their didactical materials helps them be up to date in their disciplines.

6.12 Conclusion

Research plays a pivotal role in higher education. It facilitates quality teaching and learning, collaboration, and knowledge production. Because of this reason therefore, universities should be empowered to commit substantial resources to research activities.

6.13 Recommendations

Since the study established that research plays a critical role in the higher education sector, the following recommendations are proposed:

i. For public universities, government capitation of research funds to these institutions should be increased.
ii. Universities should create more income generating activities to raise capital for supporting research.
iii. Members of university academic staff should be supported to attend international research conferences.

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An Investigation of Prevention Strategies applied to minimize Student Deviant Behaviour in Secondary Schools within Bungoma County, Kenya

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Abstract

Whereas many schools have been known to exhibit strong school culture practices that drive academic excellence, rampant theft and exam cheating in schools across counties in Kenya have stood out as a unique trend of deviance that could be reflecting absence of a well executed deviance prevention curriculum. Knowledge of the emerging trends in kinds of deviance being indulged in presupposes an effective rollout of preventive strategies within school cultures yet this has been missing. The purpose of this study was to address this gap by investigating prevention strategies being applied to minimize student deviant behaviour in schools within Bungoma County. A sample size of 400 was used from a study population size [N] of 155,796 composed of students, teachers and school management staff in secondary schools of Bungoma County. The mixed research design that comprised of concurrent triangulation, correlation and cross sectional survey was employed. Multiphase and stratified sampling was used to select schools, students and teachers. Purposive sampling was used to select school management staff. The data for the study was obtained through questionnaires and interviews. Descriptive statistics: cross-tabulations and frequency tables together with inferential statistical analyses: Chi square and simple linear regression analyses were used to analyze the data. The study established that all the nine listed preventive strategiesestablishedto minimize student deviant behaviour in schools within Bungoma County were being applied. Chi-square tests revealed a significant relationship between preventive strategiesand student deviance prevalence in Bungoma County schools. The study concludes that while most of the preventive strategies are highly applied within school cultures in Bungoma county, effective prevention curriculum as a core component of preventive strategies is poorly applied. The study recommends establishment and enforcement of a deviance prevention curriculum anchored on school-wide positive behaviour support systems.

Key Words: *Prevention Strategies, School Culture, Student Deviance, Secondary, Bungoma County*

1.0 Introduction

Deviant behaviour in secondary level schools continues to be a matter of great concern globally; though it is a more worrying trend in developing countries like Kenya (Adegun, 2013; Masese, Nasongo, & Ngesu, 2012; UNODC, 2012). These acts negatively influence the learning and teaching process as they undermine the purpose of education (Agboola & Salawu, 2011). In secondary schools, deviant behaviour is caused by an interaction of different factors that can be traced within and outside school as two distinct yet overlapping environments where the student is socialized into deviance (Carlson, 2012; Carra, et al., 2009). According to academic literature reviewed for this study, family factors that contribute to deviance include a history of drug and alcohol abuse, poor parent- child relationship, violence and socio-economic status of the family (Malayi, Mauyo, & Nassiuma, 2013; Mbuthia, 2013; Carlson, 2012). As for school factors, the size of the school, an unsafe school physical environment, inappropriate classroom management, teachers humiliating remarks and teacher- pupil relations that are too strict have been cited (Richwood, 2013).

According to Hirschi (2002), although deviant behaviour may show a small degree of specialization, there is a strong tendency for persons who engage in one type of delinquent behaviour to engage in other types as well. In this vein, the researcher posited that it was imperative that deviance is examined as a

phenomenon with multifaceted causes that demand a blend of strategies to mitigate it; be they preventive or corrective.

Minimizing deviant behaviour demands that prevention strategies be embedded in the organizational culture and work processes (Greenwood, 2008). These Prevention strategies are those which generally reduce the likelihood of engaging in deviant behaviour (UNODC, 2012; Victory, 2005). As posited by Greenwood (2008), the environment and situational factors play a critical role in shaping behavior hence several programs have been shown to produce significant effects in mitigating deviancy among youths. This study focused on the information-based programmes and life skills prevention strategies practiced within secondary schools of Bungoma County. An information-based programme is a prevention strategy based on the premise that youth in secondary school, a majority of whom are adolescents, indulge in deviance because they are unaware of the consequences. Provision with information will therefore assist them refrain from deviant behaviour (UNODC, 2012). Guidance programmes are an integral part of discipline enforcement within schools. Within a school set up, it is an authoritative direction given to a student through directing, giving opinion, explaining so that theyknow who they are, enhance personal development, achieve physical maturity and attain an assertive ego (Lutomia, 2007). As for the life skills prevention strategy, the focus is inculcation of a range of social skills. The underlying assumption is that deviant behaviour is at least partly due to poor social coping strategies, undeveloped decision making skills, low self esteem, and inadequate peer pressure resistance skills, among others (Baldry, 2004).

In view of the above argument, prevention strategies if well embedded in the school organizational culture manifest as programmes that can facilitate both academic and socio-emotional learning. They are universal since they target the whole class and student fraternity. Preventive strategies have broadly been categorized based on family factors; educational factors and individual characteristics together with personal and social competence (UNODC, 2012). This study explored whether some of them exist within the school organizational culture and their role in minimizing prevalence of deviant behaviour among students in secondary schools of Bungoma County. This study was guided by Bronfenbrenner's Bioecological Theory of Human Development which stresses process-person-context-time interrelatedness (Bronfenbrenner, 2001). As averred by Case (2006), the novelty in this theory is not the identification of environmental influences, but rather the interactions among the influencing entities and their impact on the individual. The researchers used this theory in guiding their investigation into preventive strategies as a deviance mitigation factor among students within Bungoma County schools.

2.0 Methodology

The research paradigm that informed this study was a Pragmatic approach which is a philosophical underpinning for mixed methods studies (Creswell, 2012). The study was conducted using mixed methods research design that comprised of concurrent triangulation, correlation and cross sectional survey to address the study objective. Deviant behaviour, bynature,isamulti-faceted, mutative andmultidimensionalphenomenonthatcanbe betterexploredwhenseveraldifferent methods areapplied (Bahar & Esin, 2013). A sample size of 400 composed of students, teachers and school management staff from 252 schools was used. A mixture of sampling techniques was used, that is, multiphase and stratified sampling was used to select schools, students and teachers while purposive sampling was used to select school management staff. The data for the study was obtained through questionnaire, interviews, document analysis and direct observations. Descriptive statistics: cross-tabulations and frequency tables was used to analyze the data while inferential statistics was mainly by chi-square and simple regression. The schools selected were based on the following strata: rural and urban schools; national, extra County, County schools.

3.0 Results and Discussion

Citing Gruenert (2005) among other previous studies, Engin et al. (2014) in concurrence with Brandy (2006) posited that school culture as a concept within educational administration imply a system of behaviours that evolves dynamically within given school settings and is embraced by members of that school. Bahar and Esin (2013) amplified the value of culture in school set-up within their assertion that survival of school is closely related to the behaviours of its members especially students and teachers. As asserted by Ayse and Musa (2013) culture transforms people's behaviour, attitudes and organizational effectiveness which could impact on the level of performance and deviance in a school setting which was the focus of the study. The researchers were keen on how preventive strategies as characteristics of positive school culture were being practiced in schools as perceived by all respondents. Table 1 captures their responses on a five-likert scale of excellent, very good, good, fair and poor.

Table 1: Preventive Strategies of a Positive School Culture practiced in Schools as rated by all Respondents

Preventive Strategies of Positive School Culture	Rating of Strategies as practiced in Schools					
	Excellent	Very Good	Good	Fair	Poor	Total
Goals focus	153(38)	95(24)	88(22)	64(16)	0(0)	400(100)
Communication adequacy	80(20)	95(24)	160(40)	24(6)	(10)	400(100)
Cohesiveness	128(32)	136(34)	96(24)	40(10)	0(0)	400(100)
The school has a vision of success with broad support in the school and community	176(44)	96(24)	120(30)	8(2)	0(0)	400(100)
A healthy school culture that promotes student bonding to school	72(18)	135(34)	128(32)	65(16)	0(0)	400(100)
School leaders are engaged and committed to prevention of deviance	63(16)	184(46)	129(32)	24(6)	0(0)	400(100)
A strong academic program that promotes success for students of all ability levels	184(46)	136(34)	72(18)	4(8)	0(0)	400(100)
Effectiveness of the Disciplinary committee in handling deviancy	45(11)	129(32)	134(34)	56(14)	36(9)	400(100)
Effectiveness of the G/C committee in handling deviancy	28(7)	116(29)	143(36)	75(19)	38(10)	400(100)

Source: Field Data, 2016; Note: Thefigures in parentheses are percentage frequencies n=400

Respondents were asked to evaluate application of the 9 listed preventive strategies of a positive school culture practiced in their respective schools. The selected strategies were sampled out of those used in previous studies on school culture and tested for reliability analysis for Cronbach's alpha coefficient. All had a coefficient of over 0.93 and the nine averaged at 0.965. Testing instrument reliability in this manner is an acceptable approach in social sciences (Lane et al., 2013; Dalal, 2005; Durrand, 2002). As indicated in Table 1, goal focus which in the context of school culture implies the ability for the school to exhibit goals and objectives that are clear, acceptable and supported by all members was rated along the practice continuum at 38% excellent, 24% very good and 22% good. This reflects an overall positive rating of good and above at 84%. Such a high rating could be associated with Government rules and regulations that clearly guide school operations and routine. Implementation of school curriculum anchored on attainment of Education goals and objectives could also be alluded to that high score. The 16% could be attributed to poor staffing and infrastructure in some schools that makes it hard to achieve set goals and objectives. Communication adequacy as a school culture denotes quality and quantity of information flow both vertically and horizontally within school systems. It was rated at 20% excellent, 24% very good,

40% good, 6% fair and 10% poor. On aggregate 84% rated it good and above although the 10% poor rating raises a concern because sharing of information or communication generally within a system is very critical for posting good performance and mitigating deviancy. School organizational structures along departments and class teachers could explain the high rating while bureaucracy could account for the 10% poor rating. Cohesiveness is about having a school culture where there is a clear sense of identity and members of the school feel attracted to membership and have a strong sense of belonging. It was rated at 44% excellent, 24% very good and 30% good. On aggregate, it rated at 98% above good on the practice of good culture continuum. This high rating could be attributed to the fanatical wave of formulating vision and mission statements for all schools since the year 2000 as part of strategic and performance based management paradigm within Government circles. A healthy school culture that promotes student bonding to their school was also highly rated on the positive school culture practice continuum. Although only 18% rated it excellent, 34% and 32% rated it very good and good respectively. That puts the aggregate also at 84%. School leadership engagement and commitment on preventing deviance also scored lowly on excellence at 16% just as it was the case with effectiveness of the disciplinary committees together with that of Guidance and counseling at 11% and 7% respectively. Generally however, respondents reported that on a practiced continuum, school leadership was engaged and committed to prevention of deviance at 46% very good and 32% good. Effectiveness of the disciplinary committee in handling deviancy was rated at 32% very good and 34% good, while effectiveness of the Guidance and counseling committee in handling deviancy was rated at 29% very good and 36% good. The rating for effectiveness of disciplinary together with Guidance and counseling committees at 9% and 10% poor respectively is indicative of failure by the school culture to systematically address deviancy because such lapses could allow mutation of vices within the system.

The weights given to the options were: score 1 for "poor", score 2 for "fair", score 3 for "good", score 4 for "very good" and score 5 for "excellent". The sample for the study was 400 respondents. Hence the lowest score, being for "poor" is 400 (1× 400) and the highest score, being for "excellent" is 2000 (5× 400) while grand total score for positivity rating was 6000 (400+800+1200+1600+2000). In terms of percentage for positive response in the context of positivity/effective ratings, maximum score for poor is 6.7% (1×400= 400; 400/6000 × 100%); fair is 13.3% (2×400= 800; 800/6000 × 100%); maximum score for good is 20% (3×400= 1200; 400/6000 × 100%); maximum score for very good is 26.7% (4×400= 1600; 1600/6000 × 100%); maximum score for excellent is 33.3% (5×400= 2000; 2000/6000 × 100%) and summation of weighted score being 100% (7%+13 %+20%+27%+33%). The higher the percentage score respondents gave was interpreted as more presence of that preventive strategy within the school culture in the school setting of the County. However, based on weighted scales, between 1% and 7% was interpreted to mean that preventive strategy of school culture was poorly applied, between 7% and 13% was interpreted to mean that preventive strategy of school culture was fairly applied, between 14% and 20% was interpreted to mean that preventive strategy of school culture was good in being applied, between 21% and 26% was interpreted to mean that preventive strategy of school culture was very good in being applied, while between 27% and 33% was interpreted to mean that preventive strategy of school culture was excellently being applied. The scaled calculation and subsequent ratings along an applicability continuum is as shown in Table 2.

Table 2: Rating on Practice Continuum of Preventive Strategies of Positive School Culture by all Respondents

Preventive Strategies of Positive School Culture	Scaled Weighted rating %	Rank
Goals focus	25.6	4
Communication adequacy	22.0	7
Cohesiveness	25.9	3
The school has a vision of success with broad support in the school and community	27.3	2
A healthy school culture that promotes student bonding to school	23.6	6
School leaders are engaged and committed to prevention of deviance	24.8	5
A strong academic program that promotes success for students of all ability levels	28.1	1
Effectiveness of the Disciplinary committee in handling deviancy	21.6	8
Effectiveness of the G/C committee in handling deviancy	20.3	9

Source: Field Data, 2016; n=400

As indicated in the Table 2, apart from effectiveness of the Guidance and Counselling committee in handling deviancy that was rated good in terms of being applied, those ranked number 3 to 8 were within the very good cluster of application. Those ranked 1 and 2 besides being scored excellent in application were presence of a strong academic program that promotes success for students of all ability levels and usage of school has a vision of success with broad support in the school and community. On overall, this can be interpreted to mean presence of a moderate to good application of school culture preventive strategies.The weighted rating for effectiveness of disciplinary committees in handling deviancy was at 22% meaning very good and a reflection of a positive school culture. On the hand, the study found that on a weighted average, deviance prevalence in Bungoma schools was within least severe segment. This could be explained by strict ministerial and Teachers Service Commission (TSC) directives on zero tolerance to corporal punishment and respect for child rights as stipulated in the Basic Education Act (ROK, 2013a). This finding is corroborated by Adelman and Taylor (2005) and NCSE (2012) on learning and behaviour problems (out of either severe emotional disturbance or behaviourial disorders) that where disciplinary mechanisms are used to manage misbehaviour using reasonable, fair and non-denigrating guidelines, positive results on reduced deviance will be achieved. The researcher was keen to find out evaluation of some other two preventive strategies from first tier of school management where head teachers and their deputies are targeted and their feedback corroborated with that of students. Table 3 is a cross tabulation capturing their responses.

Table 3: Preventive Strategies practiced in Schools as rated by School Management and Students only

Preventive Strategiesof School Culture	Position in School	Rating of Preventive Strategies of School Culture Excellent	Very Good	Good	Fair	Poor	Total
An integrated continuum of strategies that serves students and families with multiple levels of need	School Management	13 (4)	44 (15)	17 (6)	5 (2)	0 (0)	79 (27)
	Students	10 (3)	57 (19)	93 (32)	49 17)	7 (2)	216 (73)
Sub total		**23 (7)**	**101(34)**	**110(38)**	**54 19)**	**7 (2)**	**295(100)**
Problem-solving adequacy	School Management	15 (5)	18 (6)	33 (11)	13 (5)	0 (0)	79 (27)
	Students	0 (0)	15 (5)	138(47)	47(16)	16 (5)	216 (73)
Sub total		**15 (5)**	**33 (11)**	**171(58)**	**60 21)**	**16 (5)**	**295 (100)**

Source: Field Data, 2016; Note: Thefigures in parentheses are percentage frequencies n=295

As indicated in Table 3, on an integrated continuum of strategies that serve students and families with multiple levels of need, 19% of school management rated it very good and above while 22% of students rated it good. On aggregate, 41% of a combined rating of school management and students rated it at very good and above while 38% rated it as good. On problem solving adequacy where the school culture enables members to perceive problems and solve them using minimal energy besides sustaining such initiatives, school management rated it at 11% very good and above while students rated it at 5%. On aggregate, only 16% of a combined rating by school management and students agreed that the characteristic was practiced at a very good and above rating. Heads of departments in charge of Guidance and counseling and the class teachers occupy the second tier of management from the perspective of implementing positive school culture characteristics. They were asked to rate the listed two preventive strategies of positive school culture that directly impact on their roles within the system. Their response was as captured in Table 4.

Table 4: Preventive Strategies of School Culture practiced in Schools as rated by Heads of Guidance and Counseling together with Class Teachers only

Preventive Strategies of Positive School Culture	Rating of Preventive Strategies of Positive School Culture Excellent	Very Good	Good	Fair	Poor	Total
Optimal power equalization	7(7)	15(14)	55(52)	28(27)	0(0)	105(100)
An effective prevention curriculum or program that is faithfully implemented with all students	0(0)	0(0)	9(9)	35(33)	61(58)	105(100)

Source: Field Data, 2016; Note: Thefigures in parentheses are percentage frequencies n=105

Heads of departments in charge of guidance and counseling and class teachers are critical players at second tier of school management who if not well resourced in terms of supply and coordination may not only be frustrated but may experience high burn out from the perspective of mitigating deviancy (Dunber ,2004; Lane et al., 2013). Students learning in resource starved environments are more vulnerable to anti social behavior (Dunber, 2004) which was perceived in the study as deviance. The two categories of respondents were asked to rate the listed three preventive strategies of positive school culture that directly impact on their roles within the system. These were optimal power equalization, an effective

prevention curriculum or program that is faithfully implemented with all students and resource utilization. Optimal power equalization as a preventive strategy of school culture demands that the school culture allows a relatively equitable distribution of influence between members of the school and management. With regard to resource utilization as a preventive strategy of school culture, emphasis is on coordination of resources to allow effective operations with minimal strain. Applicability rating for these strategies was at 66% and 80% respectively good and above. It implies that heads of department and class teachers were given some leverage to deal with student deviancy within their jurisdictions. This could have accounted for a least severe weighted average verdict (of between 1% and 22%) on deviance prevalence within the study area. This finding is corroborated by Adelman and Taylor (2005) in their application of transaction model to explain student deviance particularly on the assertion that each part of school environment transacts with others to affect overall outcome; positive or negative. This is further confirmed by Simon (2013) on building student resilience when he affirms the strategic role of empowered teachers in helping students attain high level performance regardless of risk factors.

On optimal power equalization, their rating was at 14% for very good and above, 52% for good and 27% for fair. As for an effective prevention curriculum that is embraced by all students, the score was at 9% good, 33% fair and 58% poor. As a preventive strategy of school culture resource utilization denotes a school setting where both human and physical resources are well coordinated to allow effective operations with minimal strain. Table 4 is a cross tabulation capturing their responses.

Table 5: Preventive Strategies of Positive School Culture practiced in Schools as rated by Teachers (HODs &Class Teachers) and Students only

Preventive Strategies of Positive School Culture	Position in School	Rating of Preventive Strategies of Positive School Culture					
		Excellent	Very Good	Good	Fair	Poor	Total
Resource utilization	Teachers	8(3)	23(7)	54(17)	20(6)	0(0)	105(33)
	Students	61(19)	39(12)	72(22)	36(11)	8(3)	216(67)
Sub total		69 (22)	62 (19)	126 (39)	56(17)	8(3)	321(100)

Source: Field Data, 2016; Note: Thefigures in parentheses are percentage frequencies n=321

As indicated in Table 5, resource utilization was rated at 10% for very good and above by teachers, (Heads of departments and class teachers) while 31% of the students rated it at very good and above. However 17% of the teachers rated it at good in terms of it being practiced in their schools compared to 22% of the students. On overall, 27% of the teachers rated it at good and above while 53% of the students rated it at good and above. Teachers who rated it at fair were 6% compared to 11% of the students. Further 3% of the students felt that this aspect of school culture was poorly practiced in their respective schools. In terms of weights, utilization was rated at 6.93% by teachers while students rated it at 15.73%. This yields a combined rating of 22.66%. Table 6 reflects an aggregate weighted rating of all preventive strategies as evaluated by segmented respondents based on their positioning in schools.

Table 6: Rating on Practice Continuum of Preventive Strategies of Positive School Culture by Respondents

Preventive Strategies of Positive School Culture	Scaled Weighted rating %	Rank
Goals focus	25.6	4
Communication adequacy	22.0	8
Cohesiveness	25.9	3
The school has a vision of success with broad support in the school and community	27.3	2
A healthy school culture that promotes student bonding to school	23.6	6
School leaders are engaged and committed to prevention of deviance	24.8	5
A strong academic program that promotes success for students	28.1	1
Effectiveness of the Disciplinary committee in handling deviancy	21.6	10
Effectiveness of the G/C committee in handling deviancy	20.3	11
An integrated continuum of strategies that serves students and families with multiple levels of need	21.8	9
Problem-solving adequacy	16.4	13
Optimal power equalization	20.1	12
An effective prevention curriculum or program that is faithfully implemented with all students	10.0	16
Resource utilization	22.7	7

Source: Field Data, 2016

The study further tested the following hypothesis:

There is no significant influence of prevention strategies within school culture in minimizing student deviant behaviour in Bungoma County Schools.

To test this hypothesis, chi square (χ^2) tests were done to compare the prevention strategies within school culture being practiced and various variables/types of deviance as an indicator of student deviant behaviour in Bungoma County Schools. Top two preventive strategies with weighted average rated above 27 % as captured in Table 6 were picked for tests against listed student deviant behaviour. Tables 7 and 8 present a summary of the Chi-square test coefficients, degrees of freedom and the significance values for each of the variables.

Table 7: Results of Chi-square tests on association between a strong academic program promoting success of all students and Student Deviant Behaviour

Type of Deviance	Chi-square Value	df	Sig.
Drug, alcohol and substance abuse	77.71	9	0.00
Theft	94.31	12	0.00
Property Vandalism	91.55	9	0.00
Rudeness	3.72	12	0.00
Exam cheating	1.47	12	0.00
Sneaking	1.12	9	0.00

Source: Field Data, 2016

As indicated in the Table 7, the results of the Chi-square tests showed that there is a statistically significant relationship between student deviant behaviour and a strong academic program promoting success of all students as a preventive strategy within school culture that affects deviant prevalence in schools. All the listed six types of deviant behaviour showed a statistically significant relationship. Thus, drug, alcohol and substance abuse(χ^2= 77.71, df=9, p<0.05); theft(χ^2= 94.31, df=12, p<0.05); property vandalism (χ^2= 91.55, df=9, p<0.05); exam cheating (χ^2= 1.47, df=12, p<0.05); sneaking (χ^2= 1.12, df=9, p<0.05); rudeness (χ^2= 3.72, df=12, p<0.05). On the basis of these tests, it is conclusive that there is a

statistically significant relationship between student deviant behaviour and a strong academic program promoting success of all students as a preventive strategy within school culture that affects deviant prevalence in schools. The null hypothesis was therefore rejected.

Table 8: Results of Chi-square tests on association between a vision of success with broad support base of stakeholders and Student Deviant Behaviour

Type of Deviance	Chi-square Value	df	Sig.
Theft	1.18	12	0.00
Property Vandalism	1.01	9	0.00
Rudeness	91.87	12	0.00
Exam cheating	1.81	12	0.00
Sneaking	98.97	9	0.00

Source: Field Data, 2016

As indicated in the Table 8, the results of the Chi-square tests showed that there is a statistically significant relationship between student deviant behaviour and a vision of success with broad support base of stakeholders as a preventive strategy within school culture that affects deviant prevalence in schools. All the listed five types of deviant behaviour showed a statistically significant relationship. Thus, theft(χ^2= 1.18, df=12, p<0.05); property vandalism (χ^2= 1.01, df=9, p<0.05); exam cheating (χ^2= 1.81, df=12, p<0.05); sneaking (χ^2= 98.97, df=9, p<0.05); rudeness (χ^2= 91.87, df=12, p<0.05). On the basis of these tests, it is conclusive that there is a statistically significant relationship between student deviant behaviour and a vision of success with broad support base of stakeholders as a preventive strategy within school culture that affects deviant prevalence in schools. The null hypothesis was therefore rejected.

This null hypothesis was further explored by conducting simple regression analyses to assist the researchers predict strength and direction of relationship between preventive strategies within school culture and prevalence of student deviant behaviour using specific variables. The findings are as captured in Tables 9 to 10.

Table 9: Regression of Cohesiveness as preventive strategy within school culture against Rudeness as a variable of Student Deviant Behaviour

Single R	0.09
Adjusted R square	0.09
Std. Error	0.96

	df	Sum of squares	Mean square	F	Sig. of F
Regression	1	38.07	38.07	41.41	0.00
Residual	398	365.93	0.92		

Variables in the Equation

Variables	B	Standard error of B	Beta	t	Sig. of t
Rudeness	0.32	0.05	0.31	6.43	0.00
Constant	1.83	0.11		15.89	0.00

c. Predictor/independent Variable: Cohesiveness

d. Dependent Variable: Rudeness

As indicated in the Table 9, R^2_{adj} was 0.09, F = 41.41, p< 0.05; beta weight = 0.31. The results of the regression indicated that cohesiveness as preventive strategy within school cultureis a significant predictor of student deviant behaviour, which is explained by 9% of the variance. By examining the beta weight in the Table 9, the beta weight value reveals a moderate relationship that is within the decision criterion of coefficient range 0.3 to 0.7. It is evident that the variance in student deviance was significantly

accounted for by cohesiveness as preventive strategy within school culture. It is evident and therefore conclusive that this preventive strategy within school culture positively influenced student deviant behaviour on the account of rudeness. The null hypothesis was therefore rejected.

Table 10: Regression of Goal focus as preventive strategy within school culture against Rudeness as a variable of Student Deviant Behaviour

Single R		0.13			
Adjusted R square		0.13			
Std. Error		0.94			
	df	Sum of squares	Mean square	F	Sig. of F
Regression	1	52.88	52.88	59.95	0.00
Residual	398	351.11	0.88		
Variables in the Equation					
Variables	B	Standard error of B	Beta	t	Sig. of t
Rudeness	0.33	0.04	0.36	7.74	0.00
Constant	1.79	0.10		17.34	0.00

c. Predictor/independent Variable: Goal focus

d. Dependent Variable: Rudeness

As indicated in Table 12, R^2_{adj} was 0.13, F = 59.95, p< 0.05; beta weight = 0.36. The results of the regression indicated that goal focus as preventive strategy within school cultureis a significant predictor of student deviant behaviour, which is explained by 13% of the variance. By examining the beta weight in the Table 10, the beta weight value reveals a moderate relationship that is within the decision criterion of coefficient range 0.3 to 0.7. It is evident that the variance in student deviance was significantly accounted for by goal focus as a preventive strategy within school culture. It is evident and therefore conclusive that this preventive strategy within school culture positively influenced student deviant behaviour on the account of rudeness. The null hypothesis was therefore rejected.

4.0 Conclusion and Recommendation

Preventive strategies that were rated highly across schools were: strong academic programs that are inclusive for all cadres of students; vision of success that is rallied to by school members; cohesiveness and goal focus at weighted rating of 28%, 27%, 26% and 26% respectively. However, effective prevention curriculum as a component of preventive strategies was poorly rated. Only 9% of respondents rated it good in regard to how it's practiced in schools while a majority at 58% rated it poor and 33% of respondents rated it as fair. This result essentially means most schools in Bungoma County lacked a school-wide positive behaviour support system yet this has empirically been known to offer an effective framework for creating school environment that mitigates deviancy among all students (McKevitt & BraaKsma, 2008; McGoey et al., 2016). This view is corroborated by Hansen et al. (2014) study on teacher perception and positive behaviour intervention with regard to managing deviance in schools. The study recommends that secondary schools should deliberately embrace a comprehensive prevention curriculum that is anchored on a school-wide positive behaviour support system within their school culture in order to mitigate deviance prevalence which could otherwise escalate to levels that academic performance and learning in schools will be compromised.

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Challenges of Open and Distance Learning in Kenya: The Case of Public Universities

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Abstract

Kenyan education policy is based on a number of legislations including the constitution of Kenya (1961), Education Act (1968), Children Act (2001) and sessional paper no. 11 of 2005 on policy framework for education and training, among others, all of which commit the government to the provisions of at least 12 years of compulsory, free and continuous schooling to the Kenyan children (Government of Kenya, 2008). So far, however, no specific act or directive deals with Distance learning per se. Our policy on DE are far behind South Africa and even post-conflict Rwanda who have prepared very proactive policy documents to increase access via open and distance learning. This is due to various structural challenges that this paper attempts to discuss

The ODL is defined as an education programme in which the learners are separated from the instructional phase or a teacher either is space or in time, for a significant portion of their learning. In addition, learning is accredited by an institution or agency, they use print, video and audio cassettes or is computer based. Also there is teacher-learner interaction and possibility of face to face meetings for consultations (Commonwealth of Learning, 2000). The basic principles of distance education include, flexibility in increasing access to and equity in education, a variety of ways are used by the provider to open access to credible learning opportunities to a diverse range of learners by preparing learner friendly modules or teaching learning materials and there is also use of various strategies of delivery such as guided self-study and a variety of media. ODL methods encourage learning as a resource in itself, it also fosters autonomous learning, placing the responsibility on the learner rather than the teacher hence enhancing the spirit of enquiry. In addition there is proper relevant course design good for the learner, which makes the process of learning a lifelong process. As result, learning becomes an ongoing, permanent practice relevant to the ever-changing needs of the labour market and national economies. It is a learner centered education system that increases access to knowledge and information. It provides learning opportunities to the adult working and ambitious ones especially at the higher levels of learning such as diploma, degree and postgraduate levels.

In Kenya we have a PSSP or privately sponsored and self-sponsored programmes-programmes for those who are qualified to join the university but are not join due space problems. Such students could benefit from long distance education but are currently admitted on the basis of self-sponsorship and payment of tuition fees. There is also the school based programmes to offer degree and diploma courses for school teachers teaching in primary schools, who attend college only when schools are closed in the months of April, August and December. Yet such courses could be handled best under ODL. This can go in line with the reforms in the Ministry of Education. Moi University has begun Masters in Public Administration (MPA) programmes for the senior civil servants like Permanent secretaries in the various ministries and District officers on line. The MPA course have been running as evening classes but by making it an ODL course we hope to bring more students on course and train more staff for the government under our new constitution. Those enrolled attend classes in in the evenings after office hours for the stipulated maximum number of hours before sitting for the requisite exams and then writes a project paper before graduating in two years. This has increased access for several senior government officers, for example, in the 2009/2010 academic year at Moi University, twenty District Officers (DO) and

District Commissioners graduated with MPA degrees in the department of History, Political Science and Public Administration, then under the leadership of the veteran scholar, Prof. J J Okumu. This programme is based on teacher learner interaction and has more learner autonomy in doing research and writing of the project paper.

The rationale of open learning is based on the fact that all learning cannot take place in the classroom. There are times when learners will be reading, thinking, using or talking about the learning outside the class room (Jensen, 2001). Jensen states that, DE is learning which takes place while the teacher and the learner are separated time, distance or both. Parallel or self-sponsored students in public universities have also benefited from government sponsorship through Higher Education Loans Board (HELB), which gives loans to students to support their tuition and accommodation.

ODEL can be explained through various theoretical approaches such as Jean Piaget's constructivist theory, which emphasizes on the construction of knowledge by individuals hence involving learners in learning process. Another concept is Vygotsky's social constructivist theory, which puts more emphasis on construction of knowledge in collaboration with others as stressed in group activities, for example in a class room situation, thus exposing learners to multiple viewpoints.
A significant aspect in DE is preparing modules for self-instruction such as multi-media materials and documents, and lack of learner friendly pre-prepared modules like the ones used in the Republic of Rwanda's Kigali Institute of Education. While there we were trained for several months on module preparation, before we finally participated in writing a module for training secondary school teacher after 1994 genocide. Moi University there is there is a department of ODL headed by Dr Agalo, but it remains under funded and ineffective. The modules are yet to be written by lecturers who are not themselves trained in module writing. We are yet to agree on the format and type of modules. This requires funding and training hence the need to set aside funding for the same. The University of Nairobi, which began long distance learning in 1990s is the only public university able to establish a functioning ODL.

COL (2001) recognizes four main stages of technical evolution towards distance learning education. The first generation is text-based correspondence courses, with similar notes used in the classroom. The second level is less of print based, self-instructional materials and the third level is self-instructional print integrated with media (audio and video). The last stage is the use of interactive ICTs to support course delivery and learning. In the case of Moi University, apart from the school of information sciences, the rest of the university does not benefit from interconnectivity of the computers, though there are good efforts to do that by the end of this year. We are still at level one where we at the school of arts and social sciences are preparing text based modules similar to the notes we use in the classroom but without any training. This lack of uniformity in the design of learning materials remains a major handicap to the whole process. Moore (1993) observes that there is a degree of distance learning in all forms of education process. He states, 'the transaction that we DE occur between teachers and learners in an environment having the special characteristic of separation of teachers from learners. With separation there is psychological and communication space to be crossed, a space of potential misunderstanding between the inputs of instructor and those of the learner (but) in any educational programme there is some transactional distance' (Moore 1993). He points out that transactional distance between educators and learners is determined by the interrelated of there variables, ie, instructional dialogue, in which there is interaction between learner and educator. Then there is the programme structure which is the extent to which a programme can accommodate or respond to individuals needs hence the need to have a multidisciplinary approach in preparing learning modules to cater for the needs of learner-educator dialogue. And finally, learner autonomy, which is the extent to which it is the learner rather than the educator who determines the goals, the learning experiences and evaluation decisions of the learning

programmes. Thus according to Moore, the distance between the learner and educators depends on the educational philosophy of a programme and how this si manifested in the teaching strategies employed. He maintains that the difference between DE and face to face learning are blurred by increased use of resource based learning and distance education strategies. Our public universities in Kenya have yet have the basic infrastructure that would allow increased use of DE as a learning-teaching programme.

Challenges and opportunities

The objectives of University education in Kenya remains: expansion of university education and training, promotion of private sector investment in university education, ensuring quality assurance mechanisms and provision of scholarships based on the needs of the economy, among others. Yet with no policy of ODL access can not increased as it is hinged on space availability on the campuses hence the need to institute ODL in our programmes. The final objective of the Ministry is 'establishment of an open university and promotion of open distance and e-learning to increase opportunities for university education' (Government of Kenya, 2008). But this noble of ODL has to be effected due to problems of access to ICT, electricity, training of staff on e-learning and especially module writing. These challenges remain hard to tackle due to lack of finance and expertise.

In an era of globalization and competition for strategic gains and resources, even the longest and established and most successful institutions must safeguard their positions through continuous improvement. The distance education providers and advocates of information communication Technology (ICT) integration need to sell the story of their success.

Realities in our universities indicate a higher market. They overestimate the market potential and under estimate the educational and logistical challenges. Moreover, they ignore the realities of ICT infrastructure, access and costs, overestimate learner readiness for e-learning. There is embarkment on large scale online learning programmes and projects without initial try outs. At issue is the insensitivity or slowness in responding to customers' expectation and essence of not obtaining accreditation. Equally perplexing in most of our universities is the fact that they do not meet the quality expectations of learners, particularly in regard to learner support, likewise do provide incentives for continuous private sector involvement in the partnership.

With regard to integrated e-learning (IEL), one has to develop digital learning artefacts such as units (courses or programmes) and learning objects. A major problem for organizations when introducing e-learning is the question of how to deal with this development process of digital learning artefacts. The development process is complex and expensive. Possibly, the most challenging point is that in e-learning the expected quality of the units of learning cannot be easily be provided by the one person who is traditionally responsible for this, the teacher.

A further problem is the question of what to develop: not only what must be developed, but in what format and in how much detail in order to provide for a unit of learning (both usable and re-usable) that can be delivered through computer facility. The other issue is that of disaggregation of existing course materials. In most institutes, there is a large quality of existing materials that have not been prepared for and are not at all suitable for e-learning. Not only can be re-used but how should we deal with these materials? From an economic point of view, it is not appropriate to replace everything with the attributes of e-learning. Moreover, there is a problem of finding and sharing learning artefacts for re-use. We start from the assumption that there is a large, shared, distributed repository where users can search for learning artefacts, obtain them, adapt them store new ones and where legal economic principals are supported in a workable manner. Such are pository functions in the context of what is called a 'learning object economy. The principles for such an economy to succeed have not yet been established.

Campbell (2003) identifies the following issues in e-learning object economy: the granularity, interoperability, resource resumption and discovery, incentive, quality control and peer review, intellectual property rights and digital rights management, pedagogical frameworks and cultural barriers. Some sharing initiatives have already been put into practice for instance Ariadne (forte et al, 1997).

Quber Kramer, (2000) and Merlot argue that overall evaluation data relating to the success and failure factors of the approaches not yet available. Assessment in e-learning (EL) stills has many problems mostly because of the repositioning of the function of assessment in modern education. Moreover, new problems are also occurring in e-learning ernvironments specifically the problem of learner positioning in learning networks, this raises the following questions: what is the current state of knowledge of the learner relative to the learning opportunities provided? The answer is needed to allow for differentiated delivery.

The challenges faced by students with different disabilities may seem that designing accessible online courses is an insurmountable task or that the only solutions are to design plain and unattractive WebPages and avoid state of the art technologies for synchronous communication. Some faculty faced with these access barriers may try to discourage students with disabilities from participating in their courses or create independency learning sessions to accommodate them. They may also decide to wait to make necessary design adjustments until a student with a disability who has already registered further course forces that to examine their materials and activities in light of that student's or her particular needs. More often though, faculty is simply unaware of the solutions available to increase accessibility.

Experience of using distance education methods for narrower ends is nearly discouraging. Having reviewed agricultural and nutrition programmes that used communication technology Harnik concluded bluntly that, 'most efforts to use communication technology for development do not do what they are meant to' (1988:ix). He examines three possible explanations: (i) information is no solution for lack of resources: (ii) audiences for information programmes are unresponsive everywhere such information might help and (iii) information programmes have not worked because they have not been done appropriately.

In conclusion, we argue that DE is a programme in which the learner and educator do not meet face to face but exchange ideas through prepared texts. In Kenya most public universities do not have active ODL programmes due to finance problems, lack of training for the lecturers and poor policies. The solution is to effect and implement DE to increase access to e-learning and increase opportunities to the ambitious learners and professionals ready to upgrade and diversify their skills.

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Sub-Theme 2:
Challenges and Trends of University Education in the 21st Century

Teacher Mentoring: A Snyonym for Teacher Professional Instruction and Guidance

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Abstract

Teacher preparation is an issue that has attracted the concern and interest of scholars for some time now. Current research has established that an effective teacher has a great influence on what students learn and how they learn it and that the effective teacher is a product of effective initial teacher preparation. Driven by research findings, schools of education have been forced to re-examine, refine and implement teacher education courses that will make their student-teachers effective in practice. Among the new processes that have been introduced in teacher preparation to improve the effectiveness of student-teachers is mentoring. It is a truism that teaching is a dynamic and challenging job that demands that the teacher seeks and acquires the support of a colleague or colleagues. This situation is true for the practicing teacher, but more so for the student-teacher whose first real encounter with their profession is during practicum or teaching practice. Literature on mentoring in professions concur on the view that mentoring is useful in the provision of one-on-one professional instruction and guidance, that is further linked to how long one stays in the profession and their love for it. Non-educational organizations have embraced mentoring and provide evidence of the benefits that emerge from the process for both the employees and the organization. Recent developments in some university schools of education worldwide and even in Kenya require student-teachers to be in a mentor-mentee relationship. However, scant attention zzzzzhas been paid to the issue of mentoring for practicing teachers. This positional paper will examine teacher mentoring for both the practicing teacher and the novice teacher, from selected literature and studies. The discussion will provide useful insights to education stakeholders on teacher mentoring and its usefulness in supporting continuing staff development.

Key words: *Mentor, Mentee, Mentoring, Initial teacher preparation, practicing teacher, novice teacher.*

I. Introduction

Teaching is a dynamic and demanding profession. This is especially true in the 21st Century where the teacher is faced with complex issues that have implications on whether they succeed in teaching or not. To begin with, the 21st Century teacher worldwide is faced with the task of handling learners who are diverse in all senses, yet who have to be prepared to take up adult responsibility and their place in nation building. According to Darling-Hammond (1998:57), teachers have a duty to prepare their learners to frame problems, find, integrate and synthesize information and work co-operatively. This demands that the teacher has to possess certain knowledge and skills if they are to guide their students. Additionally, the teaching profession is one faced with frequent changes that include curriculum and subject matter changes, new instructional procedures, changes in student evaluation and testing and, technological changesthat require the teacher to practice differently. Of interest to note is that teachers are usually made aware of these changes through very brief in-service sessions sometimes lasting for a day and which often do not offer follow-up support for the teacher during the implementation stage. Then there is the demand by education stakeholders that the teacher should produce 'good' results with their students at the end of the school year, despite the fact that school contexts vary and so do the aptitudes of the learners.This situation is further exacerbated by large classes that are now a common sight especially in developing world contexts, together with big workloads in terms of many lessons in a week. This scenariomeans that the practicing teacher is constantly grappling with issues that challenge their effectiveness in classroom practice.

Arguably, the step to engage in some form of learning is not a choice for the teacher, but a necessity which they must embark on once they choose this profession, and continue in it until their retirement

(Darling-Hammond, 2000; Al-Weher & Abu-Jaber, 2007).Education systems around the world recognize the importance of teacher learning and are engaged in supporting their teaching force so that they can be effective change agents and also to ensure improved learning outcomes for the learners. This support has majorly been through formal learning experiences like workshops and other in-service trainings (INSET) which are organized away from the school context and usually for some limited number of days. These strategies have been criticized for a number of reasons, key among them being the inability to deal with specific challenges that teachers face with practice and lacking the ability to offer follow-up support for the teacher during implementation of the new approaches and strategies (Leliveld, 2006; Gathumbi, Mungai & Hintze, 2014). However, according to scholars like Fullan (2007), teachers should learn every day about their practice, instruction, learners and emerging educational technologies. Fullan points out that the common practice of depending on external ideas to improve practice is "…a flawed theory of action" since external ideas "… can never be powerful enough, specific enough or sustained enough to alter the culture of the classroom or school" p.35. This therefore points to the need for strategies that can enable teachers, whether novice or veteran to learn in sustainable ways that are geared at addressing their individual challenges with practice.

II. The Teacher as a Learner

The possession of sufficient knowledge to pass on to learners is one of the key requirements for a teacher (Al-Weher and Abu-Jaber, 2007). Yet even with this requirement, no school of education can claim to be able to equip a teacher with skills, knowledge and predispositions that will enable them to carry out their job effectively. Arguably, the best that teacher preparation can do is to develop in student-teachers the skills to learn about their profession, when they want to learn. The assumption is that teachers with inquiry skills will question their practice and seek for solutions without necessarily waiting for an 'outsider' to suggest what should be done and how it should be done. Nias (1992) cited in Stoll and Fink (1996), agrees with Stronge (2002) that teachers have a key role in their own learning that includes eliciting for information, providing constructive criticism and accepting feedback which is necessary for improving pedagogy. Teachers can learn through formal processes or informal ones.

Formally, teachers can learn through professional development experiences like workshops, seminars or even taking a professional course leading to a certificate. Informally, Wilson & Berne (1999) point out that everyday school experiences and interactions with colleagues have the potential of providing knowledge to the keen teacher. These experiences may be in the form of conversations with a colleague, daily classroom experiences, passing a glimpse into another teacher's classroom and sharing tips with a colleague whose practice is admirable. Stronge (2002) posits that teachers are their own best resource and their interaction can develop into warm relationships which can enhance the sharing of experiences and expertise. While teacher learning can be said to begin with initial teacher preparation, it is a process that should continue throughout the life of a teacher. Indeed, literature has established that teachers must be able to learn all the time. One of the strategies that is gaining prominence in education circles is mentoring, which is a one-on-one relationship whose purpose is to provide professional instruction and guidance.

III. Mentoring in the Work Place

Mentoring is one of the oldest forms of influence and knowledge sharing, having its roots in Greek Mythology where Odysseus' trusted servant Mentor was allowed to counsel and advise Odyssues' son Telemuchus (Ehrich, Hansford and Tennet 2004, McDonald, 2004). A mentor is therefore viewed as a wise and trusted counselor or teacher working with a younger or less experienced person. In history, mentoring was done with mentors playing a role in the shaping the destiny of their mentees who were expected to learn the trade of their mentors and even surpass the mentor's expertise. According to Abbajay (n.d), mentoring is underpinned by the view that we can all learn from each other in a way to improve how we practice. This view brings to the fore the idea of collaboration among colleagues in the

workplace with the consequence being improvement in ones' skills by working with 'a more knowledgeable other'. In a review of literature on mentoring across education, medicine and business disciplines, Ehrich, Hansford and Tennet (2004) revealed that mentoring offers far-reaching benefits for both the mentor and the mentee that include support, personal growth and professional development. These benefits are realized in a mentor-mentee relationship that is characterized by voluntary interaction, willingness of the mentor to pass down information, an identified need by the mentee and engagement in a relationship that has a life-cycle (Bovan & Philips, 1981 cited in ERIC Digest #7, 1986).

In the past two to three decades, organizations have realized that mentoring is an important tool in nurturing and growing their workforce, while at the same time retaining hard earned experience and wisdom (Ehrich, Hansford and Tennet, 2004). However, available literature on mentoring in the workplace is from the West where these programs are planned, structured and coordinated interventions that are carried out formally within the organizations. In developing world contexts, most instances of mentoring are informal in nature where both the mentor and mentee select who they wish to work with and the relationship is voluntary based on an identified need. This is unlike formal mentoring programs where the mentors are selected and assigned to mentees and the two may not choose each other (Inzer & Crawford, 2005; Scandura & Pellegrini, 2007). Additionally, Mentors are seniors with experience and the relationship is for a short term, usually running according to the program. In formal mentoring, there is the possibility for evaluation of the progress of the mentee, a factor that makes the relationship one that involves a delicate balance between co-operating and getting promoted or not co-operating and remaining in the same job group.

However, as Abbajay (n.d) notes, businesses are embracing mentoring as a professional development tool and are recording dramatic improvements in efficiency, production and passing on of institutional knowledge and leadership skills, from one generation to another.

IV. Mentoring in Education

Literature on teacher education support the view that teachers should engage in lifelong learning, given that the teaching profession is subject to constant changes that require the teacher to adopt new practices if they have to remain relevant in the profession. As a consequence, schools of education and teacher training institutions have incorporated elements in their curriculum that will enable the student-teacher develop skills of learning in practice and about practice. Such elements include collaborating in teaching, the reflective practice and action research. These elements are aimed at enabling the prospective teacher to develop interest in their profession as well as a desire to understand it through examining it. Among the other developments in teacher preparation is the reconceptualization of teaching practice as internship where the student-teacher has an extended period in the placement school, while working with a collaborating teacher in a mentor-mentee relationship (Darling-Hammond, 2008). The purpose of this relationship is to ensure consistent coaching, strong, effective communication and specific meaningful feedback (Zugelder & Nichols, 2014). Agreeing with these views, McDonald (2004) makes a strong argument that student-teachers are more likely to experience success during practicum if they observe good practice by their collaborating teachers, if the collaborating teacher is concerned about their learning needs and discusses different perceptions about teaching.

Research evidence on mentoring in education document a number of benefits and challenges that are associated with this practice either for the beginning teacher or the practicing teacher. The benefits for the beginning teacher include: reduced feelings of isolation, increased confidence in classroom practice, improved problem solving capacity and professional growth (Hobson, Ashby and Tomlinson, 2008). These are important aspect that determine whether a beginning teacher will manage the transition from being a student-teacher to being a professional and if they will remain in the profession. For the practicing teacher, the benefits include: improved self-confidence, increased availability of relevant

information, reflection on practice and personal professional support (Knippelmeyer and Torraco, 2007). For the mentor, the benefits include being more collegial, learning from the mentee, satisfaction and pride in their role as mentor and helps them to engage more in self- reflection (Ashby, Malderez and Tomlinson, 2008). The school also benefits from having staff who are professionally competent, beginning teachers who assimilate fast into the school environment, experiences less teacher attrition and most importantly, improved learning outcomes for the learners (ERIC, 1986)

V. Implications for Policy, Practice and Future Research

The introduction of teacher mentoring for the beginning teachers and practicing teacher has implication for policy, practice and future research. For policy makers, it is clear that teacher mentoring has benefits that will improve the teaching practice of both the mentor and mentee and therefore the need to develop training programs that can be used to prepare identified mentors. Schools should be required to identify and encourage teachers who show an interest in mentoring others, whose teaching experience that makes them model teachers. For practice, teachers should look within their staffroom for colleagues who can support them in improving their classroom practice, instead of struggling alone with challenges which may never be addressed by workshops and seminars. The collaboration among teachers will lead to a collegial working environment that will in turn enhance teaching and improve the learning outcomes for the learners. Mentoring is a relatively new phenomenon in Kenya and very little has been documented about it especially in education. Future research in the Kenyan context should therefore examine the phenomenon of mentoring in education to provide evidence of how it is carried out, the benefits and challenges faced.

VI. Conclusion

From the discussion above, it is evident that teacher mentoring is a practice that holds benefits for the mentor, mentee and the school where these two are working. While research evidence suggests that teachers should learn all the time about their profession and their classroom practice, most of the learning experiences available to teachers do not focus on the individual challenges that they face. Additionally, these professional learning experiences do not offer support to the teacher when it comes to classroom implementation of the new strategies and practices that they have learnt. This calls for a learning strategy that allows the teacher to learn from a colleague whose practice they admire and learn in a non-threatening environment. Literature and studies support teacher mentoring for providing professional instruction and guidance that will improve the practice of both the mentor and the mentee.

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Influence of School Based Factors on Implementation of Strategic Plans in Public Secondary Schools inkhwisero Sub-County, Kenya

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Abstract

Public secondary schools performance in national examinations has been deteriorating over the years as compared to private secondary schools as has been observed by a number of scholars. This has raised a lot of concerns from the stakeholders in the education sector. This study was occasioned by the continued poor performance in KCSE by most of the public secondary schools in Khwisero sub-county. The purpose of the study was to assess school based factors influencing implementation of strategic plans in public secondary schools in Khwisero sub-county. This research adopted a mixed research methodology namely exploratory research design and was based on the strategic planning theory and practice. The study utilized a sample size of 153 respondents which included 19 teachers, 38 HOD's, 19 DOS's, 19 Principals, 19 deputy Principals 19 BOM and 19 PTA chairpersons together with the DEO of the sub-county. Purposive sampling was used to select study respondents. The study revealed a number of school resources factors that greatly influenced implementation of strategic plans in Khwisero sub-county which included; funding from parents, skills, staff training and development, and disbursement of Free Day Secondary Education funds. On school organization structure; implementation procedures, communication of strategic decisions, mission and vision, organization support and coordination of implementation activities and involvement of implementers in the strategic process affected strategic plan implementation. On school culture it was found out that; ownership of the plan by implementers' and managers, relations between managers and implementers', school and the community in which it is located, clarity of the school vision and implementers' commitment greatly influenced strategy implementation in public secondary schools in the sub-county. Rewarding and motivating strategic objective achievers, hiring of suitable employees and drawing action plans were leadership activities that influenced implementation of strategic plans in public secondary schools in Khwisero sub-county. However it was noted that scarcity of resources, limited budgetary allocation and conflicting roles among the school leadership adversely affected strategy implementation. The researcher recommended that management of schools should initiate income generating projects to supplement financial allocations from the government in order to support strategic plan implementation, Participatory organization structures in public secondary schools that support strategy implementation should be created and stakeholders in the strategy implementation process must align the strategic plan to the school culture. There is also need for school managements to embrace activities that support strategy implementation such as rewarding strategic objective achievers among others.

Key Words:*School Based, Startegic Plan, Participatory, Khwisero Sub-County*

1.0 Background to the study

The use of strategic planning in improving performance in state organizations and government departments has been recognized and recommended internationally. Strategic planning is the process of formulating a unified comprehensive and integrated plan relating to strategic advantages of the organization to the challenges of the environment (Saleemi, 2011). It involves appraising the external environment in relation to the organization, identifying the strategies to be adopted in future to achieve the set objectives. Strategic planning defines the routes that when taken will lead to the most likely probability of getting from where the organization is to where it wants to go (John and Mathews, 2002).A strategic plan on the other hand is a plan that outlines the major goals of an organization and the organization wide strategies for attaining the goals (Hill and Mcshane, 2009).

Strategic plans can only be useful to any organization or institution if they are implemented, thus their implementation is more important than even their formulation otherwise if not implemented it is nothing

except well documented papers in an organization. Evans (2007) observes that despite the importance of having a plan there is one thing worse than not having a strategic plan that is spending all the time it takes to develop then ignoring it or find it unworkable. Hill and Mcshane (2009) on the other hand also observe that organizations without strategic planning can be chaotic and drifting like a ship without propulsion. This clearly indicates that strategic plans are important to any organization as they give them the right direction to follow.

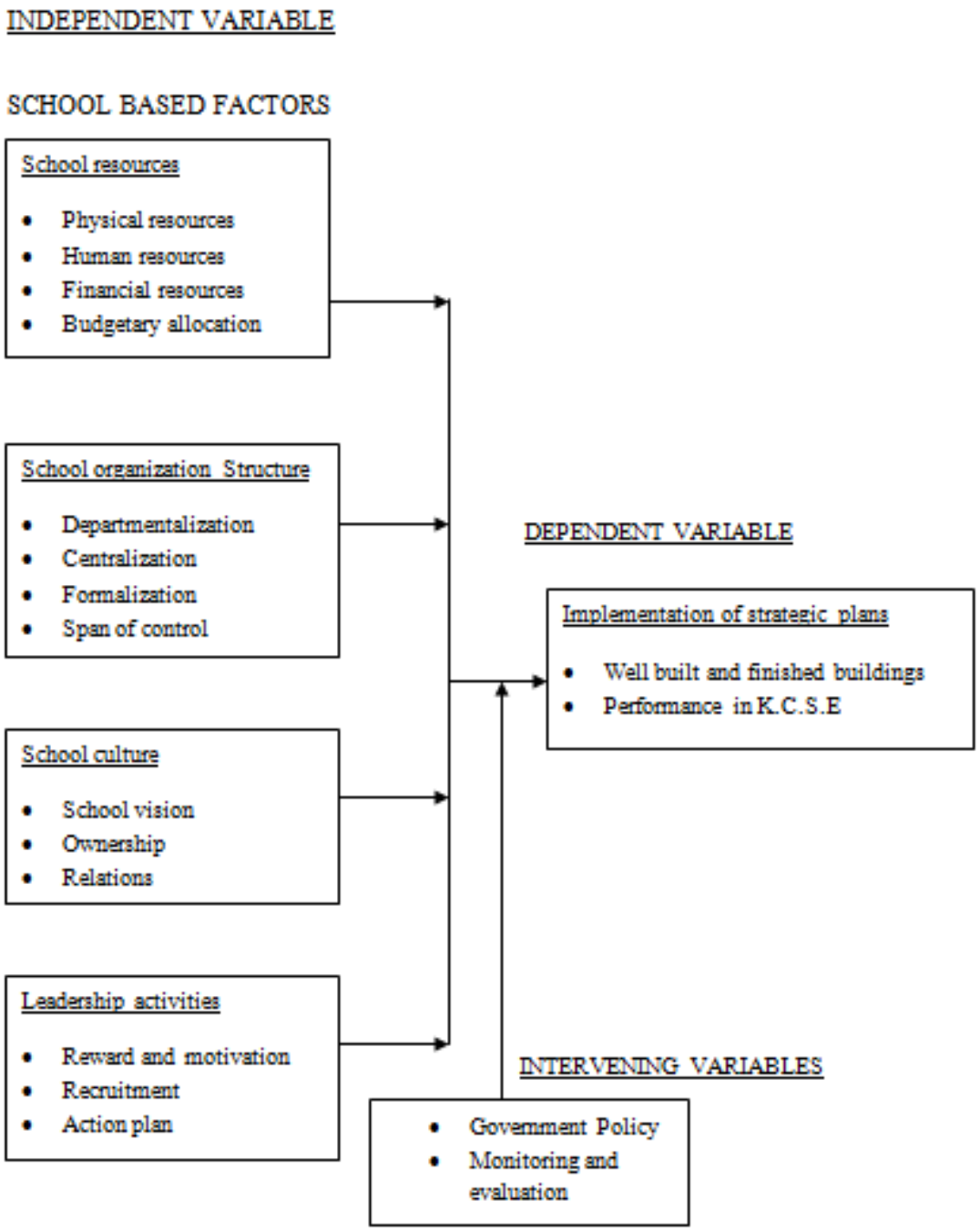
Strategic planning has military roots with commanders employing strategy in dealing with their opponents as pointed out by Evans et al (2009). Strategy was used to mean the laying down of plans to succeed in war; this included their plans and logistics to defeat an enemy (Yabs, 2010). The civil military officials elected in countries such as Athens, United states of America and Britain were expected to prepare and implement overall top level plans in order to achieve long term goal of winning war. Strategy was used to plan during the Second World War. When strategic methods and applications succeeded in the European war theater, most of the planning applications were borrowed into businesses and organizations and has since been used to refer to long term plans for organizations (Yabs, 2010).

In 1960's strategic planning entered the business world. In 1980's strategic planning entered the public sectors at a time when liberal market philosophy dominated all management thinking therefore all government administrators were expected to be more cost-effective and result oriented and this would best be achieved in the application of strategic principles (Kaufman and Harman, 1991).In the education sector strategic planning started as early as 1970's in universities and colleges and in 1980's it was introduced in schools as part of the broader decentralization and school based management reforms. The discussions of the disappointments of traditional planning that was discussed in the United Nations Educational, Scientific and Cultural Organizations (UNESCO) International Institute of Education planning (IEEP) on the occasion of its 25th anniversary made many developed and developing countries to start practicing the preparation of strategic education sector plans (Cailloids,1989).These plans were linked to introduction of sector wide approaches (SWAP) in the development cooperation for the mid 1990's. This demanded that any country that wanted to benefit from donations had to develop strategic plans indicating clear national policies formulated and owned by these countries to convince the donors. This was in line with the Paris Declaration on Aid Effectiveness of 2005 to show that the recipient countries were committed to preparing and implementing national development strategies and translating them to result oriented plans and programs (William and Cummings, 2005). The UNESCO's deliberations, the Paris Declaration and the Koech report of 2000 prompted the MOE in Kenya to come up with sessional paper no.1 of 2005 that recommended in chapter 5.10 part (viii) that the government would build the necessary capacities for strategic planning for all bodies and institutions. To operationalize the sessional paper no. 1 of 2005 the MOE developed its own strategic plan (MOE strategic plan 2006-2011) and it became a policy that each institution must develop its own strategic plan.

Despite the MOE requirement that all institutions must develop strategic plans, their implementation still remains a challenge. This is observed by Mutuku and Mutuku (2009) in their research that many organizations still have problems in implementation of strategy, Johnson, (2004) believes that 66% of strategies formulated in organizations are not executed at all and Hill and Mcshane (2009), who also observe that after the strategic planning process many of the plans are left on the shelves to gather dust never to be opened again. In addition Cole (1997) articulates that strategic plans are never implemented from the scratch thus a lot of time is spent reviewing strategies that have never been implemented. Although most educational institutions, public secondary schools inclusive have well developed strategic plans, their implementation still remains a challenge hence the need to assess school based factors influencing the implementation of strategic plans in public secondary schools in Khwisero sub-county.

1.2 Conceptual framework

This study was guided by the conceptual framework arising from the strategic planning theory and practice theory involving the various variables used in the study. Mugenda (2011) defines a conceptual framework as a concise description of the phenomenon under study accompanied by a graphic or visual depiction of the major variables of study. According to Kombo and Tromp (2011) a conceptual framework is a research tool intended to assist a researcher to develop awareness and understanding of the situation under scrutiny and communicate this, when clearly articulated, it should assist a researcher to organize his/her thinking and complete an investigation successfully.



This study was guided by the independent variables which were school resources, school structure and school culture which influenced the study's dependent variable implementation of strategic plans. School resources are important in improving the teaching and learning environment for achievement of schools strategic objectives as planned. The school structure is handy in determining the teaching and learning activities, processes and procedures that will enable the implementation of strategic plans. School culture on the other hand directs the behavior of all the staff and stakeholders towards achievement of the school's strategic objectives. Leadership activities are critical in directing every member's actions towards strategy implementation. The study however could also be influenced by the government policy, monitoring and evaluation of the MOE that the researcher has no control over.

2.0 Methodology

The research design used in this study was exploratory research design (Creswell, 2014) due to the nature of the study which was an assessment where little has been published in the topic in the area of study. The researcher needed to explore the study area and also overcome the limitations of using a single design.

2.1 Sampling procedure and sample size

The sampling design used in this study included purposive and simple random sampling technique. Purposive sampling was used to select DOS, Deputy Principal, principal, BOM and PTA chairpersons and the DEO, as they were believed to have relevant information on strategic planning while simple random sampling was used to select a teacher and two HOD's in each of the schools, where papers written on yes or no were picked. Those who picked yes were included in the study. Purposive sampling was advantageous as it enabled the researcher to select the right respondents for the study and obtained relevant information while simple random sampling ensured that the sample was representative.

Table 1: Sample size for the study

Respondents	Number	Sampling procedure
DEO	1	Purposive sampling
BOM chairpersons	19	Purposive sampling
PTA chairpersons	19	Purposive sampling
Principals	19	Purposive sampling
Deputy principals	19	Purposive sampling
DOS's	19	Purposive sampling
HOD's	38	Simple random sampling
Teachers	19	Simple random sampling
Total	153	

Source; DEO Khwisero sub-county office, 2014

3.0 Findings

3.1 Demographics

60% of the respondents were male while 40% were female. This implied that all gender was well represented in the study. 7% of respondents had a masters level of education, 71% had bachelors degree, and 22% had a diploma certificate. The respondents were purposively and randomly selected and the researcher ensured that those selected were reasonably literate and informed for optimal research results. These findings are in line with Yabs (2010) who suggests formal education to a certain level as one of key characteristic of strategists.

3.2 School resource's influence on implementation of strategic plans in public secondary schools in Khwisero sub-county

To examine the school resources influence on implementation of strategic plans in public secondary school in Khwisero sub-county, the respondents were asked to indicate their degree of agreement on the extent at which school resources factors influenced implementation of strategic plans in their schools.

Table 2: School resource's influence on implementation of strategic plans in public secondary schools in Khwisero Sub-county

No	School resources factors influencing implementation of strategic plans in schools	Frequency& Percentage	SA 5	A 4	UD 3	D 2	SD 1	Total
1	Scarcity of resources	Frequency	40	56	30	27	-	153
		percentage	26	37	20	17	-	100
2	Funding from parents	Frequency	35	60	25	10	23	153
		Percentage	23	39	16	7	15	100
3	Limited budgetary allocation	Frequency	45	50	30	14	14	153
		percentage	29	33	20	9	9	100
4	Skills, staff training and development	Frequency	60	40	40	10	3	153
		Percentage	39	26	26	7	2	100
5	Disbursement of Free Secondary Education Funds	Frequency	55	45	30	23	-	153
		Percentage	36	29	20	15	-	100

Source: Author, 2014

From the findings tabulated in table 4 above, scarcity of resources was cited by most of the respondents as the key factor that influenced implementation of strategic plans in public secondary schools in the sub-county. Out of the total respondents, 26% of the respondents strongly agreed and 37% agreed that scarcity of resources as a factor greatly influenced implementation of strategic plans in the schools, 20% were undecided and 17% disagreed on this matter. Respondents were also divided on whether funding from parents influenced implementation of strategic plans in public secondary schools in the sub-county. 23% of the respondents strongly indicated that funding from parents influenced implementation of strategic plans, 39% agreed, 16% were undecided and 23% disagreed. On the aspect of limited budgetary allocation, 29% strongly agreed and 33% agreed that limited budgetary allocation had a greater influence on implementation of strategic plans in public secondary schools in Khwisero sub-county, 20% were undecided and 18% disagreed on this matter.

On the other hand skills, staff training and development as a factor had a greater influence on implementation of strategic plans in public secondary schools in Khwisero sub-county, 39% of respondents strongly agreed and 26% agreed on this, 26% were undecided and 9% disagreed. The reactions on the disbursement of Free Day Secondary Education funds as a factor influencing implementation of strategic plans in public secondary schools in Khwisero sub-county was mixed, 36% strongly agreed and 29% agreed that disbursement of these funds had a greater influence on implementation of strategic plans, 20% were uncertain and 25% disagreed. Similar findings were also revealed from the interviews conducted.

The study findings indicate that school resources is an important factor for the implementation of strategic plans in public secondary schools. These findings clearly show that nothing can happen without the support of necessary resources. These findings are consistent with the literature reviewed. According to the literature, school resources play a key role in strategy implementation in schools. The findings on scarcity of resources, funding from parents and disbursement of Free Day Secondary Education funds are in tandem with (Yabs, 2010), who notes that without adequate resources the implementation of strategy is almost impossible. In addition he says that the success of any school or organization depends to a large extent on the availability of resources. Implementers need to be paid and facilitated and this cannot happen without financial resources. School resource is anything in a school environment that facilitates

teaching and learning (KESI, 2011) which is critical and core components of a school's strategic plan. In a strategic planning process, resources such as people, skill, facilities and money to implement strategy must be adequate (Werman, 2004). These resources must be effectively and efficiently managed to enable the school achieve its strategic goals. The implication here is that without resources to be managed there can be no implementation of a strategic plan. This implies also that parents really need to support schools through payment of school fees in time and also timely disbursement of Free Day Secondary Education funds to support strategic plans implementation. Strategic leadership is a critical resource. This kind of leadership demands the right people in critical decision making and active leadership that will ensure that what emerges and what is realized and changes of course are detected before it is too late (Mason, 2007). These staff should be efficient, effective, and committed to the school vision and for this reason, it is imperative for proper attention to be given to human resource management (Mullins, 2010). Saleemi (2011) points out that poor leadership can nullify the soundest organization. Scarcity of resources and inadequate funding from parents that is attributed to the high poverty index in Khwisero Sub-county as indicated in the Strategic plan 2013-2017 has been a big barrier to successful implementation of strategies in public secondary schools.

The findings on budgetary allocation are in agreement with (Cole, 1997) who notes that the implementation of strategy is not just about devising a management framework but involves the allocation of resources amongst the strategic organization units to facilitate achievement of goals. This therefore implies that school managers must be in a position to allocate these resources conscientiously and carefully using a well thought out plan to ensure that the school goals are realized. However experience demonstrates that poor allocation of resources constrains strategy implementation. Hill and Mcshane (2009) have also observed that plans cannot work unless they are tied to budgets and this budget must strictly be adhered to. However lack of budgeting and limited budgetary allocations to strategic units can hinder the successful implementation of strategies. Quality and committed human resource in an institution on the other hand leads to successful strategy implementation as pointed out by (Bitange, Kipchumba and Magutu, 2010). However lack of commitment can hinder implementation of strategic plans.

The findings on skills, staff training and development are in line with (Yabs, 2010) who points out that leadership skills required of strategic leaders include a combination of formal education to a certain level, appropriate character, relevant experience and special skills. Personnel skills are another vital resource in the implementation of strategies, for they are what the organization must have in order to achieve its goals (Cole, 1997). This implies therefore that however much financial and physical resources institutions may have, it all depends on how the school leaders marshal them towards achievement of strategic objectives. Thus strategic leaders and human resource must undergo some training and possess the relevant skills for successful strategy implementation. In conclusion from the field study findings and arguments in the literature reviewed it is evident that school resources have a significant influence on how strategies are implemented in organizations.

3.3 School organization structure's influence on implementation of strategic plans in public secondary schools in Khwisero Sub-county

To explore the school organization structure's effects on implementation of strategic plans in public secondary schools in Khwisero sub-county, the respondents were asked to indicate their degree of agreement on the extent at which school organization structural factors influenced implementation of strategic plans in their schools. The findings were as shown in table below.

Table 3: School organization structure's influence on implementation of strategic plans in public secondary schools in Khwisero Sub-county

No	School organization structural factors influencing implementation of strategic plans in schools	Frequency & Percentage	SA 5	A 4	UD 3	D 2	SD 1	Total
1	Conflicting roles among leadership	Frequency	39	54	35	20	5	153
		Percentage	25	35	23	13	4	100
2	Implementation procedures	Frequency	38	55	40	15	5	153
		percentage	25	36	26	9	4	100
3	Communication of the schools strategic decisions, mission and vision	Frequency	40	56	30	27	-	153
		Percentage	26	37	20	17	-	100
4	Organization support and coordination of implementation activities	Frequency	60	40	40	10	3	153
		Percentage	39	26	26	7	2	100
5	Involvement of implementers in the strategic process	Frequency	55	45	30	23	-	153
		Percentage	36	29	20	15	-	100

Source: Author, 2014

From the findings tabulated in table 5 above, 25% of respondents strongly indicated and 35% agreed that conflicting roles as a factor had greater influence on strategy implementation in public secondary schools in Khwisero sub-county, 35% were undecided and 25% disagreed. On whether implementation procedures influenced implementation of strategies, 25% of respondents strongly agreed, 36% agreed, however 26% were undecided and 13% disagreed. On the aspect of communication of the school's strategic decisions, mission and vision, 26% strongly agreed and 37% agreed that communication of vision, mission and strategic decisions had a greater influence on implementation of strategies, 20% were uncertain and 17% disagreed.

The extent at which organization support and coordination of implementation activities influenced implementation of strategies had mixed reactions 39% strongly agreed and 26% agreed that there was influence, 26% were undecided and 9% disagreed. On the matter of whether involvement of implementers in the strategic process influenced implementation of strategic plans in public secondary schools in Khwisero sub-county, 65% agreed, 20% were undecided and 15% disagreed. The findings from principal's and DEO's interviews also revealed that school organization structure had a greater influence on implementation of strategic plans in public secondary schools in Khwisero sub-county.

From the research findings it is evident that school organization structure is a significant factor for implementation of strategic plans in schools. These findings are consistent with the evidence in the literature reviewed. The findings on conflicting roles are in agreement with Weber (1948), Mcshane and Glinow, (2010), who articulate that organizations whose structures are characterized by high degree of standardization, formalization, centralization, rigid rules and tight procedures are reluctant to change, discourage creativity and innovation and hence undermine the atmosphere within which strategic plans can be implemented. However, organizations whose structures are characterized by a wider span of control, decentralized decision making and little formalization, tasks are fluid; adjust to new situations and organization needs easily. They are more dynamic and allow team members to share information more readily across boundaries, increases flexibility and improve communication efficiency and the efficient use of resources (Mcshane and Glinow, 2010). However this structure can increase conflicts among managers who equally share power and can dilute accountability and thus constrain strategy implementation.

Team based structures are increasingly popular in organizations because they are more flexible and responsive to the environment. However these structures are difficult to maintain due to the need for ongoing interpersonal skills training, takes more time to coordinate, leaders experience more stress due to increased conflicts and this can easily undermine effective strategy implementation (Mcshane and Glinow, 2010). The correct design of structure is the most significant in determining organization

performance as observed by (Drunker, 1989). He articulates that a good organization structure does not by itself produce good performance, but a poor organization structure makes good performance impossible no matter how good the individual managers may be. Thus the school organization structure should be designed so as to encourage the willing participation of for members of the organization for optimal performance through strategic planning. This implies that members' roles have to be clearly displayed and known to each one of them for successful implementation of strategic plans.

The findings on implementation procedures are in tandem with Mcshane and Glinow (2010) who articulate that organization structure is the division of labor as well as the pattern of coordination, communication, workflow and a formal power that directs organization activities. It is this organization structure that constitutes the context within which the implementation of strategic plans takes place. It shows clearly the formal framework by which jobs, tasks are divided, grouped and coordinated. Inconsistent organization structure fails strategy implementation, but a well aligned practical structure leads to successful strategy implementation. In a school setting therefore organization structure includes how the management supervises and coordinates strategic plan implementation activities, how the roles and procedures are designed, how the school vision is communicated to the staff and how the staff and other stakeholders are involved in the strategy implementation process. This also implies that implementation procedures for strategy have to be clear to all members of the organization for successful implementation of strategic plans. Contrary unclear implementation procedures fail the strategic process.

The findings on communication of school's strategic decisions, vision and mission are in tandem with Alexander (1995) who points out that schools top management should clearly communicate 'what the new strategic decision is all about' with the involved stakeholders for them to become successful strategic implementers. Unclear communication of strategic decisions lowers the pace at which strategies will be implemented. Dandira (2011) observes that communication should cascade from top to bottom of the organization so that employees are kept aware on how the strategic plan is being conceived and what is required of them. Rapert et al (2002) on the other hand articulate that communication and shared understanding play an important role in the strategy implementation process. Successful strategy implementation depends also on coordination of school resources; therefore school leaders ought to be careful how they coordinate these resources together with the activities involved.

The findings on organization support and coordination of implementation activities are in tandem with Daft (2010) who observes that leaders are the ones who deliberately structure and coordinate organization resources to achieve organization purpose. Organization theorists Lim, Griffiths and Sambrook (2010) propose that organization structure development is very much dependent on the expression of strategies and behavior of the management and the workers as constrained by the power distribution between them and influenced by the environment and the outcome. However Christension et al (2005), affirms that failure to function as a team at the executive levels of organization can equally lead to strategic failures. This implies therefore that strategic leaders need to support each other and all members of the organization on matters of strategy implementation and coordination of implementation activities or else strategies are bound to fail.

The findings on involvement of implementers' in the strategic process are in line with Mbiti (2007) who observes that the making of strategic decisions should be participatory involving the implementers, school leaders and stakeholders. Participatory leadership is essential for successful strategy implementation. This implies therefore that for successful implementation of strategy all stakeholders have to be involved in the strategic planning process from its conception to implementation and this also promotes ownership of the plan.

From the fore going it is noted that school organization structure is a significant factor for strategic plan implementation because; It determines the context in which an organization operates, It provides the foundation on which standard procedures and routines rest and it determines which individuals get to participate in which decision making processes and thus to what extent their view shape organization

actions. In conclusion the study findings and the literature reviewed seem to support the view that school organization structure has an influence on implementation of strategic plans in public secondary schools in Khwisero sub-county.

4.5 School culture's influence on implementation of strategic plans in public secondary schools in Khwisero sub-county

To evaluate the school culture's effects on implementation of strategic plans, the respondents were asked to indicate their degree of agreement on the extent at which school organization cultural factors influenced implementation of strategic plans in their schools. The results are as indicated in table 8 below.

Table 4: School culture's influence on implementation of strategic plans in public secondary schools in Khwisero Sub-county

No	School organization cultural factors influencing implementation of strategic plans in schools	Frequency& Percentage	SA 5	A 4	UD 3	D 2	SD 1	Total
1	Ownership of the plan by management	Frequency	38	50	45	15	5	153
		Percentage	25	33	29	10	3	100
2	Ownership of the plan by implementers'	Frequency	36	55	40	22	-	153
		Percentage	24	36	26	14	-	100
3	Relations between managers and implementers'	Frequency	55	40	35	23	-	153
		Percentage	36	26	23	15	-	100
4	Relations between the school and the community	Frequency	40	56	30	27	-	153
		Percentage	26	37	20	17	-	100
5	Clarity of the school vision	Frequency	39	54	35	20	5	153
		Percentage	25	35	23	13	4	100
6	Implementers' commitment	Frequency	60	40	40	10	3	153
		Percentage	39	26	26	7	2	100

Source: Author, 2014

From the findings in table 6 above 58% of the respondents agreed that ownership of the plan by the management greatly influenced implementation of strategic plans in public secondary schools in Khwisero sub-county, however 29% were undecided and 13% disagreed. Still on ownership, 60% of the respondents suggested that ownership of the plan by implementers was a key factor that influenced implementation of strategic plans in public secondary schools in Khwisero sub-county, 26% were undecided and 14% disagreed. On whether relations between managers and implementers' influenced implementation of strategic plans, 62% agreed that it was, 23% were uncertain, 15% disagreed. On relations between the school and the community within which the school is located, 26% strongly agreed, 37% agreed, 20% were undecided; however 17% disagreed on this matter. On the aspect of clarity of the school vision, 60% agreed of the respondents agreed that clarity of school vision greatly influenced implementation of strategic plans, 23% were uncertain, however, 17% disagreed. Further 65% of the respondents indicated that implementers' commitment had influence on implementation of strategic plans in public secondary schools in Khwisero sub-county; however 26% were undecided and 9% disagreed. Those participants who were interviewed generally agreed that indeed the implementers' commitment, relations and clarity of school vision were critical in the strategy implementation process.

Evidence from the field study seem to support the view that school culture is a prerequisite for the implementation of strategic plans in public secondary schools in Khwisero sub-county. These tallies with the evidence presented by the literature reviewed. The findings on ownership of plans by management and implementers' is in agreement with Mcshane and Glinow (2010) who report that culture is a deeply embedded form social control that influences employees decisions and behavior, directs employees in ways that are consistent with organizational expectation. In addition it is social glue that bonds people together and values them to feel part of organization experience. This in itself helps employees own the

plan as they are able to understand what goes on in the school and why things happen in the organization and how they can affect their ethical conduct, hence every member strives to see the implementation process of plans succeed. This implies therefore that for successful implementation of plans all members of the organizations including managers and implementers must begin by owning the plan through their involvement in the development process, understanding each aspect of the plan and why it should be implemented.

The findings on relations between the school and the community are in line with Daft et al (2010), who affirm that culture helps the organization to adapt to the external environment and Harrison and Stokes (1992) who states that culture determines how the organization responds to the environment; which is bound to affect strategy implementation in schools. However, Henry (2008) observes that unless key individuals and groups, within and outside organization accept the rationale for strategic change; any proposed implementation will be suboptimal at best. The findings on relations between the managers and implementers are in tandem with Kinicki (2008) who observes that culture helps shape behavior by helping members make sense out of the surrounding Mcshane and Glinow (2010) who articulate that culture directs employees' behavior in ways that are consistent with organizations which affects implementation of strategies through creation of good interpersonal relations.

The findings on clarity of the school vision are in agreement with Aldebayat et al (2011) and Ngware et al (2006) who articulate that a strategic plan helps communicate to all staff and stakeholders therefore the school motto, vision and mission, goals and objectives need to be displayed in conspicuous places where all stakeholders can see. However Christension et al (2005) that failure to understand the culture of the organization, failure to develop values and culture to support strategic plans constrains the strategic process. This implies therefore that the school vision must be clear to every member of the organization for successful strategy implementation.

The findings on implementers commitment are in line with Daft et al (2010) for instance observes that culture provides members in the organization identity that generates in them commitment to beliefs and values of the organization, more so the strategic objectives. The study findings are in agreement with Kinicki (2008) who articulates that culture facilitates collective commitment in members that see strategic plans succeed. These findings are also in tandem with Bitange et al (2010) who points out that quality and committed staff in an institution leads to successful strategy implementation, however David (2001) on the other hand observes that without commitment strategy implementation efforts faces major problems. This implies that implementers' of strategies in an organization have to be committed to the school vision, mission and strategic objectives for success of strategic plans.

From the fore going it is evident that organization culture impacts on most facets of the organization's life and it is the context within which things happen. Culture is also an essential part of strategic planning process and any change proposed must be in line with the culture of the organization or else it is bound to fail. Thus Johnson and Scholes (1999) articulate that the culture should be consistence with the strategy being implemented. This implies therefore that strategic leaders must be keen when deriving strategies and strategic objectives of the organization which should be in tandem with the school culture. In conclusion therefore all arguments in literature narrated above support the field study findings which are that; ownership of the strategic plan by management and implementers' is a critical factor in strategic plan implementation, relations between managers and implementers' and between the school and the community where the school is located influence implementation of strategic plans; that clarity of the school vision and commitment of implementers' influence implementation of strategic plans in public secondary schools in Khwisero sub-county. All this factors are products of the school culture which has shaped and nurtured them therefore school organization culture influences implementation of strategic plans in public secondary schools in Khwisero sub-county.

4.6 Leadership activities influence on implementation of strategic plans in public secondary schools in Khwisero sub-county

To determine the effects of leadership activities influence on implementation of strategic plans in public secondary schools in Khwisero sub-county, the respondents were asked to indicate their degree of agreement on the extent at which the following suggested leadership activities influenced implementation of strategic plans in their schools. The results were as indicated in the table below.

Table 5: Leadership activities influence on implementation of strategic plan in public secondary schools in Khwisero Sub-county.

No	Suggested leadership activities that affect implementation of strategic plans in my school	Frequency & Percentage	SA 5	A 4	UD 3	D 2	SD 1	Total
1	Rewarding and motivating strategic objective achievers	Frequency	39	54	35	20	5	153
		Percentage	25	35	23	13	4	100
2	Recruiting/Hiring suitable employees for strategy implementation	Frequency	35	60	25	10	23	153
		Percentage	23	39	16	7	15	100
3	Drawing action plans based on the strategic plan for implementation	Frequency	38	50	45	15	5	153
		Percentage	25	33	29	10	3	100

Source: Author, 2014

From the study findings in table 7 above, 25% strongly agreed and 35% agreed that rewarding and motivating strategic objective achievers influenced implementation of strategic plan in public secondary schools in Khwisero sub-county, 23% were uncertain and 17% disagreed. On recruiting suitable employees for strategy implementation 62% agreed that the hiring of suitable employees greatly influenced implementation of strategies, 16% were undecided while 22% disagreed on this matter. The aspect of drawing action plans based on strategic plans had mixed reactions 13% disagreed, 29% were uncertain; however 58% agreed that indeed drawing action plans greatly influenced implementation of strategies in public secondary schools in the sub-county. Similar results were obtained from the interviews conducted.

The findings indicate that school leadership activities are important in the implementation of strategies in schools. School leaders inspire and direct all school activities related to the implementation of strategies. Effective leadership encourages implementation of strategies hence achievement of strategic objectives, ineffective leadership on the other hand lowers strategy implementation process. The findings from the field are in agreement with the literature reviewed. For instance the findings on rewarding and motivating strategic objective achievers are in tandem with Amulyoto (2004) who points out that rewarding employees who achieve strategic objectives motivates them by increasing their morale of working hard to see strategic plans succeed. Mulube (2009) on the other hard argues that effective strategic plan implementation requires the leadership to motivate their employees in order to enhance implementation practices. Rewarding and motivating employees is critical as it determines the success of strategic plans. Okumbe (2007) underscores this by saying that failure to reward teachers who are hardworking or giving them few rewards is likely to make them feel dissatisfied constraining strategy implementation.

The findings on recruitment or hiring of suitable employees for strategy implementation are in line with Lynch (2009) who articulates that strategic leaders have a responsibility to find, select and keep key employees, develop and nurture them. This implies therefore that leaders have to be careful in recruitment of employees. They must recruit staff with the right qualifications and skills that supports strategy implementation. Hiring wrong people in schools can be a big barrier to strategy implementation. The findings on drawing action plans based on the strategic plan are in tandem with Taylor (1995) who

points out that strategic leaders need to actively get involved in translating the strategic plans into implementable activities with measurable results. Thus drawing action plans for implementation keeps employees informed on which activities they need to do in strategy implementation. Failure to draw action plans on the other hand confuses implementers' as they may not know exactly what is expected of them. The action plans stipulates the roles and responsibilities for each of the members and the timeframe and this encourages strategy implementation. In conclusion from the study findings and arguments in the literature it is evident that leadership activities influence how strategies are implemented in public secondary schools in Khwisero sub-county.

Conclusions

A strategic plan is critical in schools because it outlines the major goals of the school and the strategies designed to attain the goals. The implementation of strategic plans in schools is more important than even its formulation. Even the best formulated strategy is completely irrelevant if it is not effectively implemented. It has been noted that poor implementation has led to strategic failures. This study revealed a number of school based factors that influenced implementation of strategic plans in public secondary schools in Khwisero sub-county. On school resources it was found that scarcity of resources, funding from parents, limited budgetary allocation, Skills, staff training and development, and disbursement of Free Day Secondary Education funds are indeed resources related factors that greatly influenced implementation of strategic plans in public secondary schools in Khwisero sub-county. Therefore based on the findings and supporting evidence from literature reviewed it is concluded that school resources influence implementation of strategic plans in public secondary schools in Khwisero sub-county.

Organization structure is the division of labor as well as the pattern of coordination, communication, workflow and formal power that directs a school's activities. The correct design of structure is the most significant in determining the school's performance. The structure determines the modes in which a school operates, it provides the foundation on which standard operating procedures and routines rest and determines which individuals get to participate in which decision making processes and thus to what extent their views shape school actions. On the school organization structure the study revealed that; conflicting roles among school leadership, implementation procedures, communication of school's strategic decisions, vision and mission, organization support and coordination of implementation activities and involvement of implementers' in the strategic process are organizational structural factors that greatly affected implementation of strategic plans in public secondary schools in Khwisero sub-county. Based on the findings and supporting evidence from the literature reviewed it is concluded that school organizational factors affect implementation of strategic plans in public secondary schools in Khwisero sub-county.

School culture is also crucial in strategic plan implementation. School culture consists of values and assumptions shared within a school. School culture gives the school identity, facilitates collective commitment, promotes social system stability and shapes behavior by making members make sense out of the environment. The study found out the following factors that are shaped and nurtured by the school culture influenced implementation of strategic plans; ownership of the plan by managers and implementers', relations between managers and implementers' and between the school and the community in which the school is located, clarity of the school vision and commitment on the part of implementers'. Based on the study findings and evidential support from literature reviewed it is concluded that school culture influences implementation of strategic plans in public secondary schools in Khwisero sub-county.

Leadership is a process of encouraging and helping others to work enthusiastically towards achievement of objectives. It's a human factor that binds a group together and motivates it towards goals by transforming the group's potentials into reality (Okumbe, 2007). Leadership activities are important in

strategy implementation as they direct and influence members' behavior and actions towards achievement of strategic objectives. The research findings indicated that rewarding and motivating strategic achievers, hiring suitable employees for strategy implementation and drawing action plans based on strategic plans to assist in strategy implementation greatly influenced implementation of strategic plans in public secondary schools in Khwisero sub-county. Based on the findings and supporting evidence from the literature reviewed it is concluded that leadership activities affect implementation of strategic plans in public secondary schools in Khwisero sub-county.

Recommendations for practice

From the findings of the study the following recommendations were made;

a) Without adequate resources implementation of strategic plans is almost impossible. Availability of resources is critical. Also the available resources must be utilized efficiently in order to achieve stated strategic goals. Schools are therefore encouraged to initiate income generating projects to supplement financial allocations from the government and school fees. Resources generated from the projects will support the implementation of strategic plans. Parents should also be encouraged to enhance their funding base and provide the requisite resources when called upon.

b) The correct design of the school organization structure is the most significant in determining the school's performance. Organization structure in public secondary schools should be designed to foster a participatory approach by all stakeholders from conception of the strategic plan to implementation, monitoring and evaluation. Participation tends to create a sense of ownership and commitment. The BOM should also put emphasis on skills training and development of implementers' to enhance the adoption to any planned change.

c) The school culture is the context within which everything happens. The school culture defines what is important and unimportant and consequently directs everyone in the school towards the right way of doing things. Stakeholders in strategy implementation process must align the strategic plan to the school culture. This calls for an honest evaluation of the school culture so that the culture is consistent with the strategy being implemented.

d) The BOM's and principals of public secondary schools are encouraged to engage in leadership activities that support strategy implementation such as rewarding and motivating strategic objective achievers, hiring suitable staff and drawing action plans among many others.

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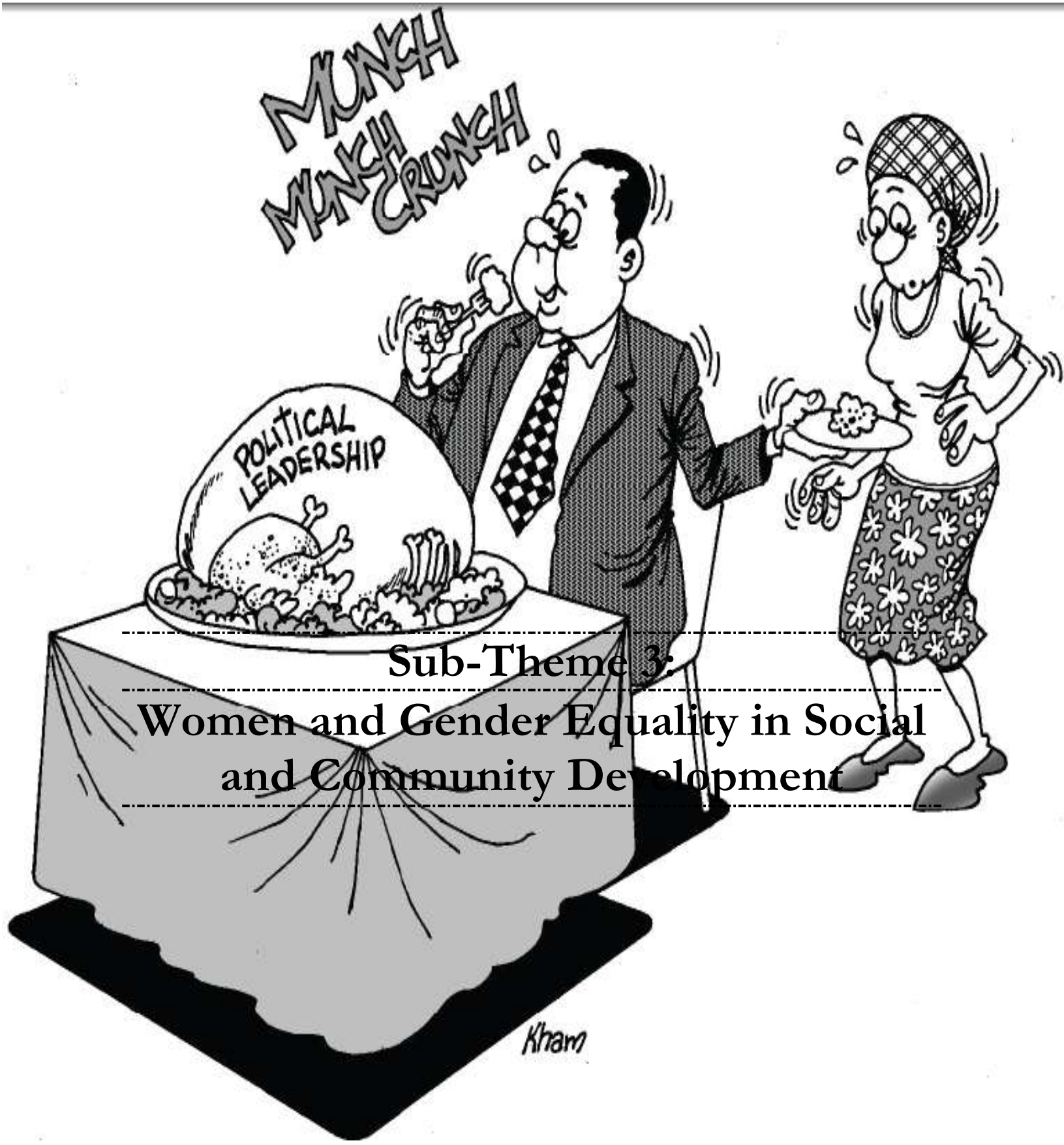

Sub-Theme 3:
Women and Gender Equality in Social and Community Development

Women and Community Development: Issues and Challenges

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Abstract
The question of women participation in community development has been widely debated since 1975 when the United Nations organized the first women's conference in Mexico. This was aimed at giving women equal opportunities with men to spur community development.UN has further come up with programs promoting women in community development as women fight for their space in male dominated community. This is evidenced in Beijing Action. In Kenya, transformative conference was done in 1992 at a National Women's Convention under the theme: Women's Agenda for a Democratic Kenya, over 2,000 women representatives from across the whole country demanded that the democratization be engendered; an overhaul of legal policy framework, to remove all forms of discrimination against women in access to decision-making positions, in employment and community development. Despite progress UN has achieved towards gender equality, women have continued to suffer discrimination all over the world. My paper therefore will focus on forms of discrimination meted against women with special reference to women in Kenya where the gender equality has remained a mystery. The study was guided by empowerment theory, feminism theory and Revolution Theory by Carl marx. According to Ledwith (2005)"Empowerment is not an alternative solution to the redistribution of unequally divided resources". Empowerment is more than providing the resources for one to help them out of poverty, it is an act of providing the necessary tools to shape the whole person and promote a critical way of thinking and consciousness. This theory can be applied to development work through the action of going to a community rather than waiting on the outside to be invited in. My argument is that to attain gender equality will need goodwill from all actors or else it remains paper work and far from reality. Failure to address this inequality may lead to revolutions similar to the ones witnessed in political spheres to bring change. This paper will shed more light on the little recognized roles women can perform to develop the society hence accelerated community development.Therefore,the role of women in community development is significant.

Key Words:

1.0 Background Information

Community development is such a varied practice that it is difficult to establish either a single history or approach. It is practiced around the world, in both the global north and the global south. It can be be practiced as a generalized approach as it is often in the third world that includes the empowerment of community members, the creation of basic infrastructures like water and electricity and the development of housing and commerce(Kenny 2002) or it can be practiced as a highly specialized approach as it is with the United States where a non-profit community development corporation may focus on rehabilitating housing in one neighborhood while another community development corporation concentrates on small business development in another neighborhood(Stoecker 1997).Some community development is practiced as top down elite controlled service provision in poor communities while other community development focuses much more on the building of the capacity of community residents to define their own issues, gather the resources to address those issues, and go to work on solving them(Kenny & Clarke 2010).This latter form of community development brings in the question of community organizing which will be discussed later in another forum.

It is also important to understand that community development is not simply about building things. Safe drinking water, schools, houses and other physical things are of course important. But even more important is building the capacity of the community members to organize them so that they can set and achieve their own community goals. In other words, it is about both building the house and building the capacity of the people to build houses and control them.

The origin of community development can be traced to a number of sources in the U.S.A,Britain and one former British colonial territory,India.Its origins in British colonial territories in Africa do not appear closely related to the noted sources as well as to the efforts of universities and international institutions. This paper traces the origins and growth of community development as a profession and shows the likely connection between the various sources of its origin which include agricultural extension work in the U.S.A and Britain (PSICS 2011).

The fourth world conference on women held in Beijing in September 1995 raised hopes of a substantial improvement in women's condition across the world and particularly in Africa. The Beijing Declaration and program of action considered by the United nations secretary General to be' one of the most remarkable documents ever produced by an intergovernmental conference", commits states to taking concrete action in twelve priority areas in relation to women's autonomy. Ten years after the Beijing and on the heels of the seventh regional conference in Addis Ababa, African women and girls had not really made remarkable gains in such essential areas like fighting poverty (Pambazuka news 2004).

It is important to note that women constitute the majority of electorate yet they are the most underrepresented in decision making fora.The existing legal statutes and widely held traditional beliefs in our partriachal systems place them in a very subordinate position.It has been pointed out by researchers such as Bookman(1973),Abbot(1977),and Feldman(1982) that although women are judicially equal to men before the law,their legal status is in many respects characterized by assumptions of depended on men.These are expressed in marriage and divorce laws and access to land rights. These structural barriers are a clear manifestations that the gender relations and ideology legitimizing it continue to prevent women from moving into profitable opportunities in the economy. The current debate that aims at facilitating or affording women a share of representation in political parties or institutions is a process in the right direction.Infact the political parties act that has been enacted by parliament affirms the principle of women's participation in party structures. Mainstream political parties are using the women inclusion issue as a major rallying point to muster the vast women vote.

Statistics available in third world countries indicate that women constitute nearly two thirds of the rural population. Studies by authors such as (Boserup1970, Palmer1975, Denis1976, Moser1993 and Sall 2000) among others demonstrate that women are the majority of the small scale farmers in the rural areas. They are also the custodians of family life. In Kenya women have a long tradition of participation in community and national development. It should be noted that during colonial days, women were encouraged and also mobilized their energies for community development.

It is important to note that the Government of Kenya has on its part recognized women as vulnerable group and targeted its development efforts towards meeting women's needs. Evidence of these efforts is reflected in the formation of the women's Bureau in 1975, to coordinate women activities. The abortive marriage between the national Maendeleo ya Wanawake organization and then ruling party, KANU, during the one party system in the late 1980s was a testimony to such efforts.In the recent past, police focus has been on the affirmative action to integrate women into the mainstream development process. This has been through the appointment of women to key positions in decision making organs. The

government is also addressing this by reservation of a third of any appointments to women. There is also the National committee on the status of women (NCSW) supported by the government among other efforts. Currently the Government has set up a women development find with an initial budgetary allocation of Ksh. 2 billion. This indicates its commitment towards the challenges facing women in the development process.

Statement of the problem

Women are making large but frequently "invisible" economic contribution, particularly in agriculture and the informal business sector while men tend to dominate the formal sector. More than 75 per cent of women live in rural areas (ILO 2004), where they dominate the agricultural sector (floriculture, tea, coffee, vegetables, cereals, poultry, mangoes and oranges).Women work for longer hours due to their dual role of production and reproduction as compared to men. On average women work for 12.9 hours as compared with 8.2 hours for men, yet women earn less because more of these hours are not remunerated(Saito,Mekonnen,andSparling 1994).According to World Bank Report(2004),women face more severe legal, regulatory and administrative barriers to starting and running business than do their male counterparts. This constituted a gap that this paper intended to address. The purpose of this paper was to re-examine issues and challenges facing women in community development with specific reference to Kenya.

Assumptions of community development

The theoretical concepts and practice of community development is based on a number of assumptions and principles.However, in this study we will deal with assumptions though sometimes assumptions and principles are rarely distinguished. Community development as a process may be based on some assumptions which may include but not limited to the following|:

1. It is assumed that the society is democratic enough and all members of a democratic society need to have access to both social and physical science knowledge to help them improve their lives. The underlying notion emphasized is that local people (Target beneficiaries) have to assume responsibility for improving their well being development.

2. It is assumed that community development will develop or strengthen local organizations and groups and to ensure coordination of their activities. Local leadership of these organizations and other formal and informal leadership within the community have to be identified and developed through relevant training which increases the ability problems, plan solutions, implementations and manage the activities.

3. It is assumed that there are adequate resources to implement the community development strategies. The community mobilizes and uses its own material and monetary resources. Members of the community have to work with the community development worker in determining the resources that are locally available and how they can be used. They have also to determine resources that are locally available and how they can be used. They have also to determine the resources that have to be imported.

4. It is assumed that community development work has to be entrusted to trained professionals who knows what needs to be done and who have the skills for doing it. The reason is that social

science knowledge is much difficult to apply in view of the changing nature of social science relationship. Individuals have also to choose to make use of the knowledge.

From the aforementioned assumptions, it is evident that women have continued to be marginalized in community development due to patriachical nature of the society. Democracy, economic leadership, property and land ownership and education is dominated by men and therefore even assumptions of community development are engendered.

Methodology

The study was guided by empowerment theory, feminism theory and Revolution theory.. According to Ledwith (2005)"Empowerment is not an alternative solution to the redistribution of unequally divided resources". Empowerment is more than providing the resources for one to help them out of poverty, it is an act of providing the necessary tools to shape the whole person and promote a critical way of thinking and consciousness. This theory can be applied to development work through the action of going to a community and waiting on the outside to be invited in. The idea of "trading lightly "is to work along individuals and not possess an overarching power. Action need to be taken through advocating for change on both an individual, community and policy level. Empowerment can be obtained through working together and forming a collective state of consciousness that promotes and encourages change.

On the other hand, one cannot talk of women without feminism. According to Tuyizire (2007) women and men are made rather than born, thereby defining as a socially learned behavior. Tamale (1999) challenges the dominant position taken by men in almost all aspects of life, and stresses that women have started defying custom, culture discrimination and marginalization to join politic. Feminism therefore is an important theoretical and ideological tool that provides women with an instrument for challenging gender based oppression and advocates for a more inclusive socio-economic and political agenda. It also has the ability to accommodate women's social diversities and identities which should be accorded space and voice to engage in social development and political change. Based on this argument, the study found out barriers women encounter on pathway to community development.

Revolution theory explains that systems of exploitation inevitably lead to some form of revolution, whether violent or non-violent. Some conditions leading to revolution include: widespread grievancies, rising expectations, blockage of change of legitimacy of government, military breakdown or politicalization and class coalitions like peoples power. When women rise up and compete for space with men, it is obvious that the donkey is tired and further pressure on it will just worsen the situation. Women can no longer keep quite in matters of community development.

Similarly, the expectations society has of women in community development are informed by the same patriarchal values. Women are expected to carry the burden of production and reproduction in all social welfare needs, including the women's and children's agendas and all disadvantaged peoples. At the same time, they are expected to maintain higher ethical, aesthetic and moral standards than their male counterparts. This amounts to unfair treatment of women.

The place of women in community development

Women place in the context of African culture has moved from the kitchen to the market place.Wome today play a crucial role in the development of any society. It thus becomes impossible to talk of community development without articulating the role of women (Masinde 1987).

The approaches to women issues in development have evolved over time. In the 1950s and early 1960s, the strategies adopted mostly focused on welfare where women were viewed as victims of underdevelopment and thus needed assistance.However, from the 1970s, there was a paradigm shift in the ways in which women issues in development were were approached. From 1970s, when the women decade was declared, and after meetings in Mexico in 1975, Copenhagen in 1990, and Nairobi in 1985, there was emphasis on the equity and anti-poverty approaches. The focus was to give women opportunities to enhance their status and productivity especially in agriculture.However, these approaches did not seem to realize the desired results until the Beijing women's conference of 1995.In this conference, there was worldwide adoption of the efficiency and empowerment approaches.

At this point in time, women were perceived as a resource for development. This era was characterized by issues of affirmative action, reservation and inclusiveness in all spheres of life in society. Womens role in development should therefore be understood within this context of changing development approaches. In Kenya today, there is encouragement of women to actively participate in politics in order to entrench themselves in the decision making process. Evidence of this is the emergence of women's lobby groups, to engage established traditions (Masinde 2002).

Women are a disadvantaged group when it comes to planning environments despite various policy pronouncements (Muuzale and Leonard 1982) have also indicated that women's groups activities are further constrained by seasonal labour demands on their individual family holdings. When it reaches its peak ,the poorer women who cannot afford hired labor tend to drop out from collective group activities.Apparently,these are the times when groups engaged in agricultural related activities which need women's labor. This directly contributes to underdevelopment in part of women.

Challenges facing women in community development

Every country in the world wants to rank top on the list of most developed nations in the world. Development is not that easy to achieve especially if there is less production, a country economy is stagnant or there are hindering factors such as gender inequality which is a core issue which has been highlighted. Gender disparity or discrimination poses immense impact on development that every nation should be well versed with.

Discrimination is another challenge faced by women. It is based on sex, tribe, caste, racial or ones language. Where discrimination agaist women exist, definitely it will result in underdevelopment. As mentioned before, women constitute half of the world population. When they are marginalized, then half of the world is left out of production and therefore a country or community production is cut by half. In Kenya specifically, discrimination is evident in areas of land ownership. We cannot talk of community development without land being one of the factors of production. Women property rights are property and inheritance rights enjoyed by all women as a category within a society at any point in time. The patterns and rights of property ownership vary between societies. The lack of control over the productive and non-productive resources that is apparent in both rural and urban settings places women at a reduced level of advantage in areas of security of home, maintaining a basis for survival and accessing economic opportunities (Steinzor, Nadia 2003).

Culture also serves no good in community development. A good reference here is china. China may be a major power now but it was the world's most developed country in the middle ages and stagnated or went backwards for centuries. Part of this was cultural, pride and sense of self sufficiency that led to a closing of Chinas borders."China seems to have long been stationary"."A country which neglects or despises foreign commerce cannot transact the same quantity of business which it might do with different

laws and institutions (Smith, 1776).However that has changed but nationalism, suspicion, or radical philosophy still has some countries closed down to outside involvement on ground of communism in North Korea or extremist Islam in Taliban Afghanistan locking countries out of development. This can be inferred to exclusion of women in community development.

Women's access to finances is another challenge. Land and property ownership rights has often restricted their access to formal financing mechanisms and decreases their contribution to Kenya's economic growth due to discriminatory African customary laws which tend to favor men. This is made worse in event that the husband dies and the man's community takes over the deceased property. This is due to the prevalence of a collateral based banking system and lack of credit bureau that could capture women's excellent repayments rates in microfinance are key constraints (Besley,T 1995).

The assumption that community development work has to be entrusted to trained professionals who knows what needs to be done and who have the skills for doing it poses another challenge of inequalities in access of education. The cost of education is the most common cause for girls dropping out of school (Government of Kenya 2002) In general, when the cost of education increases at the household level, househ, families tend to prefer schooling for boys. Factors such as teenage and early marriages also lead to lower transition rates to secondary and tertiary education for girls who are potential(Kimalu et al.2002).Women's lower education levels results in their lower formal labor force participation, as well as higher fertility and lower levels for skills for women entrepreneurs. A growing body of macroeconomic evidence shows that gender inequalities in access to schooling constrain productivity and output.Klasen uses education spending as a share of GDP, initial fertility levels, and changes in these as instruments for levels of, and changes in, the female-to-male ratio of years of education. He concludes that gender inequalities have a significant and adverse impact on economic growth rates (Klasen 1999).

HIV/AIDS and gender related violence are of paramount importance in this study. The increasing number of widows and orphans resulting from a high number of HIV/AIDS cases have significantly increased women's workload and their financial responsibilities (USAID 2002).This has caused changes in land use, household labor and financial standing because of loss of financial assets, increased costs of living, increased burdens of care giving and orphan fostering and general disintegration of family ties. All these factors negatively impacts on women participation in development. On the other hand, physical and sexual violence meted against women and girls are on the increase. This is because the patriarchal society still holds belief that women are part of their property and therefore what a woman produces belongs to her husband. This is evident in African customary laws regarding land and property ownership. For instance, under customary law, there is a general principle that a husband should manage his wife's property, whether acquired before or during marriage. Thus a married woman may use matrimonial property, but she cannot dispose of it without her husbands consent. This amounts to gender violence. Further, under customary law, a man beating his wife can be considered reasonable chastisement and may therefore take place with impunity. Gender based violence clearly inhibits women's ability to participate actively in public and economic life (World Bank 2004).

Emerging issues in community development

Community development cannot be exhausted without special mention to the emerging issues. Much attention has been given to matters of sustainability and globalization at the expense of of regionalism, technology, the housing crisis and local food systems. These issues count most in community development.

The concept of regionalism has received attention on and off during the past half century especially in the field of housing and education. The central idea of regionalism is that the economic, environmental and social issues facing the communities transcend political boundaries (Dreier, Mollenkopf, &Swanstrom, 2004).Further; the importance of regionalism in community development can be understood in the contexts of economic markets and the environment.

Economic markets are not limited geographically to local communities. It is imperative to note that today people live in one place, work in another and consume in yet another place. This has created a challenge to community development practioners.Jobs created in one community may benefit workers from another community. The local government in which workers live may not see increases in tax returns because employer is located elsewhere. And many of the costs of providing education and infrastructure may be borne by other communities not benefiting from from the job creation. It is on this ground that regional approaches to community development have attempted to some places to provide innovative tax structures that spread the benefits of economic development across all the communities in the region.

Another illustration of regionalism may be understood in the environment. Many times the source of environmental problem may not be in the community that is being affected, but in neighboring localities. In the case of water pollution, farmers upstream may may contribute to the problems in lakes and rivers downstreams.Watersheds cross political boundaries and can make it difficult to regulate or to develop collaborative solutions. These two examples demonstrate how many of the issues facing communities are regional in nature.

Today one cannot continue living in denial that the world we live in is a global village. This villaginization of the world is made possible through informatics. Community informatics refers to the growing practice of using information and communication technology within communities to promote interaction and collaboration(Gurstein ,2007).Community informatics and community development have essentially the same goals-to enhance community processes and selp-development.Community informatics emphasizes dispersed network structures that permit autonomous(almost individualized)action. The concept of the communinity tends to stress the importance of common values and norms that are the basis of collective action. The two concepts potentially overlap in the field of community development.

Integrating community informatics in community development is important in two areas. One benefit is that community informatics is built from the ground up and minimizes centralized control over community processes. Much of the community development literature emphasizes the importance role that the social institution play in bringing together people to promote interaction ,which ultimately facilitates trust and the flow of information(Wilkinson,1991).However there is a growing evidence that new technology can promote social networks(Wellman 2001).Many people prefer to interact with others through this medium and it is possible that this interaction achieves many of the same goals that more conventional social institutions have played in the past. Community informatics can be used as part of the participatory process to engage residents who are unable to participate through other venues. Youth and the elderly may be able to use new technology to overcome barriers to participation.

In community development is the concept of housing. Housing is a "bread and butter "issue of community development practitioners. All contributors to community development need housing hence nothing is more placed than housing. To stress the importance of housing we can learn from surveys. In survey of community development corporations, housing typically is identified as the top category among the various activities in which these organizations are involved. (National Congress for Community Economic Development, 1995).The focus of most community development efforts has been on home ownership. Changes in banking regulations have made it more difficult for low income families to purchase homes. This poses a serious threat to community development. When a community lacks housing some workers may not be able to take advantage of job opportunities hence the community losing the expertise needed for community development. Therefore you one cannot delink the housing crisis and community development.

Discussion, Recommendations and Conclusions

In this chapter we have discussed women participation in community development. It is important to understand vital roles played by women. Women are underprivileged when it comes to community development as a major challenge. The paper has addressed several challenges facing women in community development specifically discrimination based on sex, tribe, caste, racial or ones language besides cultural practices as was the case with India, land and property ownership rights, inequality in education,inaccess to financial mechanisms,HIV/AIDS and gender related violence. From the study it was found out that there are so many emerging issues which make women not to actively participate in community development. The major one was globalization. Others are regionalism, community informatics, housing crisis and food crisis. These issues mostly affect women.

This paper is not exhaustive and therefore a further research on the same is recommended. World governments and community development actors are called upon to come up with policies which shall promote women participation in community development.Further, world governments should come up with legislation which gives equal play ground between men and women in community development.

My argument is that to attain gender equality will need goodwill from all actors or else it remains paper work and far from reality. Failure to address this inequality may lead to revolutions similar to the ones witnessed in political spheres to bring change. This argument is based on conflict theory by Karl Marks (1867).The theory provides that conflict is normal and not abnormal and social change is constant and inevitable. It provides that change is exploited when low social classes overthrowing those exploiting them. According to Karl Marx, tension is the driving force behind social change.Conflict theories see society as made up of parts that are in constant state of conflict.Further, inequality is the single source of conflict in the world. This theory explains that even those believing that their problem is due to Gods will as told by their pastoral leaders/clergymen will soon fail to tolerate domination by their clergymen and soon will turn agaist oppressors. This is where women in community development have reached.

According to Wright mills, in every nation there are power elites-the minority controlling national affairs. These include government officials, military, business people and academicians. This minority manipulate people by misusing education. They do these by maintaining high level of adult illiteracy in terms of information accessibibility thus resulting to having yes men and women. People with little or no information may lack confidence and capacity to question or make appropriate judgement on issues. This makes it easy for people to be controlled if illiteracy in terms of education is promoted. The moment people realize they are oppressed they tend to turn against their oppressors. This is indicated by the way communities elect or reject elected leaders. When this takes roots nationwide, it becomes a revolution aimed at bringing in a new regime. The reaction to oppression is a conflict to correct the situation.

After independence of many African countries, her leaders continued with the same colonial exploitation both political and economic spheres contrary to the expectations and objects of fighting for freedom. This made Africans to react to oppression through coup, tribal clashes and mass action to counter long standing regimes. This is a case in point in Africa demonstrated by Libyan, Egyptian and many of the west African states in recent years which had recorded long standing regime of oppression.Strugle in industry between labor and management to bring about more just relationship is also an example of the most popular conflicts in many economies including Kenya.Therefore, just as political oppression results in revolutions, the same can happen where economic oppression exists. Men are alive to this fact and in recent years they have started giving women chance in community development to avoid revolutions (Gitonga 2011).

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The Role of Technology in Empowering Women: Global Perspective

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Abstract
Technology has become a strong force in transforming social, economic, and political life globally .The paper sought to establish why most women are in the deepest part of the divide further removed from the technology age than the men whose poverty they share. If access to and use of these technologies is directly linked to social and economic development, then it is imperative to ensure that women in understanding the significance of these technologies and utilize them. If not, they will become further marginalized from the mainstream of their countries and of the world. The paper looks into reasons why many people dismiss the concern for gender and technology on the basis that development should deal with basic needs first. Technology can be an important tool in meeting women's basic needs and can provide the access resources to lead women out of poverty .This paper highlights that Women, Gender, and Technology is an interdisciplinary volume, which contributes new insight into the ways in which issues of gender and technology infuse career structures, the use and adoption of technology, and the construction of commercial and business forces in the knowledge economy. The paper shows that the intersection of gender and technology has significant implications not only for women's careers, but also for the greater realm of science policy, operations, and achievement.

Key Word: *Technology, Innovations, Gender*

1.0 Introduction

Women are significantly underrepresented in information and communicationTechnologies (ICT) in most countries in most countries, there is not "a clear pattern that can help to explain why the differences between men and women with respect to computing occur in some countries and cultures, and not in others." (Galpin, 2002), p. 95) Huyer cites a Nigerian study by Ajayi and Ahbor in which women opposed ICT study because it overexposed young women to a Western lifestyle, thus endangering their chances for marriage. (Huyer, 2003) Technology therefore earns its place as an anomaly over the past generation or Two: an area in which women's professional achievement has actually regressed, as contrasted with virtually all other areas of importance to women. In view of the growing role of technology in the world at the beginning of the 21st century — in education, Communications, occupations, and entertainment, and as a tool for solving the world'sProblems — women's low and decreasing representation is a major worry. Early work on gender and Information and Communication Technologies (ICT) in education focused on a few issues that are now less relevant. Concerns about girls' limited *access* to computers, while well founded at the time, have receded now that schools tend to have sufficient hardware. (Anderson, Welch& Harris, 1983; Campbell & Gulardo, 1984; Sanders, 1985) Access to home computers, however, is still problematic due to competition with male family members (Gunn, 2003), important because students can get as much access to a computer in one weekend at home as in an entire year at school. (Linn, 2005)

Concerns about girls' low interest in computers because of an association with*Mathematics* have receded somewhat but not completely with girls' and women'sGains in mathematics since then. (Collis, 1985b; Dambrot, Watkins-Malek et al.,1985; Gressard & Loyd, 1987; Munger & Loyd, 1989)

Finally, concerns about college women's *physical safety* going to and fromEarly work on gender and Information and Communication Technologies (ICT) in education focused on a few issues that are now less relevant

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2.0 Developmental stages with respect to gender and technology

1. Societal Influences

Because gender bias pervades societies throughout the world, we can expect tofind gender bias influencing girls' choices in many ways. As Vasilios Makrakis put it, "agender-biased society teaches girls to have gender-stereotyped interests." (Makrakis,1992, p. 285) Parents are one source of gender stereotypes with respect to computing. In Romania and Scotland, parents had more stereotyped computer attitudes than their children. (Durndell, Cameron, et al., 1997) In the United States, parents, especially White and high-SES parents, were found to give less computer-related support to girls than to boys (Kekelis, Ancheta, et al., 2005). Shashaani found that parents' computer stereotypes in favor of males encouraged their sons' computer involvement and discouraged their daughters' (Shashaani, 1994), and that girls who perceived their parents as believing computers were more appropriate for males were in fact less interested in computers (Shashaani, 1997). The results of another study of Iranian students echoed Shashaani's 1997 findings for American children. (Shashaani & Khalili, 2001). Finally, while not specifically about computers but relevant for our purposes, an intriguing studyof family behavior in science museums found that both parents but especially fathers explained the content of interactive science exhibits three times more to sons than to daughters, even to children as young as one, while parents were twice as likely to explain the content of interactive music exhibits to daughters than to sons. (Crowley, 2000) Media. Magazines have been reviewed for gender stereotyping and found wanting by several researchers. (Knupfer, Kramer & Pryor, 1997; Ware & Stuck, 1985). In analyzing a computer magazine written for educators, Sanders found that men were about 75 percent of people portrayed and mentioned. (Sanders, 1998) Knupfer examined computer advertisements, the Internet, television and movies and found rampant gender stereotypes about people in technical roles. (Knupfer, 1998; Knupfer, Rust & Mahoney, 1997) Hoyles wrote a good review of the literature on the stereotyped public image of computers (Hoyles, 1988).

2. Race and Ethnicity

Many reports exist that students of color are afforded lessertheir numbers in the population. (Hess & Miura, 1985) I found two papers that specifically addressed the situation of females of color with respect to computing, pointing out that such students are subject to the double discriminatory burden of femaleness and minority status. (Edwards, 1992; Women and Minorities in Information Technology Forum, 1999) Morrell found that a day-long Saturday program for middle school girls had a stronger effect on girls of color than white girls. (Morrell, Cotten, et al., 2004). Another extracurricular program, Techbridge in California, discovered that girls were self-segregating by race and that racial tensions

developed in the group. When staff tried intervention activities, it was noted that girls with lesser technical skills and lower self-confidence were at particular risk of dropping out from attempts to force them to cross racial lines. The interventions were only partially successful. (Kekelis, Ancheta, et al., 2004)

3. Socio-Economic Status.

Often incorrectly confounded with racial/ethnic factors, studies in the United States, Australia, Iran, and the UK were unanimous in correlating high parental SES, particularly higher parental educational achievement, with greater computer encouragement of girls. (Attewell & Battle, 1999; Chambers & Clarke, 1987; Kirkman, 1993; Shashaani, 1994; Shashaani & Khalili, 2001). Children attending lower SES schools had poorer computer resources and were less likely to have computers at home. (Hickling-Hudson, 1992; Opie, 1998)

4. Male culture of ICT

There is a wealth of research on the male-dominated cultureof computing. Among the commentators who have pointed out the negative effects of American Association of University Women, and the New York Times. (American this culture on women are the Information Technology Association of America, the Association of University Women Educational Foundation Commission on Technology, Gender and Teacher Education, 2000; Information Technology Association of America, 2003; Markoff, 1989) Thoughtful analyses of the hallmarks of the male computing culture — invisibility, exclusion, condescension, hostility, an emphasis on speed and competitiveness, and other dynamics — have been published every decade since the 80s. (MIT Computer Science Female Graduate Students and Research Staff, 1983; Seymour & Hewitt, 1997; Gurer & Camp, 2002; Margolis & Fisher, 2002) Women students speak of "the harassment of continually bumping into male egos." (Durndell, Siann & Glissov, 1990, p. 159) we are reminded, however, that "even male, experienced engineering and science students encountered computing as an alien culture," making us wonder who then is well served. (Sproull, Zubrow & Kiesler, 1986, p. 257) Elkjaer, writing of ICT in Denmark, points out that masculinity, not femininity, is the problem when boys retreat into the computer to avoid human interactions and when they consider themselves the hosts in that environment, with girls as guests. (Elkjaer, 1992)

Several researchers have indicated that the violentlanguage of technology may be invisible to males but can be a problem for females. Consider hard disc, hard drive, reboot, cold boot, hits, permanent fatal error, and so forth. Recreational or even educational software for children often includes title words such as "attack" or "war." (Buckley, 1988; Cole, Conlon et al., 1994; Gurer& Camp, 1998; Linn, 1999; Spertus1991) "it is not necessarily computers and technology *per se* that females avoid, but rather the competitive, male environment that surrounds the field." (Canada & Brusca, 1991, p. 47) The male-intensive computer culture can change, however, when the proportion of women increases.

5. Gender Differences by Age

Most but not all studies have found that gender differences in attitudes and behavior are relatively small at younger ages but increase as students become older. (Hattie & Fitzgerald, 1987; Kirkpatrick & Cuban, 1998; McCormick & McCormick, 1991; Reece, 1986). Twelfth-grade girls in Canada and in China showed a decline in computer attitudes when compared to eighth-grade girls. (Collis & Williams, 1987) A study of college students showed no gender difference by age of student, but this may have been due to the short age span involved. (Koohang, 1986) In contrast, a study by the U.S. Department of Education found that use patterns did not change from elementary to high school. (Freeman, 2004) Another study found gender differences in age which were due more to computer experience than to age. (Dyck & Smither, 1994) On the whole, however, effect sizes in studies on age were larger for older students than for younger ones. Whitley, in a review of 82 studies, concluded: "[G]ender differences in attitudes toward

computers result from socialization processes: the longer that children are in school, the greater the gender difference becomes." (Whitley, 1997, unpaginated copy) He noted, however, that such differences were smaller for college-level students and speculated that perhaps young women with more positive computer attitudes were more likely to go to college.Preschool. Gender issues in computing have been studied with children as young as three, and findings are inconsistent. Most found gender differences in preschool children' attitudes and behavior. Boys but not girls showed a preference for actionoriented software. (Calvert, Watson, et al., 1989) While preschool-age boys spent longer at the computer than girls, girls' computer use increased with time. (Bernhard, 1992; Currell, 1990) In New Zealand, three- and four-year old boys considered computers to be for boys while girls thought they were for both boys and girls. (Fletcher-Flinn & Suddendorf, 1996) One study found that boys viewed the computer as masculine but girls saw it as feminine (Williams & Ogletree, 1992), while another early study found no gender stereotyping among preschoolers at all. (Beeson & Spillers, 1985)

6. Pipeline Issues

The term "pipeline" refers to the trajectory from taking computer Courses in high school on through college or graduate school and into ICT careers several writers have offered additional reasons: family balance problems (Pearl, Pollack, et al., 1990), the use of freshman courses to weed out students (Bohonak, 1995), and less financial support than men have (Leveson, 1990). Aparticularly interesting theory comes from the analysis of data from 21 countries: women's ICT representation tends to be relatively high in countries that score low as liberal egalitarian societies. They speculate that in countries where women have a freer choice of careers, gender stereotypes lead them to make stereotyped career choices, and that "Restrictive government practices that minimize choice and prioritize merit may actually result in more gender-neutral distribution across fields of study." They conclude

7. Experience, Attitude and Use Patterns

Experience. An overwhelming majority of studies have found that boys have greater computer experience than girls, and in many countries: for ICT women have not had extensive computer experience, they erroneously infer the women's lack of ability or interest which presumably leads to differential treatment in class. (Gurer & Camp, 2002)

8. Liking and Interest

With some exceptions, many studies and in many countries find that boys have more positive feelings about the computer than girls — boys tend to like computers more and are more interested in them. Again with some exceptions, many studies find that the level of computer experience correlates with liking and interest Typically, studies find that computer liking and interest decrease with age for both girls and boys but more strongly for girls. (Gurer & Camp, 2002; Lage, 1991; Shashaani, 1993; Whitley, 1997) Krendl found that while girls' attitudes decrease with age, their sense of computers' value and usefulness increases (KrendlBroihier & Fleetwood].

9. Comfort and Confidence

By and large, studies find that females' comfort level with computers increases (and anxiety decreases) with experience. I found severaltudies that examined the relationship of computer confidence with masculinity or Femininity as measured by the Bem Sex Role Inventory, and all five agreed that positive Computer attitudes correlated with high masculinity for both males and females, not with Maleness *per se*. (Brosnan, 1998a, 1998b; Charlton, 1999; Colley, Gale, & Harris, 1994; Ogletree & Williams, 1990) another determined that girls scoring high-feminine weredrawn to Web sites by their appearance, while high-masculine girls were drawn by their content. (Agosto, 2004). Some studies found that males' and females' confidence in their computer ability was equal (DeRemer, 1990; Dyck & Smithe1994; Houle,

1996; Jennings &Onwuegbuzie, 2001), but most found females' confidence level significantly lower than that of males even when females were more successful than the males in the class. (Gurer & Camp, 1998; Selby, 1997; Shashaani, 1997) Girls with lower confidence are likelier to drop out of computer programs (Kekelis, Ancheta, et al., 2004). Parental encouragement correlates with confidence for both girls and boys, but boys receive more of it. (Shashaani, 1994; Shashaani & Khalili, 2001) Girls had lower confidence in their computer skills in studies conducted in Hong Kong (Lee, 2003), Australia (Lee, 1997; Ring, 1991), New Zealand (Selby, 1997), and in a 20-nation study (Reinen & Plomp, 1993). In the United States in a huge annual survey of incoming college freshmen, the Gender gap in computer confidence was wider than it had ever been in the 35 years of the survey, with males twice as likely as females to view their computer skills as above average. (Sax, Astin, et al., 2001) A recent approach to boosting females' computer

10. Anxiety

Confidence, however, is "pair programming," discussed in Section 4, In the Classroom.

There is also a healthy literature on computer anxiety, although it seems to have wound down a bit. Most studies have found computer anxiety higher in females than in males, at all ages and in many countries. One study found that females who dropped out of computer courses had higher computer anxiety than those who stayed, but that males who dropped out had *lower* anxiety than those who stayed. (Nelson, Weise & oper, 1991) Another, following students for three years, found girls more anxious

11. Self-Efficacy

Females consistently under-estimate their technology skills regardless of what their skills really are. Betty Collis memorably referred to girls' tendency to deprecate their own skills but assert confidence in females' skills in general as the "I can't, but we can" aradox. (Collis, 1985a [T]he task of changing the outcomes of women's education in computer technologies is more complicated than simply teaching them how to use computers. … It is also necessary to change how the women (and the men around them) understand and talk about the presence and competence of women." (Henwood, 1999, p. 24 and 25) In South Africa, female university ICT students predicted they would receive lower grades for the course than males; in reality they received quite similar grades. (Galpin, Sanders, et al., 2003)

12. Distance Learning

Evidence here is contradictory, with some showing positive and some negative results for women in distance learning. Two studies indicated that females do better in electronic learning environments, or at least prefer them, than in face-to-face classrooms (Hsi & Hoadley, 1997; Leong & Hawamdeh, 1999) One study found that online academic discussions equalized female and male contributions. (Linn, 2005) In New Zealand, women performed better online than in a classroom environment in a Web design course. (Gunn, 2003) More women posted more frequently than males in an online chemistry course, significant in part because frequency of posting correlated positively with course performance, especially for women. (Kimbrough, 1999) Others found nonexistent or tiny gender differences in online behavior. (Atan, Sulaiman, et al., 2002; Atan, Azli, et al., 2002; Davidson-Shivers, Morris & Sriwongkol, 2003; Ory, Bullock & Burnaska, 1997) .Some evidence shows negative results for distance learning. Roy and colleagues

3.0 Conclusions

We know that parental influence on daughters' technology interests and behavior varies by SES and educational level, but does it vary by racial/ethnic group? One rather glaring hole in this review is research on teachers from their point of view. What is it that makes teachers want to help close the computer gender gap? Could that motivation or skill set be more widely shared with their colleagues? As

long as gender equity in technology depends on the voluntary efforts of activists and researchers trying to influence the education establishment, progress for women will remain slow or nonexistent, or might even regress further than it has already. With more aspects of life invested in technology with each passing year, the senseless waste of so much talent delays solutions for humanity's ills.As Myra Sadker, the late gender equity advocate, used to say, "If the cure for cancer is in the mind of a girl, we might never find it." Myra died of cancer when she was only 54. The person who finds a cure will need a solid background in technology.

What can we do, each and every one of us, to make it possible for that girl to find the cure some day?

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Differential Effects of Gender Groups on Entrepreneurship in Western Kenya

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Abstract

This paper is to examine the effect of gender group differential effects on entrepreneurship in western Kenya. The study provides an understanding of the entrepreneurial contextual factors influencing Women and youth entrepreneurship. The study was focused on three streams of entrepreneurship and its impact on Women and youth entrepreneurship. The study was undertaken in Bungoma and Uasin Gishu Counties which were ASALI project research sites. A survey method was adopted and evidence for this study was based on primary and secondary data sources. Data was analysed with the assistance of SPSS software. Limitations of this study were reliance on a sample instead of undertaking a complete census of enterprises and relying on self-reported data. The results show that the hypothesis were supported on gender group differential effects on the socio-economic profiles, on the nature of firm profile and on entrepreneurial profiles. The study concludes that gender group differential effects on various variables was statistically significant. Gender differences between female adult and youth categories was statistically significant on most aspects while within the youth group was not. This paper will be of practical value to entrepreneurs, policy-makers and practitioners interested in the complex interactive relationship between women and youth entrepreneurship.

Keywords: *Contextual factors, impact, Women and youth, entrepreneurs, sustainable livelihood, entrepreneurship.*

1.0 Introduction

Entrepreneurship offers opportunities to many of the world's vulnerable segments of the society so as to earn a sustainable livelihood (United Nations, 2014).In Kenya 46 per cent of the population lives below the poverty line (World Bank, 2013). Female and youth entrepreneurial activities contribute substantially to economic development in the developing world thus drawing a lot of attention in literature. As a result, there is enhanced research on female and youth entrepreneurship. The Kenyan Government and other stakeholders have supported female and youth entrepreneurship and innovation development through various interventions. Female and youth entrepreneurs are key stakeholders in the Kenyan economy who represent a valuable but largely untapped resource. Hence, emphasis on female's entrepreneurship development is highly relevant to the implementation of the Kenyan Micro and Small Enterprises Act (2012).

The Kenya Vision 2030 mainstreams gender equity in all aspects of society (Ministry of Planning and National Development, Kenya National Economic and Social Council, 2007). The Vision identifies opportunities, empowerment, capabilities, and vulnerabilities as core in addressing gender equity. Female and youth tend to be among the most vulnerable in society. The vulnerability is caused by among other factors limited (or no) access to the labour market and those assets are essential for enterprise capitalization (e.g. knowledge, land, credit). Female have been disempowered at the household, community and national levels of economic participation which further complicates their situation. This scenario has affected their potential to engage in entrepreneurial activities in order to improve their livelihoods.

Kenya's population is predominantly young with the age group 15-35 years accounting for approximately 38 per cent of the total population (Ministry of state for planning, National Development and Vision 2030, 2012). Youth aged 15 to 34 constitute two thirds of the workforce (Omondi, 2013). Similarly, female across all ages constitute about 52% of the population (Ministry of state for planning,

National Development and Vision 2030, 2012). The Kenyan Government hence, faces a significant unemployment problem with youth being hit hardest. Accelerators in Kenya include, entrepreneurial contextual factors and entrepreneurial culture among others. Kenya like other developing countries faces a serious unemployment problem which can appropriately be addressed through entrepreneurial activities. Female and youth face serious unemployment challenges hence, entrepreneurship could be an important vehicle in enhancing the desired employment (Langowitz & Minniti, 2007). Nassiuma (2011) alludes that marital status and gender of the respondents has no significant relationship with enterprise performance. This assertion is further supported by a World Bank study which states that formally registered firms led by female perform as well as - or in some cases better than - male-owned firms in a number of dimensions (OECD, 2012).

In order to fully utilize the human resource capital of female and youth, it is imperative that their entrepreneurial competences be scaled up. In spite of the various efforts undertaken to date, there is little improvement in the livelihood of female and youth entrepreneurs. Notable challenges facing the youth include limited finances; minimal support from government or failure to reap benefits from existing government initiated youth programs; inappropriate education systems and inadequate skills training opportunities; poor infrastructure, insecurity of persons and property (Katongole, Mulira, & Ahebwa, 2014).Shah & Saurabh, (2015) supports the argument regarding challenges facing female entreprneurs such as lack of access to support networks, issues relating to gender or cultural acceptance, lack of basic education, lack of technical skills and knowledge about business and lack of market knowledge. These challenges are among the explanatory factors attributed to inhibitors to entrepreneurial success among female and youth entrepreneurs.

In a study carried out in Uganda and Kenya it was found that the marital status of the majority of the rural youth entrepreneurs in Uganda were married (62%) as compared to Kenya. The study further alludes that Female were not allowed to live on their own because of fear that men could easily impregnate them.Equally over 80 per cent of enterprises had no employees in Kenya and Uganda (Katongole, Mulira, & Ahebwa, 2014). According to Katongole et al.(2014) the ultimate goal is to create a business environment where male and female entrepreneurs have equal access to economic and financial resources(Katongole, Mulira, & Ahebwa, 2014) in order to flourish. Findings on the enterprise age in a study conducted in Kenya and Uganda shows that most of the youth owned enterprises were in the age category of 1-3years (Katongole, Mulira, & Ahebwa, 2014; Namatovu , Dawa, Mulira, Katongole, & Nyongesa, 2012). Gender &Marital status of the majority of the entrepreneurs over 50% were male. Also, most of the respondents were married. In Kenya, the highest educational level was secondary while in Uganda the highest educational level was primary (Katongole, Mulira, & Ahebwa, 2014).

Education and training of female and youth is vital given that it enhances their idea generation and opportunity search which results in the creation of entrepreneurial ventures (Bhardwaji, 2014). Some of the small holder training programs provided by trainers to entrepreneurs were found to be inadequate owning to lack of proper training needs assessment (Shibanda , Jemymah, & Nassiuma , 2001). Previous work experience is significant when starting an independent enterprise (Sonja, Marija, & Vladisavljev, 2012). This suggests that experiential learning in previous employment may be transferred to the new ventures.

Entrepreneurship thrives well within an entrepreneurial environment which is conducive. However, most entrepreneurs especially female and the youth are seriously affected by the legal and regulatory constraints and limited enterprise support (Nassiuma, 2011). Female entrepreneurs lack an entrepreneurial culture and the resulting experience (Lassithiotaki, 2011) hence cannot effectively operate

their ventures. Arthur, Hisrich, & Cabrera, (2012) suggests the need for finding stability, access to improved infrastructure, entrepreneurship education and training, government policies that support entrepreneurship, self-motivated, positive social image of entrepreneurship, role models, strong entrepreneurship network, access to finance, risk tolerance, ethics and transparency.

The optimization of entrepreneurial activities is to a great extent dependent on access and utilisation of resources however, capital accumulation was greatly influenced by the entrepreneurs' age at start-up (Nassiuma, 2011). Access to credit by female entrepreneurs is mostly informal sources of finance (Equality for Growth, 2009). Several authors suggest that entrepreneurial competencies constitute a resource which can influence enterprise performance in specific contexts (Nassiuma, (2011);Sajilan & Tehseen, (2015).In order for female entrepreneurs to grow their enterprises they need to cultivate an entrepreneurial spirit which can stimulate access to greater opportunities for exploitation hence greater prosperity for them and their families. Equally, family support could spur the realization of their potential (Imbaya, 2012; Haseena, 2014). Strategies put in place to *reduce* gender disparities and address vulnerabilitiesinclude, provision of financial support to female to raise their incomes and reduce the gap in estimated earned incomes between men and female; Increase of funds and training available to female and youth entrepreneurs (MPND & Vision 2030, 2012; youth employment, 2012). Lack of resources, vulnerability and poor institutional support were identified as constraints to the long-term sustainability (Kabir, Hou, Akther, & Wang, 2012). Inspite of the importance of entrepreneurship as a vehicle for enhancing the quality of life of entrepreneurs, its acceptance alone is not enough hence the need to for an enabling environment that depends on the preparedness of the community and policies promoting entrepreneurship (Kamaruddin & Samsudin, 2014). Family background, entrepreneurial context and necessity motivation are construed to have a relatively strong positive significant effect on small business growth while the owner's age has a negative effect on small business growth (Eijdenberg, Pass, & Masurel, 2015).

This study was conducted in Bungoma and Uasin Gishu Counties in Western Kenya. The study investigated the gender group's differential effects on entrepreneurship. The specific objectives were to; compare firm, female and youth entrepreneurial profiles, compare the socio-economic profiles of female and youth entrepreneurs and analyse challenges facing female and youth entrepreneurship. Based on the findings of this study this research draws a set of practical recommendations to enhance female and youth entrepreneurship with the final goal of improving their livelihood outcomes.

The Kenyan government has put in place many initiatives to address female and youth entrepreneurship as a strategy to national development. However, there is limited understanding on the initiatives that work and what does not work. Hence, the need to examine the gender groups differential effects on entrepreneurship in western Kenya.

1.1 Theoretical foundations

The theoretical foundations of this study were based on the Achievement Motivation Theory by McClelland (1961) and the biological theory of entrepreneurship by Eagly (1995). According to McClelland's theory, there are three types of motivational need, which include achievement motivation, authority/power motivation and affiliation motivation. These needs are found in varying degrees in all people. This mix of motivational needs characterizes a person's behaviour, both in terms of being motivated, and in the management and motivation of others. An achievement motivated person will always seek achievement and attainment of realistic but challenging goals. It can be argued that while most people do not possess a strong achievement-based motivation, those who do, display a consistent behaviour in setting goals which is critical in entrepreneurship development. The motivation to achieve

has the potential to unravel the dynamic inclination of an individual towards entrepreneurship. This theory sheds light on elements such as personality characteristics, individual's environment, enterprise's environment, specific business ideas, respondent's goals, access to role models and friends and inclinations to entrepreneurship and success. It also explains how they influence emerging patterns of entrepreneurship and access to information and self-assessment that culminates in the identification and grasping of opportunities.

On the other hand, Biological Theory of Entrepreneurship according to Eagly (1995) focuses on the dialogue about gender and entrepreneurship. In literature, several of the academic theories of gender differences offer explanations based on deeply seated cultural or even biological differences between men and female. They also tend to emphasize gender differences, construing them as core aspects of what it means to be a man or a woman in the entrepreneurial process. A more promising recent line of research has suggested that entrepreneurs differ in cognitive style from others and that they may be more likely to make particular cognitive errors (Baron, 1998 and Palich and Bagby, 1995), especially errors of overconfidence (Busenitz and Barney, 1997). Psychologists have documented moderate and consistent levels of differences between men and female in risk-taking behaviours. Studies have found that men were significantly more likely than female to engage a variety of risky activities. It is argued that males took more risks even when it was clear that it was a bad idea to take a risk and that Female seemed to be disinclined to take risks even in fairly risky situations or when it was a good idea, leading to the speculation that men and boys would tend to encounter failure or other negative consequences more often than female and girls. It is further argued that female and girls would tend to experience success less often than they should (Byrnes et al., 1999, p.378).

The above theoretical paradigms provide a context within which we can understand entrepreneurship discourse among female and youth. This is well captured in the conceptual framework discussed below.

1.2 Conceptual Framework

The study focuses on three dimensions of entrepreneurship: the individual (i.e. potential entrepreneur), the context/ environment which encompasses the bundle of external factors that may stimulate/ hinder the emergence of an enterprise and the enterprise. Based on literature, the demographic, entrepreneurial competencies and challenges were identified as key in the study. For each element, a number of indicators were used. The conceptual framework of this study is presented in Figure 1.

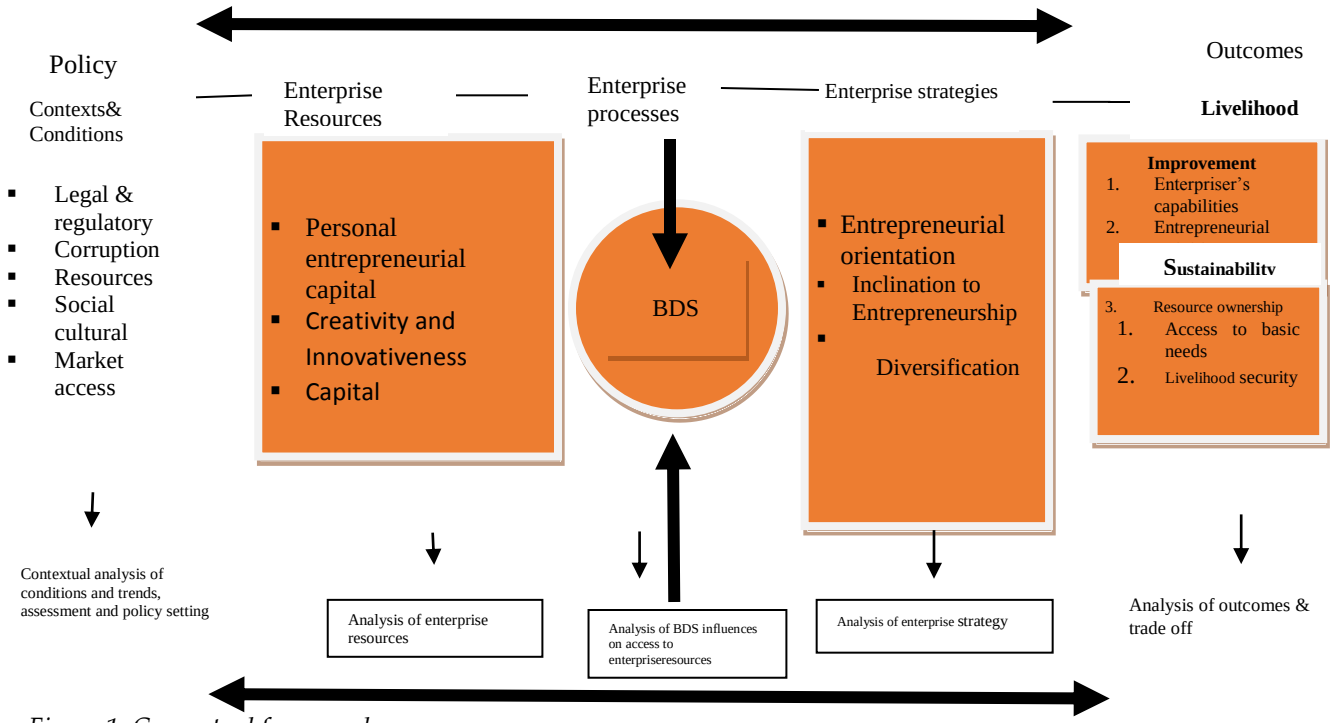

Figure 1: Conceptual framework

Source: Adopted from Scoones (1998) and modified (Scoones, 1998.)

3.0 Methods

The methods section is presented on the basis of the setting of the study site, data collection instruments, data analysis andlimitations of the study. Collecting primary data in contexts such as Africa can have major difficulties for researchers (Kolk & Van , 2010). However, data was collected from all the respondents targeted in the study. This study adopted a survey research method anchored on the qualitative and quantitative approaches. The research sites were Uasin Gishu and Bungoma Counties in Western Kenya which were purposively selected being the project focus. The study sites in Bungoma County comprised of urban and peri-urban areas, mainly where Female and youth entrepreneurs had set-up innovative enterprises to improve their livelihoods; namely; Bungoma town, Bumula, Chwele, Kimilili and Webuye. In Uasin Gishu the study sites included the central business District, Soy, Turbo, Moiben and Ainabkoi. Most of the respondents were identified in the central business District of Eldoret town owing to the high population of Female and youth entrepreneurs. The study sample was a representative of the study sites and comprised of female and youth entrepreneurs who had operated their enterprises for a period of over one year. The entrepreneurial activities in which the respondents were engaged included; trade, service and manufacturing. Study respondents were within the category of micro and small enterprises. Primary and secondary data sources were used in this study. Data was collected from respondents, checked for errors, summarized and analysed using descriptive statistics. Data was presented using tables, frequencies and graphs.

The questionnaire and interview guides were developed basing on a literature review and a pre-study consisting of expert interviews before the main study. The data was collected between February and March 2016. In the main study 698 respondents completed the questionnaires. The study tools were administered by research assistants who had been recruited and trained. Research assistants had to meet the minimum threshold of either pursuing a degree in entrepreneurship or business related area and had either graduated or substantially progressed in the degree programs. Questionnaire contents were structured to address the objectives in the study. Data collection instruments were tested for reliability

using cronbach alpha, (.951) for items on entrepreneurial competencies and .908 for challenges facing entrepreneurs Descriptive statistics was used focusing mainly on proportions (Alan, 2012). Non parametric statistical tests conducted on differences among groups was Kruskal Wallis test.

This study faced some limitations including; reliance on a sample instead of undertaking a complete census of enterprises or increasing the number of clusters. It is the view of the researchers that the number of female and youth respondents in the areas not covered are expected to be insignificant and do not seriously influence the outcomes of this study.

4.0 Results

The results are presented on the basis of the study objectives to; compare firm, female and youth entrepreneurial profiles, compare the socio-economic profiles of female and youth entrepreneurs and analyse challenges facing female and youth entrepreneurship.

4.1 Firm, socio-economic profiles of female adult, female youth and male youth entrepreneurs

Female and youth entrepreneurs' profile elements were marital status, age, educational level, entrepreneurial experience and employment status before start-up of the entrepreneurial ventures.

4.1.1 Marital status

Based on data collected and analyzed, (Table 2) the marital status of adult female respondents showed that the majority (Uasin Gishu, 71%; Bungoma, 74%) were married followed by single and the least were widowed or divorced. Youth female respondents equally, had the majority (53%, 55%) in the married category in Uasin Gishu and Bungoma Counties respectively. This was closely followed by single persons and the least were in the category of widowed and divorced.

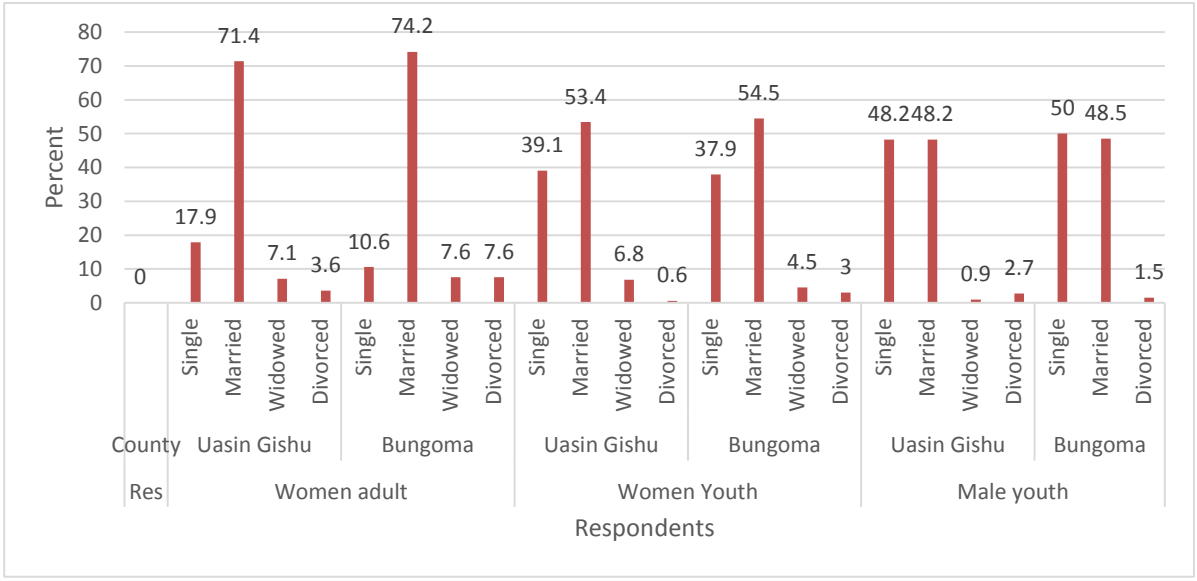

Figure 2: Presents the respondents by county, location and marital status

4.1.2 Gender of the Respondents

The results on the gender of respondents indicate that the majority (58.3%) were Female while male youth constituted 41.7 %.

4.1.3 Age of Respondents

The enterprise owner's age categories (Table 3) show that the mean age of respondents in the study was 33 years. Adult female respondents had a mean age of 47 years in Uasin Gishu County and 45 years in Bungoma County.

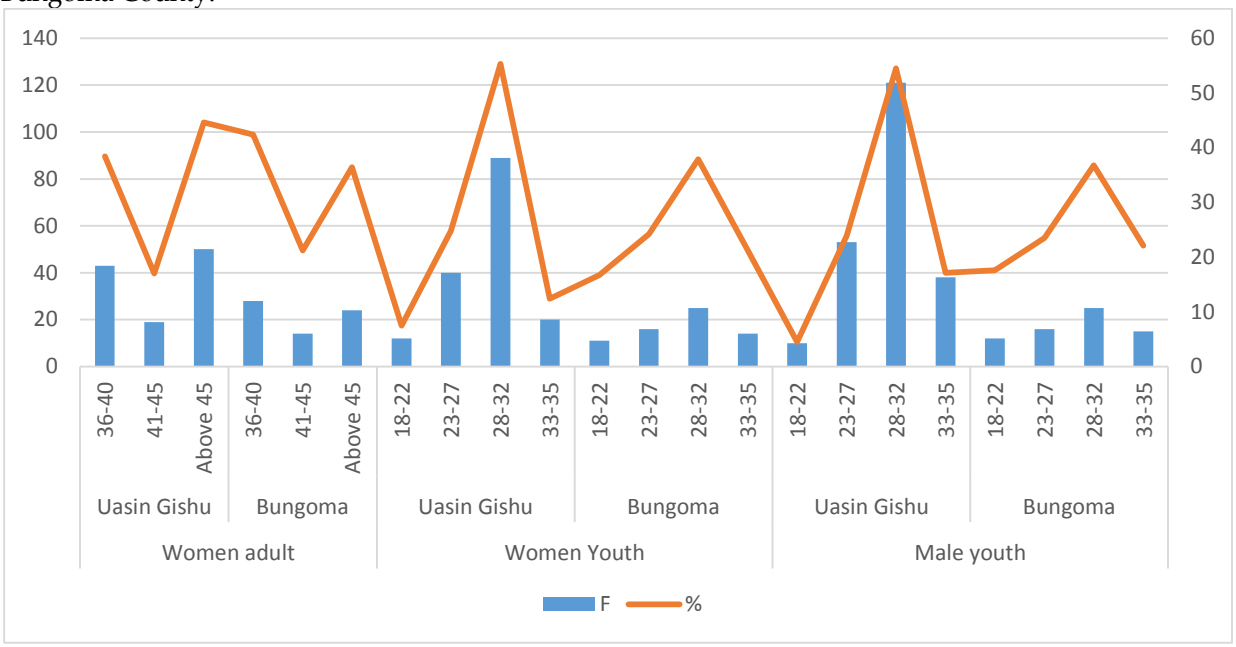

Figure 3: Enterpriseowners age categories

The mean age for Female youth respondents was 29 years in Uasin Gishu while in Bungoma was 28 years. The majority of the Female adult respondents were in the age category of over 50 years and 36-40 years in Uasin Gishu County and Bungoma County respectively. The majority of female and male youth respondents in the two Counties were in the age category of 28-32 years.

4.1.4 Education

The educational level of respondents (Figure 4) indicate that the majority of respondents had attained a secondary school educational level in all the study Counties, with an exception of Female adults in Bungoma County who had the least in this category (19.7%). This was closely followed by primary educational level except for Female youth respondents in Uasin Gishu County, where secondary level was followed by college level (18%).

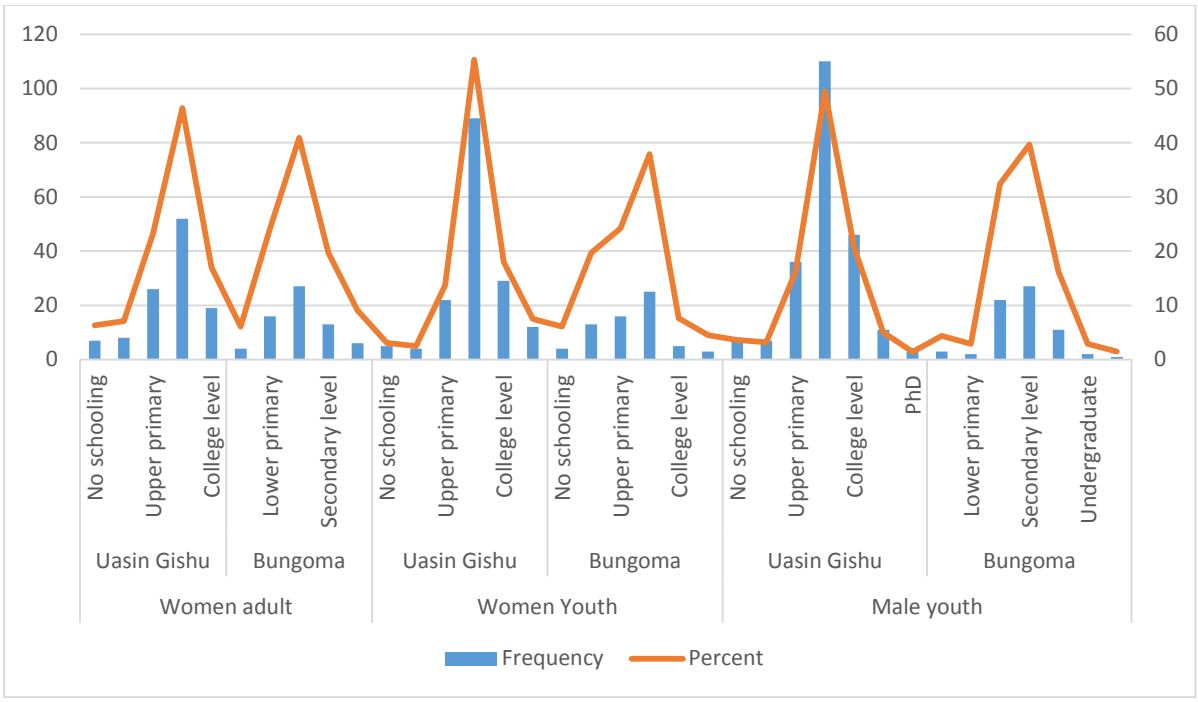

Figure 4: Respondent's educational levels

4.1.5 Entrepreneurial experience

The respondents entrepreneurial experience (Table 5.), shows that female adult respondents in Bungoma and Uasin Gishu Counties were in the experience categories of 7-10 and 1-3 years respectively female and male youth respondents were in the experience categories of 1-3 years respectively.

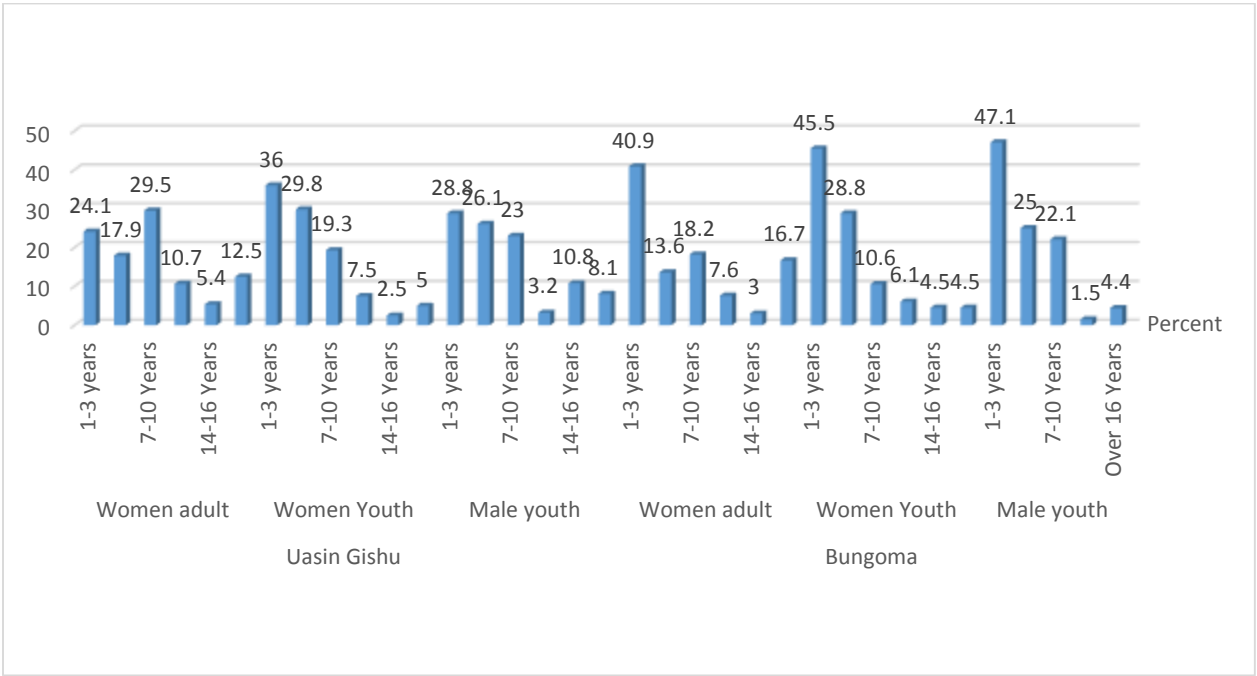

Figure 5: Respondent's entrepreneurial experience

4.1.6 Employment Status before Start-up Enterprises

The employment status of Female and youth before enterprise start-up is presented in Table 6. The majority (68%) of the Female adult respondents in Uasin Gishu County had no previous employment before enterprise start-up. At the same time, Female youth and male youth in Uasin Gishu and Bungoma Counties equally had no employment before enterprise start-up. In Bungoma County, more Female adults (53%) had previous employment before venturing in start-up enterprises.

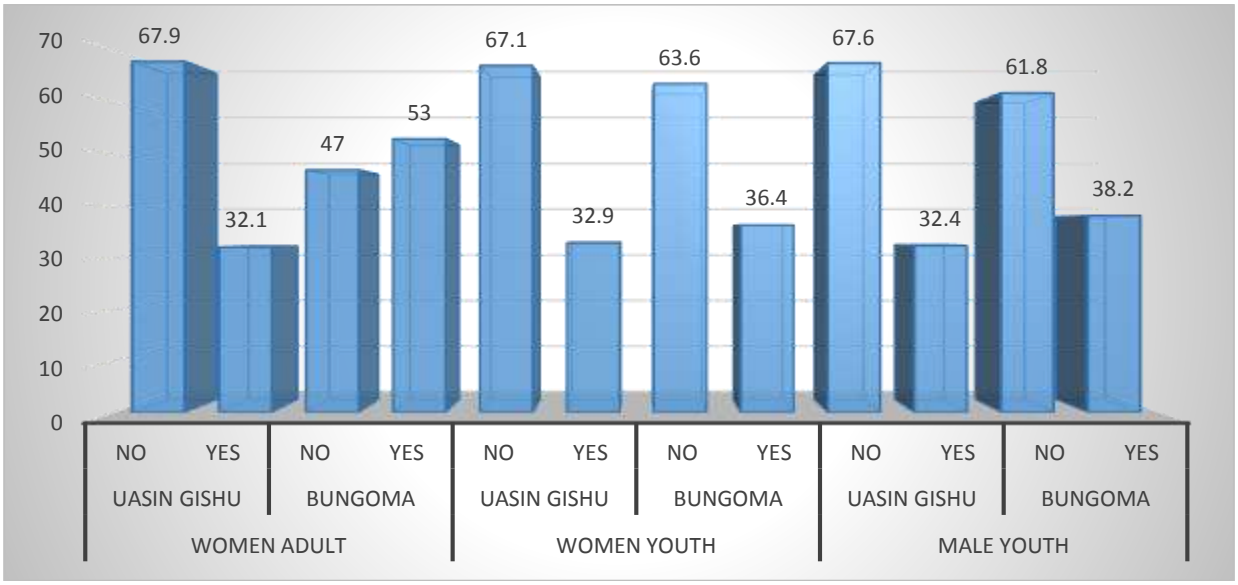

Figure 6: Respondent's employment before start-up by percent

4.2 Hypotheses tested

H0₁: Gender of the respondent has no differential effects on the socio-economic profiles

The results on the gender of the respondent and differential effect on the nature of the firm profile are presented in Table 1. The results indicate that there was a statistically significant difference between gender groups on work experience categories in Uasin ($\chi 2$ (2) = 10.140, p = 0.006) with a mean rank of 236.68 (median = 2.5) for female adult respondents, 227.47 (median = 2.0) for female youth respondents and 268.19 (median = 2.0) for male youth respondents. While in Bungoma County ($\chi 2$ (2) = 6.587, p = .037) with a mean rank of 115.43 (median = 2.0) for female adult respondents, 95.10 (median = 2.0) for female youth respondents and 92.88 (median = 2.0) for male youth respondents. On marital status results indicate that there was a statistically significant difference between gender groups in Uasin Gishu ($\chi 2$ (2) = 14.332, p = .001) with a mean rank of 312.42 (median = 2.0) for female adult respondents, 264.88 (median = 2.0) for female youth respondents and 231.55 (median = 2.0) for male youth respondents. While in Bungoma County there was a statistically significant difference between gender groups on marital status ($\chi 2$ (2) = 26.925, p = .000) with a mean rank of 127.43 (median = 2.0) for female adult respondents, 94.79 (median = 2.0) for female youth respondents and 83.04 (median = 2.0) for male youth respondents. Results on the respondent's educational level in Uasin Gishu indicate that there was a statistically significant difference between gender groups and educational level ($\chi 2$ (2) = 7.787, p = .020) with a mean rank of 175.23 (median = 3.0) for female adult respondents, 251.59 (median = 4.0) for female youth respondents and 253.67(median = 4.0) for male youth respondents. While in Bungoma there was a statistically significant difference between gender groups and educational level ($\chi 2$ (2) = 15.966, p = .000) with a mean

rank of 79.29 (median = 3.0) for female adult respondents, 101.00 (median = 4.0) for female youth respondents and 118.01 (median = 4.0) for male youth respondents.

The results indicate that there was no statistically significant difference between female adult and female youth respondents on work experience categories in Uasin Gishu County. While in Bungoma county there was a statistically significant difference between female adult and female youth on work experience categories ($\chi 2$ (1) = 4.186, p = .041) with a mean rank of 71.20 (median = 2.5) for female youth respondents and 58.40 (median = 2) for female youth respondents. The effect size was 32%. On marital status, there was no statistically significant difference between female adult and female youth in Uasin Gishu County. While in Bungoma there was a statistically significant difference between female adult and female youth on marital status ($\chi 2$ (1) = 13.653, p = .041) with a mean rank of 75.35 (median = 2) for female adults and 54.62 (median = 2) for female youth. On Educational level, there was a statistically significant difference between female adult and female youth ($\chi 2$ (1) = 7.958, p = .005) with a mean rank of 83.85 (median = 2) for female adults and 121.35 in Uasin Gishu County (median = 2) for female youth. While in Bungoma there was a statistically significant difference between female adult and female youth on Educational level ($\chi 2$ (1) = 4.363, p = .037) with a mean rank of 57.57 (median = 2) for female adults and 70.8 (median = 2) for female youth.

The results indicate that there was a statistically significant difference between female adult and male youth respondents on work experience categories in Uasin Gishu County. While in Bungoma county there was a statistically significant difference between female adult and male youth on work experience categories ($\chi 2$ (1) =5.715, p =. 017) with a mean rank of 70.69 (median = 2.0) for female adult respondents and 60.02 (median = 2) for male youth respondents. The effect size was 32%. On marital status, there was a statistically significant difference between female adult and male youth in Uasin Gishu County ($\chi 2$ (1) = 9.417, p = .000) with a mean rank of 188.17 (median = 2) for female adults and 140.53 (median = 2) for male youth. While in Bungoma there was a statistically significant difference between female adult and male youth on marital status ($\chi 2$ (1) = 26.577, p = .041) with a mean rank of 83.08 (median = 2) for female adults and 53.38 (median = 2) for male youth.

Table 1: Kruskal Wallis Test on Differential Effect between Socio-Economic Profiles of Female Adult, Female Youth and Male Youth Entrepreneurs

Profile	Uasin Gishu County			Bungoma County		
	Chi-Square	df	Sign	Chi-Square	df	Sign
Work expcat	10.140	2	0.006	6.587	2	.037
Marital status	14.332	2	.001	26.925	2	.000
Educational level	7.787	2	.020	15.966	2	.000

The post-hoc tests with effect size were conducted are presented in Table 2.

Table 2: Kruskal Wallis test (Post hoc) by county

Profile	Uasin Gishu County			Bungoma County		
Kruskal Wallis test (Post hoc) on differential effect between Socio-economic profiles of female adult and female youth						
	Chi-Square	df	Sign	Chi-Square	df	Sign
Work expcat	.103	1	.748	4.186	1	.041
Marital status	2.819	1	.093	13.653	1	.000
Educational level	7.958	1	.005	4.363	1	.037
Kruskal Wallis test (Post hoc) on differential effect between Socio-economic profiles of female adult and male youth						
Work expcat	1.132	1	.287	5.715	1	.017
Marital status	9.417	1	.002	26.577	1	.000
Educational level	6.922	1	.009	16.861	1	.000

Kruskal Wallis test (Post hoc) on differential effect between Socio-economic profiles of female youth and male youth						
Work expcat	9.902	1	.002	.044	1	.834
Marital status	7.970	1	.005	1.747	1	.186
Educational level	.038	1	.846	2.936	1	.087

The results indicate that there was no statistically significant difference between female adult and male youth respondents on work experience categories in Uasin Gishu County ($\chi 2$ (1) =9.902, p = .002) with a mean rank of 215.94 (median = 2.0) for male youth respondents and 254.65 (median = 2) for male youth respondents. The effect size was 20%. While in Bungoma county there was no statistically significant difference. On marital status, there was a statistically significant difference between female adult and male youth in Uasin Gishu County ($\chi 2$ (1) = 7.970, p = .005) with a mean rank of 225.08 (median = 2) for female adults and 223.52 (median = 2) for male youth the effect size was 16%. While in Bungoma there was no statistically significant difference between female adult and male youth on marital status. On educational level, there was no statistically significant difference between female adult and male youth in Uasin Gishu County and Bungoma counties.

4.3 Enterprise profile

The aspects examined under enterprise profile included; the organisation mode, the choice of enterprise; location, enterprise age, and ownership arrangement.

The majority (66.2% - 85.7%) of the entrepreneurial ventures were sole proprietors' in the two Counties. This is the basic enterprise mode that presents a lot of benefits to the sole proprietor but can limit the growth potential of the venture. The choice of enterprise location by the respondents was based on the factors that can defined the success of an enterprise. The mean age of the enterprise which participated in the study was seven (7) years in the two counties, while the minimum was one (1) year and the maximum was forty (40) years. The mean enterprise age for female adult's respondents was nine (9) years; while female youth was six (6) years; and male youth seven (7) years. Ownership arrangements indicate that the majority (66-87%) of the ventures were owned by sole proprietors in the two counties.

$H0_2$: Gender of the respondent has no differential effect on the nature of firm profile.

The results on the gender of the respondent and differential effect on the nature of the firm profile are presented in Table 3. The results indicate that there was a statistically significant difference between gender groups on Ownership arrangement in Uasin ($\chi 2$ (2) = 129.104, p = 0.000) with a mean rank of 177.38 (median = 21) for female adult respondents, 176.4 (median = 175) for female youth respondents and 313.51 (median = 231) for male youth respondents. While in Bungoma County ($\chi 2$ (2) = 129.104, p = 0.0002) with a mean rank of 88.41 (median = 42) for female adult respondents, 73.74 (median = 53) for female youth respondents and 135.65 (median = 13) for male youth respondents. On enterprise location the results indicate that there was a statistically significant difference between gender groups in Uasin Gishu ($\chi 2$ (2) = 14.942, p = 0.001) with a mean rank of 131.71 (median = 24) for female adult respondents, 211.16 (median = 132) for female youth respondents and 227.17 (median = 146) for male youth respondents. While in Bungoma County there was no statistically significant difference between gender groups on enterprise location. Results on employment status before start in Uasin Gishu indicate that there was a statistically significant difference between gender groups and employment status before start ($\chi 2$ (2) = 17.903, p = 0.000) with a mean rank of 137.39 (median = 22) for female adult respondents, 247.83 (median = 139) for female youth respondents and 257.81(median = 171) for male youth respondents. While in Bungoma there was no statistically significant difference.

The post-hoc tests with effect size were conducted and the results indicate that there was a statistically significant difference between female adult and female youth on enterprise location in Uasin Gishu County ($\chi 2$ (1) = 10.182, p = 0.001) with a mean rank of 69.75 (median = 24) for female adult respondents and 108.49 (median = 123) for female youth respondents. The effect size was 49%. While in Bungoma County it was not significant. On employment status before start-up in Uasin Gishu County the results indicate that there was a statistically significant difference between gender groups ($\chi 2$ (1) = 14.137, p = 0.000) with a mean rank of 70.41 (median = 70) for female adult respondents and 121.57 (median = 139) for female youth respondents. The effect size was 61%. While in Bungoma there were no statistically significant differences.

Table 3: Gender by Differential Effect on Firm Profile

Firm characteristic	Uasin Gishu			Bungoma		
	Chi-Square	df	Sig.	Chi-Square	df	Sig.
Gender by differential effect on firm profile in Uasin Gishu &Bungoma counties						
Ownership arrangement	129.104	2	.000	48.552	2	000
Enterprise location	14.942	2	.001	3.299	2	.192
Basis for choice of location	1.608	2	.448	2.886	2	.236
Business organisation	.769	2	.681	.518	2	.772
Employment status before start	17.903	2	.000	2.912	2	.233
Actual engagement	.472	2	.790	5.464	2	.065
Firm characteristic by county for female adult and female youth						
Ownership arrangement	.002	1	.964	2.154	1	.142
Enterprise location	10.182	1	.001	.078	1	.780
Basis for choice of location	.459	1	.498	3.290	1	.070
Business organisation	.665	1	.415	.297	1	.586
Employment status before start	14.137	1	.000	2.649	1	.104
Actual engagement	.219	1	.639	2.080	1	.149
Firm characteristic by county by female adult and male youth entrepreneurs						
Ownership arrangement	30.709	1	.000	22.061	1	.000
Enterprise location	14.313	1	.000	3.267	1	.071
Basis for choice of location	1.381	1	.240	.981	1	.322
Business organisation	.782	1	.376	.011	1	.915
Employment status before start	18.342	1	.000	1.711	1	.191
Actual engagement	.017	1	.896	5.023	1	.025
Firm characteristic by county by female and male youth entrepreneurs						
Ownership arrangement	122.305	1	.000	46.175	1	.000
Enterprise location	1.920	1	.166	1.733	1	.188
Basis for choice of location	.669	1	.413	.411	1	.521
Business organisation	.013	1	.911	.478	1	.489
Employment status before start	.665	1	.415	.098	1	.755
Actual engagement	.378	1	.539	1.146	1	.284

The post-hoc tests with effect size were conducted and the results indicate that there was a statistically significant difference between *female adult and male youth* on Ownership arrangement in Uasin Gishu County ($\chi 2$ (2) = 30.709, p = 0.000) In Bungoma County the results indicate that there was a statistically significant difference between *female adult and male youth* on Ownership arrangement ($\chi 2$ (2) = 22.061, p = 0.000) On Enterprise location in Uasin Gishu County the results indicate that there was a statistically significant difference between gender groups and Enterprise location. ($\chi 2$ (2) = 14.313, p = 0.000) On employment status before start in Uasin Gishu County the results indicate that there was a statistically significant difference between gender groups on employment status before start ($\chi 2$ (2) = 18.342, p = 0.000) The results on actual engagement indicate that there was a statistically significant differences between gender groups ($\chi 2$ (2) = 18.342, p = 0.000) While in Bungoma County there was no statistically significant differences between gender groups and actual engagement.

The effect size was

The post-hoc tests with effect size were conducted and the results indicate that there was a statistically significant difference between female youth and male youth on ownership arrangement in Uasin Gishu County ($\chi 2$ (2) = 122.305, p = 0.000) with a mean rank of 164.46 (median = 32) for female youth respondents and 294.92 (median = 231) for male youth respondents. The effect size was 26%. While in Bungoma there were no statistically significant differences.

$H0_3$: Gender of the respondent has no differential effect on the entrepreneurial profiles

4.4 Attitudinal Competency

The results on the Kruskal Wallis test (Table 4) shows that gender groups' differential effects on attitudinal competences in Uasin Gishu and Bungoma counties were statistically significant. The null hypothesis was therefore rejected. In order to identify the groups that had significant differences post hoc tests and effect size were computed.

Table 4: Summary Kruskal Wallis Test on Gender Group Differences by Attitudinal Competencies in Uasin Gishu and Bungoma Counties

Attitudinal Competency	Uasin Gishu county			Bungoma County		
	Chi square	df	sig	Chi square	df	sig
Self Confidence	21.836	2	.000	17.235	2	.000
Self Esteem	14.592	2	.001	6.859	2	.032
Dealing with Failures	17.623	2	.000	8.236	2	.016
Tolerance for Ambiguity	10.431	2	.005	16.835	2	.000
Performance	15.878	2	.000	16.956	2	.000
Concern for High Quality	23.268	2	.000	11.463	2	.003
Locus of Control	28.605	2	.000	9.063	2	.011

Post-hoc results on gender group differential effects on altitudinal competencies

The results of post-hoc tests are presented in Table 5.

Table 5: *Post Hoc Tests of Gender Groups Differential Effects on Attitudinal Competency*

Attitudinal Competency	Uasin Gishu county			Bungoma County		
	Chi square	df	sig	Chi square	df	Sig
Female adult/ female youthgroup differential effects on altitudinal competencies						
Self Confidence	20.683	1	.000	3.555	1	.059
Self Esteem	12.855	1	.000	1.900	1	.168
Dealing with Failures	16.790	1	.000	1.67	1	.196
Tolerance for Ambiguity	10.784	1	.000	4.493	1	.034
Performance	15.716	1	.000	4.315	1	.038
Concern for High Quality	21.583	1	.000	3.032	1	.082
Locus of Control	26.643	1	.000	3.841	1	.050
Post hoc tests: Female adult/ male youth group differential effects on altitudinal competencies						
Self Confidence	20.929	1	.000	16.579	1	.000
Self Esteem	13.752	1	.000	6.156	1	.013
Dealing with Failures	16.664	1	.000	7.020	1	.008
Tolerance for Ambiguity	9.094	1	.003	15.206	1	.000
Performance	14.609	1	.000	15.759	1	.000
Concern for High Quality	21.381	1	.000	11.840	1	.000
Locus of Control	27.532	1	.000	7.899	1	.005
Female Youth and male youth group differential effects on Attitudinal competencies						
Self Confidence	.010	1	.921	5.615	1	.018
Self Esteem	.662	1	.416	2.327	1	.127

Dealing with Failures	.047	1	.828	3.702	1	.054
Tolerance for Ambiguity	.125	1	.723	5.680	1	.017
Performance	.045	1	.832	5.372	1	.020
Concern for High Quality	.885	1	.347	2.464	1	.117
Locus of Control	.012	1	.911	2.027	1	.155

The post-hoc test results on the female adult/ female youthgroup differential effects on altitudinal competencies in Uasin Gishu indicates that there was a statistically significant difference between female adult and female youth on self-confidence ($\chi2$ (1) = 20.683, p = 0.000), self-esteem ($\chi2$ (1) = 12.855, p = 0.000), dealing with failures($\chi2$ (1) = 16.790, p = 0.000), tolerance for ambiguity ($\chi2$ (1) = 10.784, p = 0.000), performance ($\chi2$ (1) = 15.716, p = 0.034), concern for high quality ($\chi2$ (1) = 21.583, p = 0.000), Locus of Control ($\chi2$ (1) = 4.493, p = .034). While in Bungoma County apart from tolerance for ambiguity ($\chi2$ (1) = 4.315, p = 0.000), performance ($\chi2$ (1) = 4.315, p = .038) and 038 locus of control ($\chi2$ (1) = 3.841, p = .050) other attitudinal competencies had no statistically significant differences.

Post hoc test results female adult/ male youth group differential effects on altitudinal competencies in Uasin Gishu county indicates that there was a statistically significant difference between female adult and female youth on self-confidence ($\chi2$ (1) = 20.929, p = 0.000), self-esteem ($\chi2$ (1) = 13.752, p = .013), dealing with failures($\chi2$ (1) = 16.664, p = 0.000), tolerance for ambiguity ($\chi2$ (1) = 9.094, p = 0.000), performance ($\chi2$ (1) = 14.609, p = 0.034), concern for high quality ($\chi2$ (1) = 21.381, p = 0.000), locus of control ($\chi2$ (1) = 27.532, p = .034). Equally in Bungoma County gender had statistically significant differential effects on attitudinal competencies (self-confidence ($\chi2$ (1) = 16.579, p = 0.000), self-esteem ($\chi2$ (1) = 6.156, p = 0.000), dealing with failures ($\chi2$ (1) = 7.020, p = 0.000), tolerance for ambiguity ($\chi2$ (1) = 15.206, p = 0.000), performance ($\chi2$ (1) = 15.759, p = 0.034), concern for high quality ($\chi2$ (1) = 11.840, p = 0.000), locus of control ($\chi2$ (1) = 7.899, p = .034).
Post-hoc results on female youth and male youth group differential effects on attitudinal competencies indicate that there were no statistically significant deferential effects in Uasin Gishu while in Bungoma county self-confidence, ($\chi2$ (1) = 5.615, p = .018) tolerance for ambiguity, ($\chi2$ (1) = 5.680, p = .017) performance ($\chi2$ (1) = 5.372, p = .020).

4.5 Behavioural Competency

The results on the gender groups'differential effects on behavioural competency in Uasin Gishu and Bungoma Counties are presented in Table 6. The Kruskal Wallis test on gender groups' differential effects on behavioural competency indicates that there was statistically significant difference on Persistence ($\chi2$ (1) = 12.071, p = .002), Need for achievement ($\chi2$ (1) = 14.957, p = .001), Need for autonomy ($\chi2$ (1) = 25.628, p = .000), Risk-taking ($\chi2$ (1) = 24.735, p = 0.000), drive and energy ($\chi2$ (1) = 53.326, p = 0.000), innovation ($\chi2$ (1) = 29.767, p = 0.000), and creativity ($\chi2$ (1) = 51.473, p = 0.000).

Table 6: Gender by Differential Effect on Behavioural Competency in Uasin Gishu and Bungoma Counties

Behavioural competency	Chi square	df	sig
Initiative	3.886	2	.143
Acting on opportunity	5.527	2	.063
Persistence	12.071	2	.002
Assertiveness	10.224	2	.006
Need for achievement	14.957	2	.001
Need for autonomy	25.628	2	.000
Risk-taking	24.735	2	.000
Drive and energy	53.326	2	.000
Innovation	29.767	2	.000
Creativity	51.473	2	.000

The results indicate that female adults and male youth had significant deferential effects on behavioural competence as presented in Table 7.

Table 7: Gender Groups Differential Effects on Behavioural Competency in Uasin Gishu and Bungoma Counties

Behavioural competency	Uasin Gishu			Bungoma		
	Chi square	df	sig	Chi square	df	sig
Female adult/female youth groups						
Initiative	6.629	1	.010	2.168	1	.141
Acting on opportunity	5.943	1	.015	1.630	1	.202
Persistence	3.852	1	.050	3.884	1	.049
Assertiveness	2.498	1	.114	5.558	1	.018
Need for achievement	1.548	1	.213	1.680	1	.195
Need for autonomy	1.539	1	.215	3.620	1	.057
Risk-taking	2.803	1	.094	2.392	1	.122
Drive and energy	.498	1	.480	3.793	1	.051
Innovation	.133	1	.715	2.216	1	.137
Creativity	.935	1	.333	7.258	1	.007
Female adult/male youth groups						
Initiative	7.807	1	.005	6.982	1	.008
Acting on opportunity	6.327	1	.012	8.631	1	.003
Persistence	2.267	1	.132	12.807	1	.000
Assertiveness	4.367	1	.037	14.516	1	.000
Need for achievement	3.146	1	.076	9.582	1	.002
Need for autonomy	1.730	1	.188	12.458	1	.000
Risk-taking	.969	1	.325	8.422	1	.004
Drive and energy	1.581	1	.209	18.410	1	.000
Innovation	.986	1	.986	10.395	1	.001
Creativity	.077	1	.077	15.261	1	.000
Female Youth/ Male Youth groups						
Initiative	.058	1	.809	1.637	1	.201
Acting on opportunity	.007	1	.934	4.598	1	.032
Persistence	.918	1	.338	3.743	1	.053
Assertiveness	.273	1	.601	3.543	1	.060
Need for achievement	1.255	1	.263	3.660	1	.056
Need for autonomy	.007	1	.931	4.843	1	.028
Risk-taking	3.980	1	.046	3.159	1	.076
Drive and energy	1.458	1	.227	9.428	1	.002
Innovation	.941	1	.332	4.627	1	.031
Creativity	2.439	1	.118	1.092	1	.296

4.6 Managerial competency

The results on gender groups differential effect on managerial competency in Uasin Gishu and Bungoma counties is presented in Table 8. The results indicate that all managerial competency elements were statistically significant;

Table 8: Kruskal Wallis Test on Gender by Differential Effect on Managerial Competencyin Uasin Gishu and Bungoma Counties

Managerial Competency	Chi square	df	sig
Information seeking	37.156	2	.000
Systematic planning & monitoring	37.839	2	.000
Problem solving	34.851	2	.000
Persuasion and Networking	35.481	2	.000
Goal setting & Perseverance	50.418	2	.000

Communication Skill	40.684	2	.000
Technical knowledge	33.019	2	.000
Social skill	31.848	2	.000
Commitment	15.679	2	.000
Decision Making Capabilities	6.262	2	.044

Comparison of the Kruskal Wallis results on managerial competency (Table 9) shows gender groups differential effects on in Uasin Gishu and Bungoma respectively: Persuasion and Networking ($\chi 2$ (1) = 8.936, p = .011) and ($\chi 2$ (1) = 15.762, p = .000); Technical knowledge ($\chi 2$ (1) = 14.770, p = .001), and ($\chi 2$ (1) = 6.606, p = .037); Social skill ($\chi 2$ (1) = 7.630, p = .022), and ($\chi 2$ (1) = 6.869, p = .032). Bungoma county had additional gender groups differential effects on; Information seeking, ($\chi 2$ (1) = 8.802, p = .012). Systematic planning & monitoring ($\chi 2$ (1) = 14.391, p = .001). Goal setting & Perseverance ($\chi 2$ (1) = 15.265, p = 000). Communication Skill ($\chi 2$ (1) = 12.906, p = .002).

Table 9: Gender Group Differential Effect on Mmanagerial Competency by County

Managerial competency	**UG**			**Bungoma**		
	Chi square	**df**	**sig**	**Chi square**	**df**	**sig**
Information seeking	3.817	2	.148	8.802	2	.012
Systematic planning & monitoring	.849	2	.654	14.391	2	.001
Problem solving	6.628	2	.036	10.162	2	.006
Persuasion and Networking	8.936	2	.011	15.762	2	.000
Goal setting & Perseverance	5.637	2	.060	15.265	2	.000
Communication Skill	1.118	2	.572	12.906	2	.002
Technical knowledge	14.770	2	.001	6.606	2	.037
Social skill	7.630	2	.022	6.869	2	.032
Commitment	3.160	2	.206	10.331	2	.006
Decision Making Capabilities	3.305	2	.192	2.407	2	.300

4.7 Post hoc tests on Gender groups differential effects on managerial competency by county

The post-hoc test results on female adult and female youth groups differential effects on managerial competency indicates that there were no statistically significant results in Uasin Gishu on all managerial competency elements. While in Bungoma the statistically significant differentials were on Goal setting & Perseverance ($\chi 2$ (1) = 6.328, p = .012) and Communication skills ($\chi 2$ (1) = 5.030, p = .025).

The post-hoc test results on *female adult and male youth groups* differential effects on managerial competency indicates that there were no statistically significant results in Uasin Gishu on all managerial competency elements. In Bungoma County all elements had statistically significant differential effects except decision making capabilities.

The post-hoc test results (Table 10) on female youth and male youth groups in Uasin Gishu indicates statistically significant differential effects on; Problem solving ($\chi 2$ (1) = 6.295, p = .012) Persuasion and Networking ($\chi 2$ (1) = 8.707, p = . .003) Goal setting & Perseverance ($\chi 2$ (1) = 5.210, p = .022) Technical knowledge ($\chi 2$ (1) = 14.732, p = .000) while in Bungoma Information seeking ($\chi 2$ (1) = 5.299, p = .021) had statistical differential effects.

Table 10: Post Hoc Tests on Gender Groups Differential Effects on Managerial Competency by County

Managerial competency	**Uasin Gishu County**			**Bungoma**		
	Chi square	**df**	**sig**	**Chi square**	**df**	**sig**
Female adult and female youth groups						
Information seeking	.368	1	.544	2.378	1	.123
Systematic planning & monitoring	.024	1	.878	3.477	1	.062

Managerial competency	Uasin Gishu County			Bungoma		
	Chi square	**df**	**sig**	**Chi square**	**df**	**sig**
Problem solving	1.306	1	.253	2.060	1	.151
Persuasion and Networking	1.303	1	.254	1.709	1	.191
Goal setting & Perseverance	.001	1	.982	6.328	1	.012
Communication Skill	.001	1	.971	5.030	1	.025
Technical knowledge	.649	1	.420	3.397	1	.065
Social skill	.337	1	.562	2.687	1	.101
Commitment	.068	1	.068	3.497	1	.061
Decision Making Capabilities	.186	1	.186	1.554	1	.213
Female adult and male youth groups						
Information seeking	2.037	1	.154	8.312	1	.004
Systematic planning & monitoring	.040	1	.842	12.851	1	.000
Problem solving	.000	1	.989	9.908	1	.002
Persuasion and Networking	.039	1	.843	14.141	1	.000
Goal setting & Perseverance	1.261	1	.262	14.551	1	.000
Communication Skill	.249	1	.618	12.472	1	.000
Technical knowledge	.781	1	.377	5.950	1	.015
Social skill	.462	1	.497	6.185	1	.013
Commitment	2.427	1	.119	10.686	1	.001
Decision Making Capabilities	3.123	1	.077	2.081	1	.149
Female youth and male youth groups						
Information seeking	2.600	1	.107	2.527	1	.112
Systematic planning & monitoring	.861	1	.353	5.299	1	.021
Problem solving	6.295	1	.012	3.237	1	.072
Persuasion and Networking	8.707	1	.003	7.626	1	.006
Goal setting & Perseverance	5.210	1	.022	2.131	1	.144
Communication Skill	1.026	1	.311	1.937	1	.164
Technical knowledge	14.732	1	.000	.661	1	.416
Social skill	7.581	1	.006	1.520	1	.218
Commitment	.213	1	.644	.242	1	.242
Decision Making Capabilities	.721	1	.396	.861	1	.861

4.8 Analysis of the Challenges faced by female and youth Respondents

An analysis of the challenges faced by respondents were categorized into resource based challenges, entrepreneurial orientation challenges, management related challenges, corruption related challenges, Legal & political, start-up and family related.Resources constitute an integral component in the entrepreneurial process hence could determine the success of the venture. Resource based challenges facing female and youth respondents are presented in Figure7.

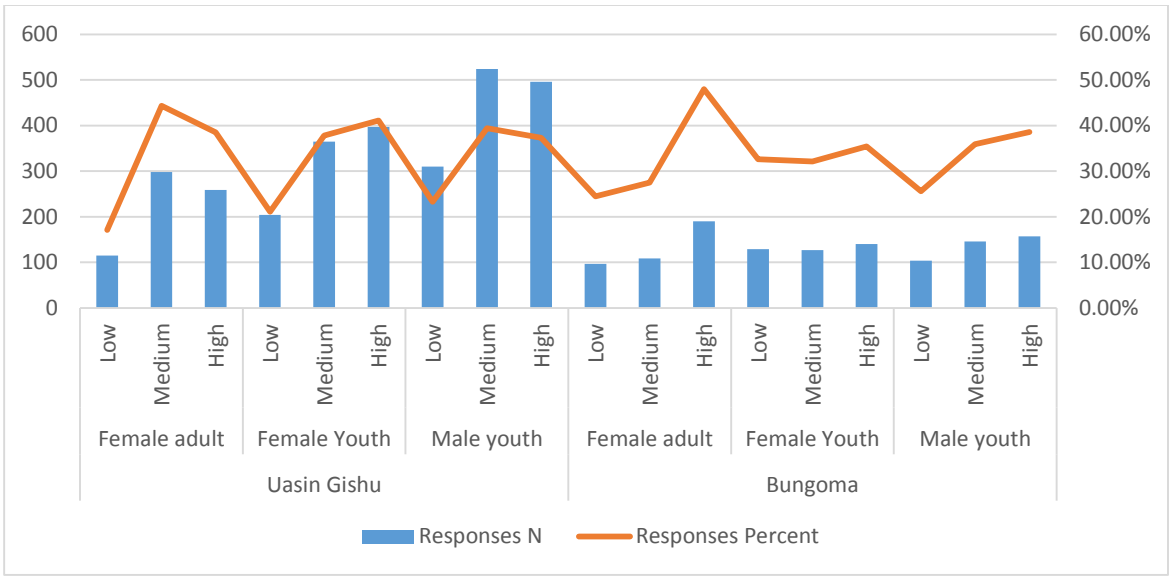

Figure 7: Respondent's resources-based challenges by frequency

The aspects in the analysis of resource based issues included, access to reliable sources of funding, Lack of personal property rights, Access to good market information, Infrastructure (Poor, Roads & Electricity), Problem with bank's attitude towards female and Technological Advancements. The success of failure of an entrepreneurial venture and by extension to the sustainability of livelihoods. The results show that the challenges were of medium (44%) impact on female adult respondents in Uasin Gishu, Female youth respondents was high (41%) and male youth respondents' medium (39%). In Bungoma county female adult respondents indicated resource challenges to be high (48%), female youth medium (35%) and male youth respondents' medium (36%). This could justify why most of these ventures are sole proprietorships.

4.9 Entrepreneurial orientation challenges

The challenges covered under entrepreneurial orientation included negative attitudes towards female/youth in business and Lack of ability to take calculated risks. The results of this study show that adult female respondents in Uasin Gishu considered the challenge high (45%), female youth medium (42%), and male youth medium (36%). While in Bungoma female adult respondents considered the challenge to be high (50%), female youth low (42%) and male youth medium (44%).

4.10 Management related challenges

Management challenges in this study (Figure 8) included, ability to delegate authority to staff, inadequate management experience, managing accurate record-keeping and hiring and keeping good, and reliable staff.

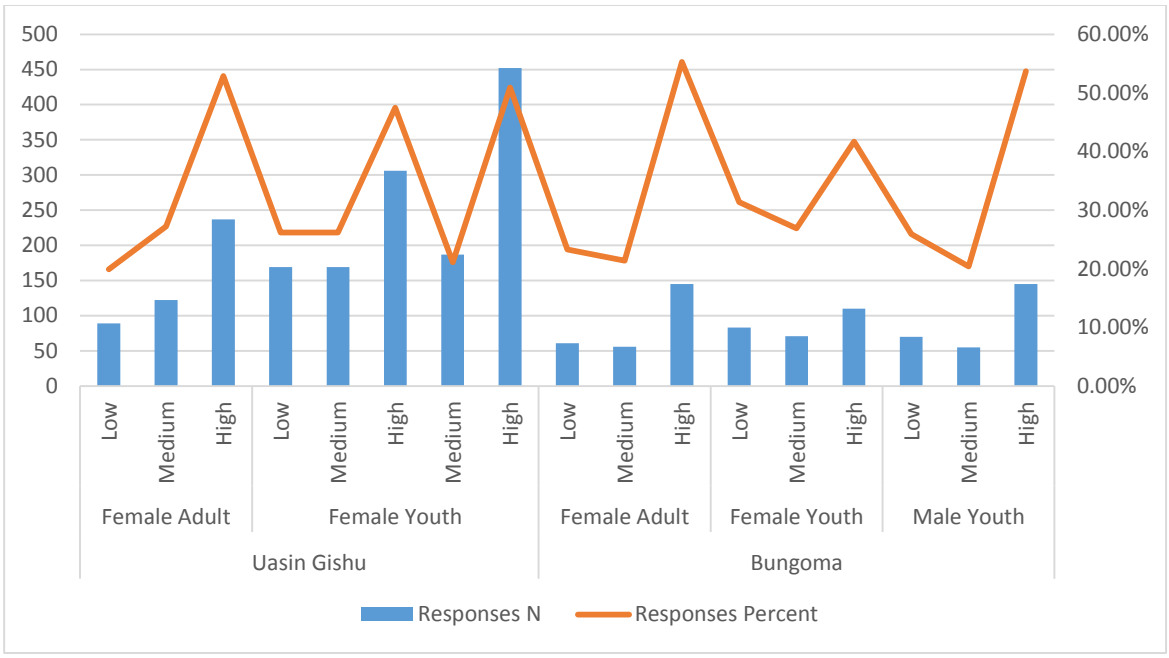

Figure 8: Respondents' management related challenges

The management challenges were in all counties and to respondent's categories high. This can be related to the organizational modes, and perceptions regarding human capital and an empowerment tool to the operation of entrepreneurial ventures. Inappropriate management could result in lack of sustainable livelihoods improvement in the study counties

4.11 Corruption related challenges

The results on corruption challenges (Figure 9) show that female adult respondents in Uasin Gishu considered the challenges to be medium, female youth respondents considered it low (44%), and male youth high (35%). In Bungoma county female adults rated corruption high (38%), female youth rated low (46%) and male youth rated high (40%).

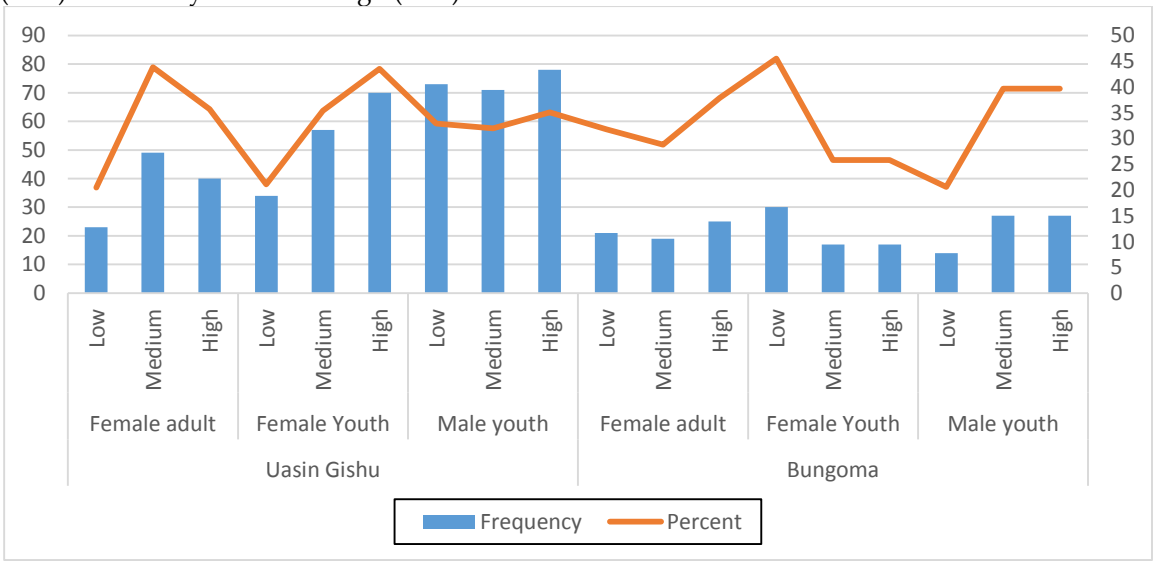

Figure 9: Corruption related challenges by frequency

4.12 Legal & political

The legal and political challenges included political trends and lack of policy for entrepreneurship. The results on the legal and political issues are presented in Figure 10. The results in Uasin Gishu and Bungoma counties show that all respondents rated legal and political challenges to be high.

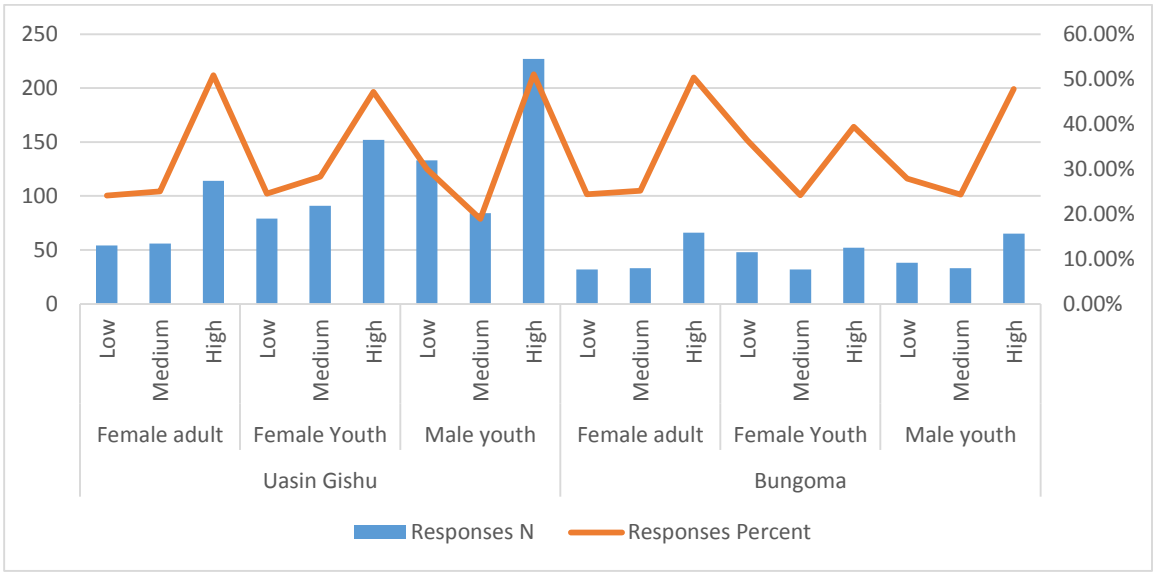

Figure 10:Legal and political challenges by severity

4.13 Start-up challenges

The results in Uasin Gishu and Bungoma counties show that the start-up challenges were high as presented in Figure 11.

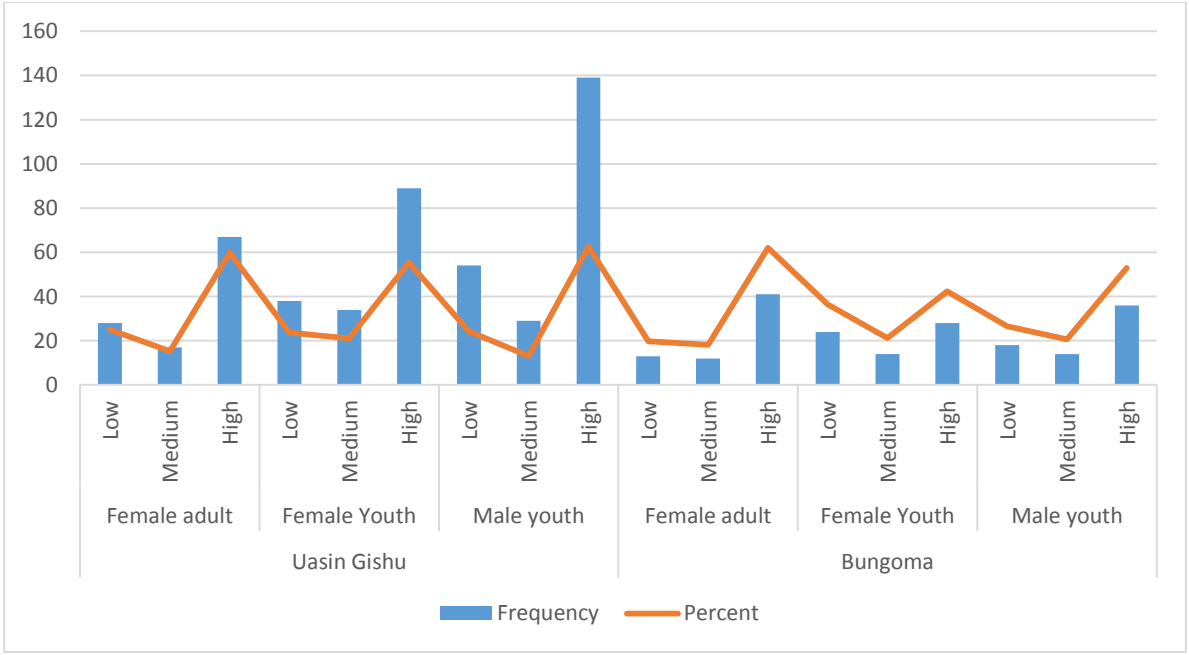

Figure 11.Start-Up challenges rating by frequency

4.14 Family issues

The components on family issues (Figure 12) included maintaining a healthy work/family balance and pressure to provide for other family members. In Uasin Gishu county female adult respondents rated family issues medium (52%), female youth rated medium (40%) and male youth also rated medium (42%). In Bungoma county female adult respondents rated family issues high (35%), female youth respondents low (42%) and male youth respondents high (43%).

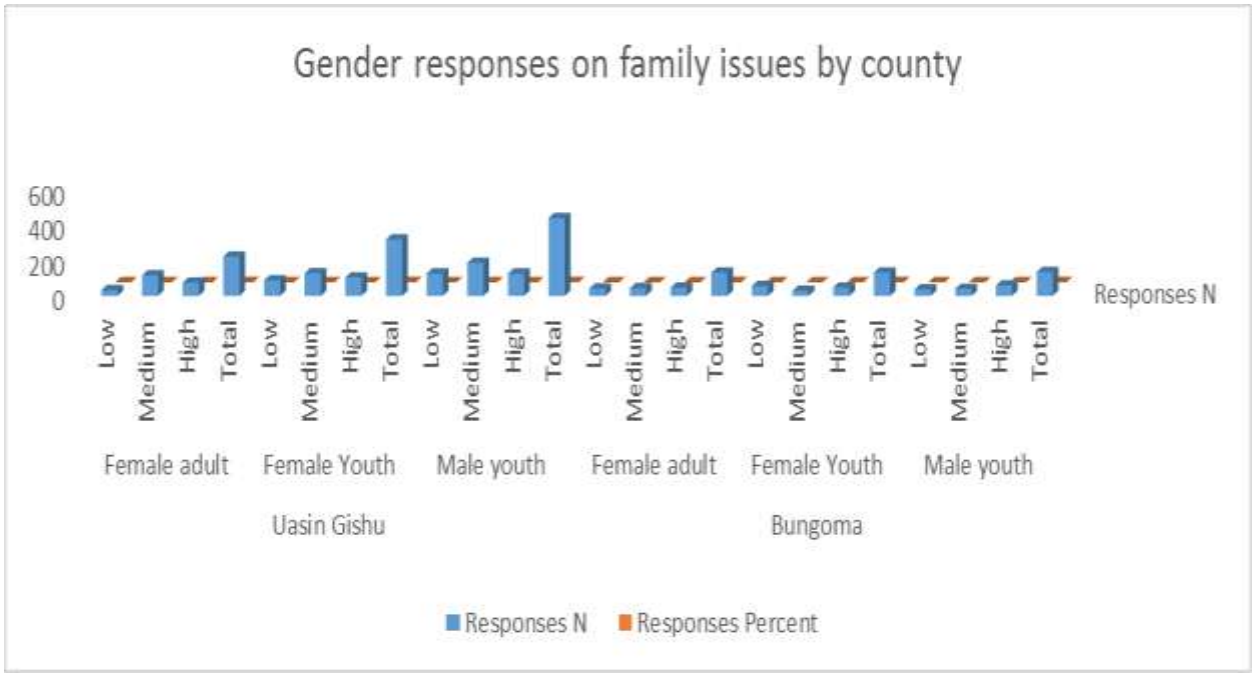

Figure 12: Gender responses on family issues by percentage

5.0 Discussion

The findings from the study suggests that gender groups differential effects on entrepreneurship exists in western Kenya. The aspects include; marital status, work experience, educational levels and choice of start-up strategy in Uasin Gishu and Bungoma counties. Firm characteristics and gender differential effects were statistically significant. Gender groups' differential effects with entrepreneurial competencies was identified including; attitudinal, behavioural and managerial that showed statistical significant differences. Challenges facing female and youth entrepreneurs were also analysed including, corruption, legal and regulatory, entrepreneurial orientation and marketing issues. Respondents considered education to be of increasing importance in the entrepreneurial process.

This finding supports arguments of several authors on the role of education in entrepreneurship development (Bhardwaji, 2014; Katongole et al. (2014); Nassiuma (2011); Shah & Saurabh (2015). However, the level of engagement in entrepreneurship by respondents holding higher education was minimal. This indeed may points to the value attached to entrepreneurship as a career. It may also be an indicator to attractive formal employment opportunities. On the aspect of marital status the majority of the respondents were married in the two counties. A finding which concurs with that of Katongole et al.(2014). The results on the gender suggests that entry of female in entrepreneurship career is at an increasing rate. Family support was found to be an important human capital input. The finding concurs with that of Imbaya (2012) on the need for family support. Adult Female respondents had a higher experience which may be attributed to the age factor. While youth respondents' in the two counties

showed a progression, suggesting that they were starting up new enterprises at a much faster rate in comparison to adult Female. The changing value system, empowerment, culture, education and lack of employment opportunities may be some of the justification for this trend. Female adults had a higher entrepreneurial experience in Bungoma in comparison to Uasin Gishu while the youth have similar findings. As suggested by Sonja, Marija, & Vladisavljev, (2012. The youth (male and female) respondents generally ventured into entrepreneurship arising from either necessity or opportunity. While adult female respondents ventured into entrepreneurship owing to survival needs or opportunity.
$H0_1$: Gender of the respondent has no differential effect on the socio-economic profiles

An analysis of the gender differential effects on individual profiles across counties indicated a statistical significance. Implying that gender differentials existed. The null hypothesis was thus rejected and the alternate hypothesis was accepted. The post hoc results indicate that there were no female adult and youth differential effects on work experience in Uasin Gishu County as compared to Bungoma County which had a significance. Again of marital status Uasin Gishu County was not significantly different from Bungoma. On education both Uasin Gishu and Bungoma counties had statistical significance on female adult and youth differential effects. This finding implies that the individual profiles were different and this may point to the entrepreneurial management strategies that could be adopted.

$H0_2$: Gender of the respondent has no differential effects on the nature of firm profile.

Choice of proprietorship mode by the majority of the respondents may be attributed to lack of entrepreneurial ideas, opportunity identification, support, resources and the low employment potential of formal enterprises. Sole proprietorship may not contribute effectively to sustainable livelihood improvements through employment valuecreation. Respondents chose the venture site in Uasin Gishu County by putting into consideration better conditions at the site. While in Bungoma considerations were based on family issues for all categories of respondents. Cultural aspects could have had a profound influence on the site selection in Bungoma County. It may also be construed to be a strategy ofavoiding family conflicts in setting up the venture. It is worth noting that poor venture site selection may contribute to diminishing opportunities for the entrepreneurial venture.Most of the ventures were in the initial development stages and hence could have been founded on the need to enhance livelihoods. The findings compare favourably well with the increasing level of unemployment that could precipitate respondents to venture into enterprise creation as an alternative strategy for wealth creation and sustainable livelihoods. The findings suggest that most of the respondents lacked appropriate support and capital, notwithstanding the proliferation of micro financing institutions in Kenya.

$H0_3$: Gender of the respondent has no differential effect on the entrepreneurial profiles

The results show that gender groups' differential effects on attitudinal competences in Uasin Gishu and Bungoma counties were statistically significant. This implies that there were difference among groups owing to the gender groups. The post hoc tests and effect size were computed and the findings imply that the female adult and female youth differential effect on attitudinal competencies had statistical significant differences in Uasin Gishu and not Bungoma. While the results on female adult and male youth shows significant differences in Uasin Gishu and Bungoma. A comparison of female youth and male youth in the two study sites had no statically significant differences. This suggests that female youth and male youth had the same attitudinal competence levels. On behavioural competence the study showed a statistically significant difference on almost all items. This implies here were differences on the basis of gender. The gender groups' differential effects on behavioural competencies in Uasin Gishu were not statistically significant on female adult and female youth, female youth and male youth and female adult

and male youth. While in Bungoma County the post hoc tests showed no significance except on female adult and male youth in Bungoma. On the managerial competence on overall the results show that there were gender groups' significant differential effects in Uasin Gishu and Bungoma counties. On the side of post hoc tests the gender groups' differential effects were noted on female adult and male youth in Bungoma County.

Respondents faced challenges including resource based, entrepreneurial orientation, management related, corruption related, Legal & political and start-up and family related issues. Lack of adequate resources contributed to the formation of sole proprietorships. This might have been aggravated by lack of personal property rights, access to good market information, Infrastructure (Poor, Roads & Electricity), technological advancements and problem with bank's attitude towards female.A low level of entrepreneurial orientation was noted among the respondents, and this is reflected in the sole proprietorship status of enterprises. Management challenges were high in all counties and to all respondents. The challenges comprised of the ability to delegate authority to staff, inadequate management experience, accurate record-keeping and hiring and keeping good, and reliable staff. All respondents in the study counties perceived corruption to be high. This is a potential hindrance to venture operation. Legal and political challenges affected the operation of entrepreneurial ventures in the study sites. This finding concurs with that of Nassiuma (2011). Start-up challenges identified concurred with entrepreneurial orientation challenges, organisational modes, innovational levels, entrepreneurial competencies and managerial challenges and all this combined could reduce the potential for start-up. These results point to family issues taking a key role that can be attributed to female and youth being income poor, cultural issues, family responsibilities in terms of extended families and time poverty due to dual roles played. It thus implies that family issues may hinder venture operation. A collaboration of comparative results with the challenges faced by respondents suggests that the married respondents were most affected, yet at the same time were the majority. Challenges were more severe among Female adults and female youth in comparison to male youth.

6.0 Conclusion

In this study, we compared gender groups' differential effects on firm, individual profiles, entrepreneurial competencies and analysed challenges facing female and youth entrepreneurs in Uasin Gishu and Bungoma counties, Kenya. Based on the results from the survey of 698 female and youth entrepreneurs the study concludes that gender group differential effects on the various variable was statistically significant. The gender differential effect between female adult and youth category was statistically significant on most aspects while within the youth group was not. The gender differential effects on entrepreneurship indicators hold for sustainable livelihood improvement. Future studies can examine the relationship between firm, individual profiles and venture performance.

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Sub-Theme 4:
Computting and Informatics for Sustainable Development

The Impact of Architectural Designs on Sustainability of Software Systems

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Abstract
Architectural design is the first stage in the software design process since it provides a critical link between design and requirements engineering. It's an important stage to every software developer as it identifies the main structural components in a system and the relationships between them. Today increasing attention is being paid to the broad effects of software on society and the need to embody longer-term thinking, ethical responsibility, and an understanding of sustainability into the design of software systems. The purpose of this study was to establish the impact of architectural designs on sustainability of software systems. For this study desk research methodology was adopted. The secondary data from published reports was discussed with emphasis on the area of interest to this study. The findings of this study indicated that the software profession lacks a common ground that articulates its role in sustainability design. The study thus proposes that there should be approaches for identification and analysis of evolution problems in the life cycle of software systems early in the architectural design stage. It also recommends that there should be sustainability guidelines that will enable software engineers develop software with higher quality and lower evolution costs.

Key Words: *Architectural Designs, Sustainability, Software Systems, Software architectures*

1.0 Introduction

Sustainable software systems in general are often long-living systems with a life-span of more than 10 years. These systems include a range of products from embedded real-time systems to large-scale distributed control systems. Such systems have to be constructed with special requirements to their design, structure, and extra-functional properties, such as safety, performance, and availability.

During their life-cycle, sustainable software systems evolve in response to changes in their environment (i.e., hardware and software), usage profile (e.g., changed workload), and business demands (e.g., new features, changed business processes). Because this may require expensive changes to a system, it is necessary to keep efforts and costs under control during maintenance and evolution by coming up with proper architectures during the design stage. However it's important to note here that the term "sustainability", i.e., the ability for cost-efficient maintenance and evolution is restricted to an economical perspective and subsumes quality attributes of a software system that impact its maintenance and evolution (Seacord et.al, 2003).

Such sustainability properties should be kept in mind during the whole life-cycle of a software system and are especially relevant for long-living systems. In most cases however design and development decisions are sometimes taken for granted omitting sustainability aspects in favour of time and budget or due to the lack of expert knowledge, leading to accumulation of technical debt (Lehman & Ramil, 2003). This can lead to increased maintenance costs and introduce a major risk due to insufficient flexibility and quality. It requires the constructive articulation of the top-down approaches to development with the bottom-up initiatives as postulated by Martin, 2009.

It requires the simultaneous consideration of the local and the global dimensions of software systems development and of the way they interact. And it requires broadening the spatial and temporal horizons to accommodate the need for intra-generational as well as inter-generational equity. As software systems become more complex, the overall system structure or software architecture becomes a central design problem.

This problem can only be effectively addressed during the design phase where the systems architecture is created. A system's architecture provides a model of the system that suppresses implementation detail, allowing the architect to concentrate on the analyses and decisions that are most crucial to structuring the system to satisfy its requirements. The structure of a system is what enables it to generate the system's behaviour, from the behaviour of its components.

The architecture of a software system is an abstraction of the actual structure of that system. The identification of the system structure early in its development process allows abstracting away from details of the system, thus assisting the understanding of broader system concerns (Roscoe, 1994). One of the benefits of a well-structured system is the reduction of its overall complexity, which in turn should lead to a more dependable system. However the process of system structuring may occur at different stages of the development or at different levels of abstraction (Sommerville, 2011).
Reasoning about sustainable at the architectural level has lately grown in importance because of the complexity of emerging applications, and the trend of building trustworthy systems from existing untrustworthy components. There has been a drive from these new applications for sustainability concerns to be considered at the architectural level, rather than late in the development process. From the perspective of software engineering, which strives to build software systems that are rid of faults, the architectural consideration of sustainability compels the acceptance of faults, rather than their avoidance (Sommerville, 2011). This means that if a software system is to be classified as sustainable then it should be able to tolerate faults in any circumstance.

Thus the need for novel notations, methods and techniques that provides the necessary support for reasoning about faults at the architectural level. For example, notations should be able to represent nonfunctional properties and failure assumptions, and techniques should be able to extract from the architectural representations the information that is relevant for evaluating the system architecture from a certain perspective. In addition to the provision of facilities that enable the reasoning about faults at the architectural level, there are other issues that indirectly might influence the sustainability of systems, and that should be observed for achieving effective structuring. These include understandability, compositionality, flexibility, refinement, traceability, evolution, and dynamism [Clements, e.t. al, 2003].
This study seeks to establish if there is any relationship between the architectural design of a system and the sustainability of that system. It explores the area of software architecture with the aim to affirm that the architectural design of a software system will in turn affect the software system sustainability. The study is organized as follows: Section 2 discusses the methodology which is mainly desk research in the subject area to deduce any gaps; Section 3 identifies relevant or related work while Section 4 provides discussions and conclusions related to this work.

1.1 Problem Statement

In many application domains, software systems are maintained and evolved over decades. In industrial automation, for example, longevity is necessary because industrial devices have long life cycles. Software architectures play a major role in large-scale systems' sustainability (that is, economical longevity), vastly influencing maintenance and evolution costs. Developing good software architecture is critical for ensuring sustainable software systems. Unfortunately, today descriptions of software architecture are largely based on informal box & line drawings that are often ambiguous, incomplete inconsistent and unanalyzable. This study seeks to examine ways in which an architectural design of a software system will impact the sustainability of that system.

2.0 Methodology

For this study desk research methodology was adopted. Desk research refers to secondary data or data that can be collected without fieldwork. To most people it involves published reports and statistics and these are certainly important sources. Desk research therefore is the collection of secondary data from internal sources, the internet, libraries, trade associations, government agencies, and published reports. It is frequently carried out at the beginning of a study as a stage-gate to see if more costly primary research is justified.

2.1Software Architecture

While there are numerous definitions of software architecture, the basis of all of them is the notion that architecture describes a system's gross structure using one or more views. These views shed light on concerns such as the system's composition, its main pathways of interaction, and the key properties of its parts (Clements et al, 2002). Furthermore, an architectural description ideally includes sufficient information to allow analysis and critical appraisal during evolution and maintenance of the system.

As the size and complexity of software systems increases, the design problem goes beyond the algorithms and data structures of the computation: designing and specifying the overall system structure emerges as a new kind of problem (Gacek et al, 1995). This new paradigm is mainly because most of these complex systems have many components thus the design should ensure that the components are well structured so as to ensure sustainability. For example, there are structural issues that emerge and this include; gross organization and global control structure; protocols for communication, synchronization, and data access; assignment of functionality to design elements; physical distribution; composition of design elements; scaling and performance; and selection among design alternatives (Garlan et al, 2003). If all these structural issues postulated by Garlan here are to be addressed the software architecture of the system under design should be done in such a way that it accommodates all the areas of concern.

Effective software engineering requires facility in architectural software design. This is essential so as to be able to recognize common paradigms so that high-level relationships among systems can be understood and so that new systems can be built as variations on old systems (Issarny & Zarras, 2003). However, getting the right architecture is often crucial to the success of a software system design; the wrong one can lead to disastrous results. It is also important because, detailed understanding of software architectures allows the engineer to make principled choices among design alternatives (Garlan et al, 2001). Also, an architectural system representation is often essential to the analysis and description of the high level properties of a complex system. This demystifies the complexity of the software system making it well understood by all the concerned parties in the project.

Software architecture entails the structure or structures of the system, which comprise software components, the externally visible properties of those components and the relationships among them with respect to modeling and analysis (Becker, 2014). This means that as a system developer, to develop a sustainable system one should be able to confidently answer questions like, what is a structure? What are components? What kinds of relationships are relevant? What is an external visible property? These questions are very important and when well answered by the developer they help breakdown complex systems into understandable modules and functionalities (Structural decompositions) that can help clear the ambiguity notion of whether a system will be sustainable or not (Issarny & Banarte, 2001).

This breakdown involves a number of different kinds of structural decompositions of a system (Clements, et al, 2002). Each of these decompositions needs to be well understood by the developer because it plays an important role in the design and description of complex systems besides having its own unique uses (Garlan, 2003). The developer needs to understand things like the code decomposition whose primary elements are code modules like classes or packages. It should be clear that relationships between these elements typically determine code usage and functionality relationships such as calls and imports.

Another type of decomposition entails the run-time structures of a system, this is an area that covers elements that are the principal components of a system that exist as a system is running like the servers, the clients they serve and the databases. The communication channels that determine how the components interact should also be included in these descriptions. The relationships between these elements normally determine which components can be communicated with each other and how they do so. Garlan 2003 ascertains that analyses of these structures will be used to address run-time properties such as reliability, performance and security of the system. These are very important factors to consider especially when architecting systems for sustainability.

However other decompositions emphasize the physical context in which the system will be deployed for example they might consider processors to be used, and the networks or the context in which the system will be developed like if it is a business unit etc. While systems can in principal be described as arbitrary compositions of components and connectors in practice it's important to constraint the design space for software architecture by associating it to an architectural design or style (Ozkaya et al, 2008). This is important because it defines the types of components, connectors, interfaces and properties together with rules that govern how the elements of these architectures may be composed (Brown et al, 2010). This means that it can be established earlier whether the system is sustainable besides the other known benefits like support for analysis, re-use, and code generation and system evolution.

2.2Architectural Design

The structure of a system is what enables it to generate the systems behaviour from the behaviour of its components. Design has been described as a multistep process in which representations of data and program structure, interface characteristics, and procedural detail are synthesized from information requirements. This description is extended by Freeman (1980): Architectural design is concerned with understanding how a system should be organized and designing the overall structure of that system.

In the model of the software development process, architectural design is the first stage in the software design process. It is the critical link between design and requirements engineering, as it identifies the main structural components in a system and the relationships between them (Durdik et al, 2011). The output of the architectural design process is an architectural model that describes how the system is organized as a set of communicating components (Buckley et al, 2005).

Software engineering design has two phases: architectural design and detailed design. Architectural design is a problem-solving activity whose input is the product description in a Software requirement specification (SRS) and whose output is the abstract specification of a program realizing the desired product (Bengtsson et al, 2004). Architectural design thus sits between software product design and detailed design in the software design process (Tang et al, 2010). But in fact, the architectural design activity is not as clearly separated from product design and detailed design as the previous paragraph suggests.

Some architectural design occurs during product design for the following reasons:

- Product designers must judge the feasibility of their designs, which may be difficult without some initial engineering design work.
- Stakeholders must be convinced that their needs will be met, which may be difficult without demonstrating how the engineers plan to build the product.
- Designers and stakeholders must trade off requirements to create a feasible product that can be built on schedule and within budget. Tradeoffs may not be clear without exploring alternative software architectures.
- Project planners must have some idea about what software must be built to create schedules and allocate resources.

Consequently, software engineering design work often begins during product design, proceeds in parallel with it, and influences product design decisions. The boundary between architectural and detailed design is even less clear. Software architecture specifies a program's major constituents, their responsibilities and properties, and the relationships and interactions among them (Rozanski & Woods, 2005). Detailed design refines the architecture by specifying the internal details of the major program constituents and fleshing out the details of their properties, relationships, and interactions. This picture is vague, and, in particular, we may wonder:

- What comprises a "major" constituent?
- How abstract should architectural specifications be?

There are no definitive answers to either of these questions. Some architects lean toward quite abstract specifications of a few top-level constituents, while others insist on detailed constituent specifications through several layers of abstraction.

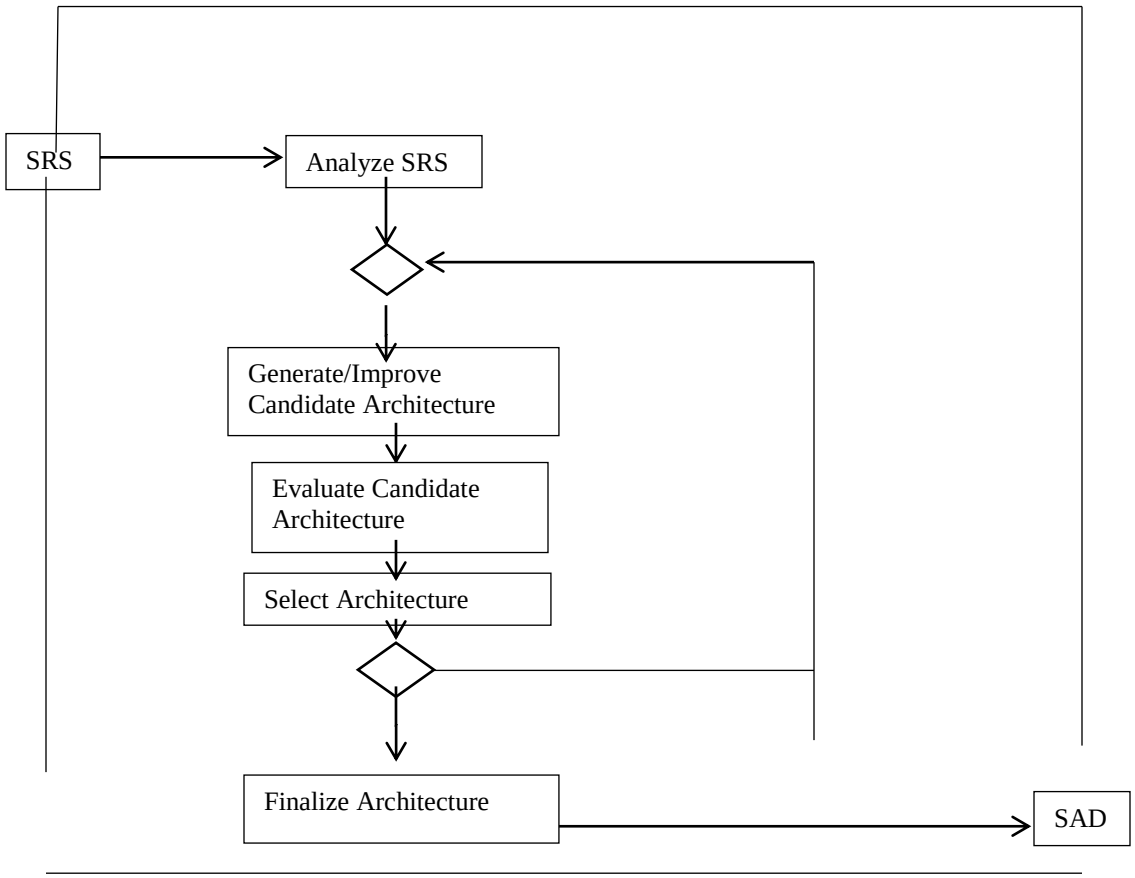

Figure 1.1 Architectural Design Process, Adopted from Fox, 2007

The architectural design process is a straightforward application of the generic design process to the problem of architectural design. The activity diagram in Figure 1.1 reproduces and slightly elaborates part of the Software engineering design process activity diagram. As indicated in the diagram, the input to this process is a software requirements specification (SRS), and its output is a software architecture

document. A software architecture document (SAD) is simply a document that specifies the architecture of a software system (Fox, 2007).

Software architecture is crucial not only for satisfying a product's functional requirements, but also for satisfying its non-functional requirements. Non-functional are important requirements because they specify properties or characteristics that a software product must have. These are called quality attributes and fall into two categories: *development attributes* and *operationalattributes.*

Development attributes include properties important to development organization stakeholders, such as the following characteristics:

Maintainability--A product's maintainability is the ease with which it can be corrected, improved, or ported. Sometimes more specific kinds of maintainability attributes are used, such as modifiability or portability.

Usability--A product's reusability is the degree to which its pacts can be used in another software product. A product designed for reuse will have higher reusability.

Operational quality attributes include the following properties:

Performance-A program's performance is its ability to accomplish its function within limits of time or computational resources. Programs often must respond to external events within a certain time or must do their jobs using small amounts of memory or processor time.

Availability--A program's availability is its readiness for use. A Web server, for example, may need to be available for all but a few minutes a day. '

Reliability--A program's reliability is its ability to behave in accord ·with its requirements under normal operating conditions. Any program that handles money or can endanger humans must have high reliability.

Security--A program's security is its ability to resist being harmed or causing harm by hostile acts or influences.

Programs can have a wide variety of architectural designs and still satisfy a product's functional requirements, but various architectural designs make it easier or harder to satisfy non-functional requirements. Furthermore, architectures that increase the ability of a program to satisfy some non-functional requirements may decrease itsability to satisfy others. Software architects must consider alternative structures that enable a program to satisfy itsfunctional requirements and select those that allow it to best satisfy its non-functional requirements (Godfrey & German, 2008).

Software architects must record their designs somehow to assist their thinking, share their ideas with others, evaluate their designs, and document them. Architectural designs constituents are large and abstract, and several kinds of models and notations are needed to represent software architectures fully.

Architectural design, like all design, makes demands on the creativity of designers. Where do ideas for architectures come from? How can architectures be improved? Software architects must somehow assess the ability of software architectural designs to meet its requirements, even though the architecture is an abstract specification and there is no software to run. This is one of the most challenging aspects of architectural design, but there are techniques for evaluating architectures. A product's architecture should be validated before moving on to detailed design. Validation as an activity comes in handy to ensure that the product of the said architecture will meet the requirements that were laid out by the intended users. Software architects should therefore have a keen interest in the architectural design of any software system so as to attain sustainability.

2.3 Sustainable Software Systems

In the past few decades, production and use of information technologies (IT) have had a dramatic effect on society, giving us new tools and new capabilities, but also generating a massive growth in demand for

energy and other resources. Software systems, in particular, play a transformative role, as they enable dematerialization (Hilty, 2006), drive consumption patterns for products, services, materials, and energy, and facilitate structural changes from consuming material goods towards consuming immaterial services, such as the shift to listening to music online instead of purchasing (and discarding) physical records and CDs (Becker et al, 2015).

They also collect, manage and distribute information needed to understand long-running complex phenomena ranging from climate data to personal health records, and statistics on global equity and capital. As such, the software industry increasingly represents a central driver for innovation and economic prosperity, but simultaneously increases social inequity, as people without access and technical skills are left behind (Graham et al, 2011), and causes environmental damage, as consumption of technology grows (Williams, 2011).

2.3.1The Concept of Sustainability

The word 'sustain' comes from the Latin word 'sustenare' meaning "to hold up" or to support, which has evolved over time to mean keeping something going or extending its duration, (Sutton, 2004). The most common non-specialized synonym for sustain is 'maintain'. Although maintain and sustain are sometimes used interchangeably, maintenance usually refers to activities targeted at correcting problems, and sustainment is a more general term referring to the management of system evolution (Sandborn & Meyers, 2009).

However the most widely circulated definition of sustainability (or more accurately sustainable development) is attributed to the Brundtland Report (Sandborn & Meyers, 2009), which is often stated as "development that meets the needs of present generations without compromising the ability of future generations to meet their own needs." Moreover it's worth noting that the concept of sustainability has principally been associated with ecology, and the relationship between humans and this planet we live in (Woodrof & Mankof, 2009).

Because sustainability is multifaceted and traverses through many fields of study, it's understood differently in different fields for example:-

Environmental Sustainability – this is the ability of an ecosystem to maintain ecological processes and functions, biological diversity, and productivity over time, (ForestERA). The objective of environmental sustainability is to increase energy and material efficiencies, preserve ecosystem integrity, and promote human health and happiness by merging design, economics, manufacturing and policy (Sandborn & Meyers, 2009). *Corporate Sustainability* – Is defined as the increase in productivity and/or reduction of consumed resources without compromising product or service quality, competitiveness, or profitability. This type of sustainability is often described as the triple bottom line (3BL) (Elkington, 1997): which encompasses, financial (profit), social (people) and environmental (planet). A closely related endeavor is "sustainable operations management", which integrates profit and efficiency with the company's stakeholders and the resulting environmental impacts, (Kleindorfer et al, 2005).

Technology Sustainability – Which is closely related to this study and includes all the activities necessary to: a) keep an existing system operational (able to successfully complete its intended purpose); b) continue to manufacture and field versions of the system that satisfy the original requirements; and c) manufacture and field revised versions of the system that satisfy evolving requirements.

2.3.2Software Sustainability

The term "sustainable software engineering" is sometimes applied to technology sustainability activities and is the process of assessing and improving a system's ability to be sustained by determining, selecting and implementing feasible and economically viable alternatives, (Crum, 2002). The Brundtland definition

includes "present and future generations" which can be interpreted as the users and maintainers of a system.

This definition is however too broad and difficult to understand and apply in any meaningful way. Recently, a triple bottom line perspective of sustainability has been adopted which considers sustainability to include three areas: environment, society and economy (Svendrup & Svenson, 2004). The feeling is that when these three dimensions are incorporated it leads to more sustainable outcomes (Elkington, 2004). This means that if system developers are to create systems that will be sustainable, then the outcome should take into consideration the environmental aspects, under which the software system will be implemented, the society that will use this software system and the economic implications that this procedure will have on the society. At this point it's therefore clear that this topic of sustainability emerges as an important area of research in a number of fields within the subject area of computing including software engineering, requirements engineering, and human-computer interaction (Sedef et al, 2015). My bias in this study is to try and understand the concept of sustainability from the software engineering perspective so as to clearly bring out the fact that since architectural design is a middle stage between requirements engineering and software design it therefore will affect the sustainability of the created system.

In recent times, software sustainability is commonly being approached as an area of research in the field of software engineering and has been identified as an important future topic as new approaches to research become increasingly dependent on complex software systems, which operate in evolving, distributed e-infrastructure eco-systems (Geist & Lucas, 2009). This is because the areas of environment, society and economy play a major role in addressing sustainability as a result of the pervasiveness of software systems, which can enable or undermine it.

Software sustainability is key in software engineering; this has been further underlined by recent funding initiatives from the National Science Foundation in the US and the Engineering and Physical Sciences Research Council in the UK, combined with the establishment of the Software Sustainability Institute. However further advancement of software sustainability as a field of research requires an understanding of the concept (Calero et al, 2013). This means that the developer should be able to grasp and articulate that software sustainability is "the ability to modify a software system based on customer needs and deploy these modifications".

However there is no agreed definition of the term software sustainability. While there have been a number of contributions to formalize a definition of software sustainability, the concept remains an elusive and ambiguous term with individuals, groups and organizations holding diametrically opposed views. However, this is not a problem unique to the field of software engineering (Glavic & Lukman, 2007). In many fields most authors will give different definitions and hold their view as long as they have facts to support their stand. However for this study software sustainability is the ability of a developed software to satisfy the customer needs by meeting the functional and nonfunctional requirements without having adverse effects to the environment and at no extra costs.

There is need for software architects to understand software sustainability so as to produce good artifacts. Seacord et al 2003, From their findings suggest that it's important to note that a sustainable software is one that is developed based on a number of factors in play like the organization, stakeholders, the operational domain as well as other software artifacts including the architecture, design, documentation and test scripts. According to Koziolek 2011, sustainable software should operate for more than 15 years. This means that there should be formal methods to assess software longevity. For this case maintainability and extensibility are key features of sustainability which are tightly coupled with the economical dimension in determining whether the software is long lasting or not. In relation to this there are four aspects proposed by Penzenstadler 2013, against which most software should be checked to ensure sustainability. This include;-

- Development process: use of ecological human and financial resources

- Maintenance process: continuous monitoring of quality and knowledge management
- System production: focused on the use of resources for production to be achieved
- System usage: takes into account responsibility for the environmental impact

He suggests that once software satisfies these four areas then it can be classified as sustainable.

2.4 Sustainable Software Development

Sustainable software development as used in software systems is a 'mode of software development inwhich resource use aims to meet product software needs whileensuring the sustainability of natural systems and theenvironment' (Calero et al, 2013). In complex systems sustainable software development should in essence lead to a sustainable software product. Tate 2006 argues that developing software is a complex task that is performed in an environment of constant change and uncertainty, which results in software products that are unsustainable.

This process is also linked to agility and context where agility is concerned with the balance between the short term versus long term, anticipation versus adaptation, ceremony versus informality, and context is the specific context of each project, which must be understood in order to adapt development practices. Tate proposes that the solution to this problem is sustainable development; a mindset and culture which can be accompanied by a set of practices that include continual refinement of the product and project practices; a working product at all times; continual investment in and emphasis on design; and valuing defect prevention over defect detection.

However, Fenner et al., 2006 argue that for sustainable engineering to be successful it requires a paradigm shift in thinking to embrace a holistic approach founded in complexity science. When this is done the resultant systems will be long lasting and those that can meet the needs of the present without compromising the ability of the future generations to meet their needs, such systems are what software architects refer to as sustainable systems.

2.5 Related studies

Traditional software engineering has not fully supported the topic of sustainability as a relevant field in software engineering. Software engineers approach various topics that have to do with sustainability such as green IT, efficient algorithms, agile practices and knowledge management, but in all these work there is less emphasis on what the impact of the architectural design of a software system will have on the overall sustainability of the system.

Today increasing attention is being paid to the broad effects of software on society and the need to embody longer-term thinking, ethical responsibility, and an understanding of sustainability into the design of software systems. However, the software profession lacks a common ground that articulates its role in sustainability design, and a long rooted set of misperceptions persist in research, theory, and practice.

However with all these teething problems various authors have put forward work that can serve to build this field of study. Penzenstadler 2012, in her work on "What does Sustainability mean in and for Software engineering?" argues that there are different aspects of sustainability from a point of view of software engineering and goes ahead to exemplarily illustrate their consideration during the requirement engineering phase and quality assurance. Her work envisions an approach for software engineering that supports sustainability into software systems with a corresponding assessment model.

Durdik et al. point out that "in many software development projects, sustainability is treated as an afterthought, as developers are driven by time-to-market pressure and are often not educated to apply sustainability-improving techniques", and they call for better guidance for software practice. Koziolek et al 2012, in their study termed "Towards software sustainability guidelines for long living industrial systems" affirm that sustainable systems are usually implemented with a variety of technologies and have very high requirements for safety, performance, and availability.

Because of their long life-cycles and complicated replacement procedures, such software systems are continuously maintained and evolved resulting in high costs. Thus, some automation companies, such as ABB, are interested in creating sustainable long-living software systems, i.e., systems that can be cost-effectively maintained over their complete life-cycle. This is a complex challenge, as industrial software systems are continuously subject to new requirements, new standards, failures, and technology changes during their operation time. The authors therefore postulate that this problem can be well tackled at the design stage through the architecture.

Becker et al argue that, sustainable or green design in general encourages the parsimonious use of resources particularly, in the design, construction, and operation of software to minimize harmful environmental impacts. This can be achieved by positing that requirements on sustainability are central to all aspects and processes pertaining to software systems. Using a combination of knowledge and proactive steps, designers can ensure desired outcomes through choices for resources, systems, and methods. One way is to produce systems that fulfill criteria for sustainability. This involves a process of evaluation, which is multifaceted and multi-phased, ensuring that measures have been taken for the system to achieve certain performance levels in categories such as energy consumption reduction, conservation of resources, low carbon footprint etc.
Despite these advances in understanding software sustainability as a technical concern, in practice it is interdependent with its organizational and business context. Thus, technical sustainability of a software system cannot be separated from social and financial sustainability of the organization that created it, a challenge already acknowledged at the first Software Maintenance Workshop in 1983.

4.0 Discussionsand Conclusions

Although many authors agree that in the discipline of computing and mainly the field of software engineering software architects must record their design, mainly so as to assist their thinking or share their ideas with others, evaluate their designs and document them. It's clear from this study that architectural design should be the first stage towards sustainable software. However the architectural designs that most software developers come up with are simply informal box and line diagrams that make it hard for them to be used in analysis because they are imprecise. Generally most authors agree that it's therefore hard to determine with confidence whether some property of a system holds, or whether a design is complete or consistent. It's even harder to tell whether an implementation conforms to an architectural design, or whether a proposed change during the evolution of the system violates an architectural principle.

Today increasing attention is being paid to the broad effects of software on society and the need to embody longer-term thinking, ethical responsibility, and an understanding of sustainability into the design of software systems. However, the software profession lacks a common ground that articulates its role in sustainability design, and a long rooted set of misperceptions persist in research, theory, and practice. To truly make progress in understanding the role software plays in the choices we make as designers of the systems at the backbone of our society, we need to understand the nature of sustainability and find a common ground for a conceptual framework.

This study has deduced that the software profession lacks a common ground that articulates its role in sustainability design. Therefore a long rooted misconception persists in research, theory and practice. The study thus proposes that there should be approaches for identification and analysis of evolution problems in the life cycle of software systems. Popular architecture analysis approaches such as ATAM, SAAM and ALMA should therefore be employed early in the architectural design stage. There should

also be sustainability guidelines that will mainly help developers in this domain to develop software with higher quality and lower evolution costs. If this is adopted then there will be risks associated with architectural designs and the systems developed therein. These guidelines could also come in handy to identify potential gaps for future research.

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Employers Perspective in the Management and Usage of Information Technology

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Abstract
Information technology is what is trending today globally because of the important role it plays in a growing world of economy. Accordingly, various organizations are becoming increasingly beneficial from continuous investment in the information technology as well as the use of it. This study aims to illustrate what it entails to set up an information technology infrastructure in an organization. The paper further attempts to elucidate the extent of information technology as a functional area within an organization from the employer perspective. The study concludes that since the information technology environment is important in the decision making process in any organization/company, employers should strive to embrace its usage.

Key Words: *Employer perspective, functional area, information technology, infrastructure*

Introduction

Of recent times the role of information technology has taken a centre stage as a driver of the economy is as such regarded as an important resource for organizations to improve their market positions in the long term by provision of timely appropriate information (Burt & Taylor, 2003). Globalization in business world has increased the chance of getting a greater amount of information in much less time. As a result, companies are forced to spend more time and energy on handling the increased information load (Brown, 2005) (Coex & Kreger, 2005).

For many organizations, the increasing availability of technologies has resulted in ambiguity in their management (Laudon, 2009). This is due to management and support services of these complex and heterogeneous provision of different gadgets such as PC's, desktops and Laptops. Applications of mobile and wireless devices, printers, and networks have proven difficult and expensive for most organizations that want to implement information technology.

According to OECD (2002) information technologies play an important and growing role in the world of economy and organizations, companies, industries and governments are getting increasing benefits from their continuous investments in information technology as well as from a wider use of the internet in a knowledge-based economy. As information systems are designed to provide effective help in this process, they are becoming increasingly popular among companies and employers due to the robust technological development (O'Brien, 1999).

This paper deals with what information technology is as well as the usage of information technology among employers in their enterprises and analyzes the following three key questions: how the usage of information technology influences an organizations economic performance, what is required for an individual company to develop its information technology infrastructure and finally, to what extent information technology is considered important as a functional area within the organization from the employers perspective (Coex and Kreger, 2005).

1.1 What is Information Technology?

Information Technology (IT) can therefore be summarized as a set of all activities and solutions provided by computing resources and, with applications related to several areas (Burt & Taylor, 2003). Information Technology is also commonly used to denote the set of non-human resources dedicated to storage, processing and communicating information as well as the mode of how these resources are organized in a

system capable of executing a set of tasks. IT is not limited to equipment (hardware), software (software) and data communications. There are technologies for the planning of Computing, for the development of systems, for the support, for the software, for the processes of production and operation and for the support of hardware. Thus IT covers all activities developed in society by using the resources of computers.

1.2 How the Usage of Information Technology Influences an Organizations economic performance

It is very clear that the world is flat due to information technology (IT). IT has wired the world and brought about global business (Brown, 2005). However basing on the Information Systems Strategy Triangle, a company has to balance its business, organizational and information systems strategies so as to be successful (O'Brien, 1999). Just like in enterprises, today's employers in companies and organizations depend on information technology IT to help drive competitive advantage. Whether you're running a small legal firm or a midsize finance company, you know that business performance is increasingly tied to your ability to keep the IT systems operating at peak efficiency.

But for organizations with more modest IT resource and personnel, IT management and maintenance can be a difficult job to do. Routine system monitoring and maintenance can eat up time and resources that could be better used to help run the business more efficiently and make it more competitive. And when something does go wrong, it can be a nightmare employees can't get their jobs done, customers can't get service, orders can't be processed and supplies can't be ordered.

Most employers understand the value of IT, and know that the right solutions are critical to streamline operations and processes, Improve communication and collaboration, and better serve customers and employees, especially in tough economic times. Organizations need technology to help compete more effectively against larger enterprises –it is therefore of no surprise that most analyst firms forecast that organizations adoption of new IT solutions and services is growing at a faster rate.

Many organizations are challenged by the growing complexity of their IT environment. Even the relatively modest businesses may need to manage several desktops and notebooks, handheld devices, servers, a network and applications to successfully transact. However, many organizations don't have any depth or resource to dedicate solely towards the plethora of IT maintenance and monitoring tasks in today's modern IT environment. IT complexity grows as the organization grows in size -more employees, devices, servers and software solutions to look after. You're also likely to have multiple locations, and have to support users and systems in these locations-adding to management time and hassle. The number of people that work remotely from a tele-commuter who is working at home, to sales and service people working on the road-is growing in organizations of all sizes.

According to OECD (2002), the Information Technology IT play an important and growing role in world economy, and companies and industries are getting increasing benefits from their continuous investments in IT, as well as from a wider use of the Internet in a knowledge-based economy. IT has stimulated innovation in services, increased the efficiency of production and creation, and at the same time, facilitated the management of inventories and administrative costs.

It is a catalyst of changes in companies, improving the organization of work, helping companies to reduce the cost of their routine transactions and streamlining their supply chains. So crucial is I Tespecially when associated with the raise of the level of skills and organizational change, and apparently seem to support the improvement of productivity within enterprises, both in new sectors and in traditional ones. Such benefits have long term effects and will continue to develop, despite the difficulties and challenges with which companies are facing today.

1.3 Other Applications of IT

Many new applications of IT have a potential meaning and may have economic and social impacts, as well as a key role in the bonding and in the convergence of the various technologies. Among these

emerging technologies are the ubiquitous networks, which enable monitoring of people and objects as well as tracing, storing and processing of information in real time. Applications such as radio frequency identification (RFID) and other technological sensors are being used in applications for commercial use. The technology of prevention and warning of natural disasters are becoming more important for reducing the impacts of disasters which result in large economic losses.
The participatory Web (Web 2.0) is the active participation of users on the Internet, creating contents; they adapt the Internet and develop applications for a wide variety of fields. The digital content represents an important factor in the IT industry. Technological innovation and demand of new consumers are leading to new forms of creation, distribution and access to digital content. The convergence in applications such as convergence of nanotechnology, biotechnology, neuro-technology and robotics, probably, will provide more opportunity and challenges for companies and employers operating in the IT sector (OECD, 2006).

1.4 Setting up an Information Technology Infrastructure

In the last quarter of this century, a new form of socio-economic organization has emerged. After the collapse of statism, in the Soviet Union and throughout the world, it is certainly a capitalist system. Indeed, for the first time in history the entire planet is capitalist, since even the few remaining command economies are surviving or developing through their linkages to global, capitalist markets (Sasvari &Majoros, 2013). Yet this is a brand of capitalism that is at the same time very old and fundamentally new. It is old because it appeals to relentless competition in the pursuit of profit, and individual satisfaction (deferred or immediate) is its driving engine. But it is fundamentally new because it is tooled by new information technologies that are at the roots of new productivity sources, of new organizational forms, and of the formation of a global economy.

As people and companies rely on basic infrastructures to function, businesses also rely on an information systems infrastructure (consisting of hardware, software, networks, data, facilities, human resources, and services) to support their decision making, business processes, and competitive strategy (Erickson & Howard, 2007). Business processes are the activities that organizations perform in order to reach their business goals and consist of core processes and supporting processes. The core processes make up the primary activities in the value chain; these are all the processes that are needed to manufacture goods, sell the products, and provide service, and so on.
According to Allen and Westby (2007), almost all of an organization's business processes depend on the underlying information technology infrastructure, albeit to different degrees. For example, an organization's management needs an infrastructure to support a variety of activities, including reliable communication networks to support collaboration between suppliers and customers, accurate and timely data and knowledge to gain business intelligence, and information systems to aid decision making and support business processes. Therefore, organizations rely on a complex, interrelated information technology infrastructure to effectively thrive in the ever-increasing, competitive digital world.

<table>
<tr><td>Core ⟶</td><td>Inbound Logistics</td><td>Operations & Manufacturing</td><td>Outbound Logistics</td><td>Marketing & Sales</td><td>Customer Service</td></tr>
<tr><td rowspan="5">Support</td><td colspan="5">Administration</td></tr>
<tr><td colspan="5">Firm Structure</td></tr>
<tr><td colspan="5">Human Resource</td></tr>
<tr><td colspan="5">Technology Development</td></tr>
<tr><td colspan="5">Procurement</td></tr>
</table>

Fig 1.1: A Generic Value Chain showing an Organizations Core &supporting activities, Adopted from Managing Information Systems Infrastructure, Chapter 4.

In order to make better decisions, managers at all levels of the organizations as shown above need to analyze information gathered from the different business processes. The processes of gathering the information as well as the information itself is commonly referred to as business intelligence. Whereas some of these processes obtain the information from external sources—such as marketing research or competitor analysis—other processes gather business intelligence from internal sources, such as sales figures, customer demographics, or performance indicators (Buckley et al, 2008). While there are a variety of different systems used for gaining business intelligence, all gather, process, store, or analyze data in an effort to better manage the organization. In other words, modern organizations rely heavily on their information technology infrastructure; its components include the following:-

- Hardware
- Software
- Communications and collaboration
- Data and knowledge
- Human resources
- Facilities

All these when well set up in an organisation present solutions that can help support an organizations competitive strategy, decision making and business process. Setting up an IT infrastructure entails a lot. The change in organizational IT status brings with it a change in the roles of the Chief Information Officer (CIO), a change that more closely aligns the function of IT leadership with that of chief executive officers. For example, the CIO of the State of California "serves as IT advisor, leader, strategic planner, and collaborator" (California, 2007). There is no mention of the CIO as a technologist or as a technology manager. The proliferation of change and standardization of IT infrastructures has driven a bifurcated role for CIOs.

While some CIOs are still focusing on cost minimization through leveraging IT infrastructure, others have become less focused on technical management and more on leveraging IT processes as competitive advantages (Chun & Mooney, 2009). Similarly, McNurlin, Sprague, & Bui (2009) posits that currently there are four roles for the CIO, namely, leading, governing, investing, and managing. In these four roles, the bifurcated nature of the CIO role is evident with three of the four roles focusing on strategic direction and one role continuing to focus on technology management. Along with the changing nature of the CIO and technology management roles, employers are challenged to address changing assumptions that underlay strategic decision making with respect to information technology infrastructure.

These assumptions result from a rapidly changing environment, an environment that many employers find daunting to assess and understand. For example, Kelly and Erickson (2005) give the example of Radio Frequency Identification (RFID) use by Benetton that caused a public outcry concerning privacy issues and forced a reversal of the decision to implant RFID chips in clothing as a means of tracking. Other ethical concerns that are likely to arise when setting up an IT infrastructure include security, legal issues, and voluntary and informed consent. Nonetheless, understanding the underlying assumptions that provide strategic advantage can give any organization a significant advantage through the strategic application of IT resources.

1.5 Information Technology as a Functional Area in an Organization

The size of the information Technology department can vary greatly, depending on the role of information technology in the organisation and on the organizations' size. The size of the information technology group and the total expenditures on computers and information systems are largest in service organizations where information systems can consume more than 40% of gross revenues (Fan, 2009). Today the information technology group often acts as a powerful change agent in the organization, suggesting new business strategies and new information based products and coordinating both the development of technology and the planned changes in the organisation.

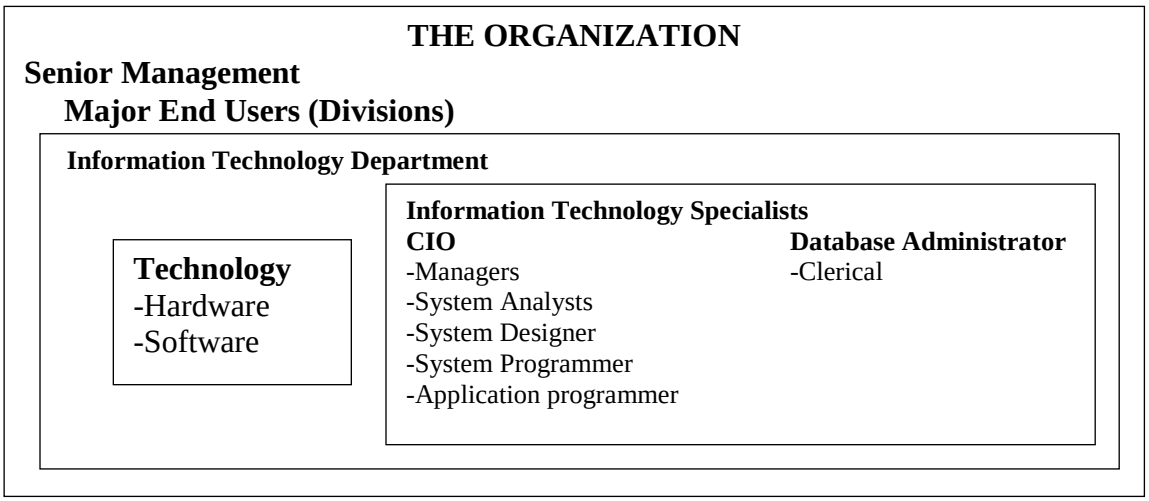

Figure 1.2: The Entities of the Information Technology Function in the Organization, Adopted from Boudreau, Loch, Robey, &Straud, 1998

From the figure above the information Technology function in the organisation is composed of three distinct entities. The first is a formal organizational unit or function called an information technology department. The second consists of information systems specialists such as programmers, systems analysts, project leaders, and information systems managers. Also, external specialists such as hardware vendors and manufacturers, software firms and consultants frequently participate in the day-to-day operations and long term planning of information technology. A third element of the information technology package is the technology itself, both hardware and software. These three combined make the functional area of the organisation and should be well understood as well as supported by the employer or the owners or stakeholders of the organisation because this is the platform on which the contemporary world rides today.

It's necessary to understand that the world is a rapidly changing canvas that visits a dynamic and turbulent environment on employers (Boudreau et al, 1998), changing how Information technology (IT) are used and needed in each organization. The power to collect, assess, and disseminate information is a valuable strategic resource that any organization can use to improve its competitive advantage. At the same time, technological advances are changing rapidly, thus requiring frequent updates in hardware and software as well as new competencies for IT professionals.
As employers face the challenges of optimizing the use of information technology, they are called to address a number of issues so they can make informed and effective decisions. A failure to understand the nature of the changing environment and the associated consequences is certain to cause decision-making that is slow to meet the challenges of the global market, thus creating a strategic disadvantage for the late mover (Stauss & Jedrassczyk, 2008). Employers must not only understand the role of IT in corporate governance and corporate strategy formulation, but how the accepted norms of this role are changing over time. This touches on key issues related to these changing roles for employers involved in corporate governance and senior-level strategic planning.

1.6 The IT Relationship to Strategic Governance in an Organization
The changing environment of IT includes numerous issues that employers as strategists must consider as they make IT decisions. Some of the trends related to IT include flattened organizational hierarchies,

increasing reliance on intellectual capital, greater reliance on outsourcing and strategic alliances, changing demographics, consumer focus, and a need to organize and control an increasingly complex and turbulent environment (McNurlin, Sprague, & Bui, 2009).

Further, IT evolution is often at the heart of environmental complexity and turbulence, often causing organizations to spend millions in terms of cash so as to remain competitive. These changes require new competencies for IT employers as well as IT technologists. They also require new competencies for non-IT employees and employers. The complexity and turbulence of these changes create an unrelenting need for continued education and system updating, along with increasing demands for transparency. All are associated with significant costs for any organization, both in terms of financial investments and in terms of effort to manage the related changes processes themselves.

The challenge becomes one of balancing constrained resources with a need to remain competitive. Even the mission of the IT function itself is changing, evolving from a focus on efficiency and effectiveness in a support role to a focus on enterprise performance as the foundation for competitiveness in a rapidly changing market. In many cases, IT becomes the backbone for customer management and even product delivery. With this new direction, IT becomes a strategic partner in organizational performance, working on a level comparable to other functions such as accounting, marketing, and human resources.

Strategically, there is a notable change in status, because IT moves from a position of supporting the traditional business functions, to one of enabling them, thereby becoming a strategic necessity and a full partner in the success of the organization. All of the change places strong demands on IT governance in terms of the roles and responsibilities that are required of employers with respect to IT decision making.

One assumption that every employer needs to understand is that there is pervasive ambiguity throughout strategic decision-making. Because the environment is dynamic and turbulent, employers are less capable of making precise forecasts about the future. Less precision in forecasts indicates a need for current, accurate, and transparent information, one of the competencies that can be developed through tactical IT implementation. Well engineered IT processes provide leverage against the ambiguity that is inherent in a turbulent environment and provide transparency in an environment that demands increasing accountability. Another assumption that employers need to be aware of is that, because of rapid technology proliferation, the window for creating strategic advantage through IT implementation is considerably shorter than it has been in years past and continues to grow even shorter.

This indicates that there is need to recognize opportunities as they emerge, so that strategies can be developed in a timely manner to create advantage through IT implementation. For example, the time from design to completion for many clothing manufacturers is still several months. Through the innovative use of information technology, one manufacturer has created a competitive edge by streamlining the design-to-delivery time to 3 weeks, thus creating a significant advantage over other clothing manufacturers (Apparel Search, 2010). Similarly, Wall-mart and Ford have used IT applications to improve their business processes to provide strategic advantage. Wall-mart's inventory management system has eliminated the need for purchase orders while Ford's automated accounts payable function has eliminated the need for 300 staff positions (Lacity, 2010; Kelly and Erickson, 2005).

Another changed assumption is the need for IT to be recognized as a full partner in the success of any organization, from the smallest of organizations that need to post information online to satisfy customer expectations to the very large organizations significant online revenue-generating divisions. This shift is apparent with companies such as United Parcel Service that now is described as "the technology company that delivers packages" (Brewster & Dalzell, 2007). Similarly, through careful architecture and principles development, Dow Corning recently moved the CIO position to one of equal authority to that of other chief officers, thus creating a natural connection between IT strategy and business strategy (Weill & Ross, 2004).

There is also a necessary assumption that IT technologists must be educators as well as technologists, and Employers of all organizations cannot lead an innovative, global enterprise without being educated in IT initiatives. If employers want innovation, they need to learn about information technology. Davenport (1993) identifies ten IT activities that facilitate innovation, including: "... identifying and selecting processes for redesign, identifying enablers for new process design, defining business strategy and process vision, understanding the structure and flow of the current process, measuring the performance of the current process, designing the new process, prototyping the new process, implementing and operationalizing the new process and associated systems, communicating ongoing results of the effort, and building commitment toward the solution at each step." Additionally, there is evidence to suggest that, when employers are engaged with IT, a business is more likely to leverage IT initiatives into a successful business opportunity, and consequently, into a strategic advantage (Lacity, 2010). Finally, because relationships between companies often lead to strategic advantage, one must recognize the assumption that technologies facilitate relationships. Whether the relationships are with customers, front line employees, strategic allies, or other senior leaders, IT creates an environment of accessibility that fosters productive relationships and employers need to understand that.

In this way, IT helps level the competitive playing field for many organizations, allowing small, that is geographically localized, organizations to have worldwide access to customers, and worldwide organizations to have seemingly local access to employees. In terms of governance, use of IT can create ethical issues with any of these stakeholders. For example, Mujtaba (2003) investigates the multiple issues that are involved when using information technologies to monitor employees and opens the discussion for employers' consideration before implementing an information technology. Nonetheless, if communication is the process through which people are connected with others to create relationships, then IT has become the conduit for modern relationships.

Taken together, these assumptions along with the changing environment and emerging governance roles are a call for employers to revisit strongly held beliefs about the IT function, because they may point to potentially serious gaps in IT strategy, which often lead to error and strategic disadvantage. "The fundamental error that most companies commit when they look at technology is to view it through the lens of their existing processes. They ask, 'How can we use these new technological capabilities to enhance or streamline or improve what we are already doing?' Instead they should be asking, 'How can we use technology to allow us to do things that we are not already doing?" (Hammer &Champy, 1993).

2.0 Conclusion

The purpose of writing this article was to find out the employers perspective of Information Technology and how the said Information technology are used or needed by various organizations. From the literature search we have deduced that most organizations rely on an information technology infrastructure to support their decision making process, business processes and competitive strategy. This therefore means that information technology is a basic functional area in any organisation because it's the only change agent that the organization can use to suggest new business strategies, new information based products and coordination of development of new technologies for the organization as well as initiate the planned change.

Therefore the Information technology environment contains numerous issues that employers must consider as they make decisions. But because information technology is cost related employers should consider working closely with information technologists if they have to balance between resource uses and also remain competitive. Consequently since information technology enables organizations attain a competitive edge it should be the one area that each employer strives to implement.

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Factors Inhibiting the Implementation of Digital Villages in Kenya

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Abstract
The achievement of an information-based society is one of the main priorities of the Government of Kenya (GoK) towards the realization of national development goals and objectives for wealth and employment creation. However, even in their efforts the ICT sector is still currently more active in urban areas, resulting in wide regional disparities in the distribution of ICT facilities. In order to address this disparity, the Kenya ICT Board (KICTB) supported the roll out of new "electronic centre's" which were named Pasha Centre's (and are also commonly referred to as Digital Villages).The Digital village's initiatives in Kenya commenced with a lot of optimism in 2009 however five years down the line it cannot be recorded that they have been successful. The purpose of this study was to establish the factors that have hindered the successful implementation of digital villages in Kenya. For this study desk research methodology was adopted. The secondary data from published reports was discussed with emphasis on the area of interest to this study. The findings of this study indicated that there were various factors that hindered the successful implementation of digital villages in Kenya. The study recommended need for having a government policy for the digital village project. This policy if developed will serve to protect such projects in future enabling them to take off and function independently.

Key Words: *Digital Villages, Pasha Centres, Kenya ICT Board, Inhibiting, Implementation.*

1.0 Introduction

Developed countries have already experienced a revolution in Information and communication Technology (ICT). According to Sola (1990), in most cases this is normally considered an industrial revolution of some sort. This craze has awakened many nations Kenya notwithstanding. Nations have discovered the pivotal role of ICT hence today it forms part and parcel of their daily interactions, according to the Economist (2009), ICT is core in every nation because it forms part of the economic, social and political empowerment.

Efforts Made by developing nations to reap the benefits of the ICTs are challenged by the lack of infrastructure especially in the rural areas where majority of the population is poor. As a result some developing nations like Kenya have come up with innovative ideas to encourage development of ICT infrastructure in the rural areas and provide the rural community with access to information. One such innovation is the development of "Pasha Centers"

The Kenyan Government, together with external stakeholders and private contractors, has been increasing their ICT investments to provide the entire population with information and communication regardless of demographic factors (Hallberg et al, 2011).Therefore the Government, through the Ministry of Information and Communication (MoIC), recognizes that the provision of Information and Communication Technology goods and services is important for enabling economic and social development by improving communication and facilitating information flow. However, even in their efforts the ICT sector is still currently more active in urban areas, resulting in wide regional disparities in the distribution of ICT facilities.

In order to address this disparity, the Kenya ICT Board (KICTB) supported the roll out of new "electronic centre's" which were named Pasha Centre's (and are also commonly referred to as Digital Villages) (Obora et al, 2014). These existing e-Centres according to KICTB were also to be upgraded. Digital villages are hubs that provide a host of services to the public via computers connected to the internet, or

by using and marketing other ICT-enabled applications. This work was to be done under the Kenya ICT Program (KICTP) initiative, which had an aim to provide internet access and e-Services at the grassroots level via multi-stakeholder partnerships. The purpose of the Digital villages is to enhance the livelihoods of local citizens and encourage new micro-enterprises by providing access to information, education and new markets.

Although the objective of the digital villages was quite splendid, it is far from being realized. This study seeks to establish the success of the digital villages in Kenya and determine the factors inhibiting the potential of the digital villages from being realized.

1.1 Problem Statement

The achievement of an information-based society is one of the main priorities of the Government of Kenya (GoK) towards the realization of national development goals and objectives for wealth and employment creation. ICT is one of the fastest growing sectors in the country. Harnessing of ICT will therefore help the Government to realize a number of its key public policy objectives. Most ICT facilities in the Kenya have traditionally been located in urban areas; this has resulted in glaring disparities between urban and rural areas in the distribution of ICT facilities. To redress the disparities, the Kenya ICT Board embarked on the implementation of digital villages in 2009. However five years down the line it cannot be recorded that they have been successful with some pasha managers abandoning the project (Obura, 2014). For all this period, only 63 centers have been opened with others failing to pick up and others closed down as they could not break even. This study thus sought to assess the success of digital villages with a view of determining the factors inhibiting their success.

1.2 Objectives

The objectives of this study are;-

- To establish the aim of the digital village project in Kenya
- To determine the factors inhibiting the implementation of the digital villages in Kenya

1.3 Purpose of the study

The purpose of this study was to establish the factors that have hindered the successful implementation of digital villages in Kenya and suggest remedies to be employed by the government so as to achieve the intended objectives.

2.0 Methodology

For this study desk research methodology was adopted. Desk research refers to secondary data or data that can be collected without fieldwork. To most people it involves published reports and statistics and these are certainly important sources. Desk research therefore is the collection of secondary data from internal sources, the internet, libraries, trade associations, government agencies, and published reports. It is frequently carried out at the beginning of a study as a stage-gate to see if more costly primary research is justified.

2.1 Genesis of Digital Villages in Kenya

The fast growth of the use of Information and Communication Technologies (ICTs) has had a profound impact on many aspects of our daily life. Recently, ICTs have dramatically transformed the current society and many economies around the world (Acilar, 2011). Today, ICTs have become an essential part of modern culture and cover almost all aspects of our lives. With the advancement of ICTs, especially the dawn of the Internet and the World Wide Web, the world has today become like a global village.

The mass diffusion of the Internet across most populations across the world has led many to speculate about the potential effects of the new medium on society at large. Enthusiast have heralded the potential

benefits of the technology suggesting that it will reduce inequality by lowering the barriers to information allowing people of all backgrounds to improve their human capital, expand their social networks, search for and find jobs, have better access to health information and otherwise improve their opportunities and enhance their life chances (Hargattai, 2003).

However the study done by Hargattai, (2003) cautions that the differential spread of the Internet across the population will lead to increasing inequalities improving the prospects of those who are already in privileged positions while denying opportunities foradvancement to the underprivileged.While the telecommunications infra-structure has grown and ICT has become less expensive and more accessible, today more than ever, the invisible line that separates the rich from poor, men from women and the educated from the illiterate; also separates the connected from the disconnected (Zaidi, 2003). The unequal access to and utilization of ICTs is now being recognised as one of the prevalent issues of our times (Sciadas, 2005).

Almost every indicator shows that there is a significant difference between developed and developing countries in terms of accessing and using ICTs. For example, according to International Telecommunication Union (ITU), while approximately 72 % of the population is Internet user in developed countries, this ratio is 21 % in developing countries. The number of fixed telephone lines per 100 inhabitants in developed countries is estimated about 41, but, it is 12 in developing countries (ITU, 2010). With such disparities it can therefore be very challenging to access up-to-date knowledge and information in developing countries (Suchak & Eisengrein, 2008).

Much attention among both academic researchers and policy makers has been paid to what segments of the population have access to the Internet or are Internet users. Access is usually defined as having a network-connected machine in one's home or workplace. Use more specifically refers to people's actual use of the medium beyond merely having access to it. Such studies more often reveal that in developing countries there is evident Internet use by people in urban areas compared to rural areas (Rogers & Shukla, 2001).

Furthermore, Acilar, (2011) & Iskandarani, (2008), affirm that as a result of advances in information technologies, the knowledge gaps between the information-rich and the information-poor have deepened over time and that has caused excluding certain parts of the world from enjoying the fruits of the said global village. This phenomenon has birthed what is referred to today as the digital divide.

The term "digital divide" was introduced by Larry Irving, Jr., former US Assistant Secretary of Commerce for Telecommunication and Communication in the mid-1990s in order to focus public attention on the existing gap in access to information services between those who can afford to purchase the computer hardware and software necessary to participate in the global information network, and low income families and communities who cannot (Boje & Dragulanescu, 2003).

Wilson (2004) defines the digital divide as "an inequality in access, distribution, and use of information and communication technologies between two or more populations." According to Wilson there are eight aspects of the digital divide: physical access, financial access, cognitive access, design access, content access, production access, institutional access, and political access. There are also philosophical and sociological sides of the digital divide because of a potential missed opportunity on the part of millions of people to obtain desirable jobs and enhance their lives by using computers and the Internet (Friedman, 2001).

"One strategy for bridging the digital divide within a nation, and between nations, is to encourage telecenters". (Rogers & Shukla, 2001) The first telecentres were established in the early 1980s in Scandinavia to promote the use of advanced Information and Communications Technology (ICT). They were funded from public funds for three years. This approach was seen as a way of letting people, especially farmers, experiment with different ICTs. Similar projects were subsequently replicated in other parts of Europe and North America.

The centres aimed mainly at facilitating access to computers and online applications. African countries such as Ghana, Kenya, and Senegal were early in establishing private telecentres. Nonetheless, apart from private contractors, telecentres in Africa have received considerable support from international development organizations, e.g. UNESCO, ITU and IDRC (Benjamin, 2000; Jensen & Esterhuysen, 2001). In Kenya this centres are referred to as Pasha Centres and were aimed at bringing ICT services closer to the people in the rural areas.

2.2 Role of Digital Villages in the Realization of MDGs in Kenya

The Millennium Development Goals (MDGs) are eight goals to be achieved by 2015 that respond to the world's main development challenges. The MDGs are drawn from the actions and targets contained in the Millennium Declaration that was adopted by 189 nations-and signed by 147 heads of state and governments during the UN Millennium Summit in September 2000.Kenya has made tremendous efforts in implementing the MDGs since the process started in September, 2002.

While the country is on course to achieve universal primary education due to the introduction of the free public primary education and reduction of HIV/AIDS as a result of the introduction of free antiretroviral (ARV) drugs in Government health facilities hence improving the survival rates of people living with HIV, other MDGs are still lagging behind. With the launching of the Vision 2030 and its first MTP (2008-2012), the UNDP supports the Government's initiative to disseminate the documents and sensitize the people of Kenya and its partners on the development goals enshrined in the Vision 2030. This is highly important.

Since these goals were intended to increase an individual's human capabilities and advance the means to a productive life, the MDGs emphasize that each country should develop policies tailored to its own needs and how to achieve these. Currently the MDGs emphasize three areas, human capital, infrastructure and human rights (UNDP, 2013). This study emphasizes infrastructure. The objectives of infrastructure include mainly access to information and communication technology.

Most developing countries Kenya not withstanding have put up interventions like using the limited resources to achieve these goals within the stipulated time. In Kenya the target is to ensure information infiltrates to the rural areas where larger populations abide. The government of Kenya therefore resolved to set up digital villages to be used as hubs to disseminate the information and incline the nation towards achieving the MDGs.

2.3 Digital Villages in Kenya

"One strategy for bridging the digital divide while positively attaining the MDGs within a nation, and between nations, is to encourage telecentres". (Rogers & Shukla, 2001) The first telecentres were established in the early 1980s in Scandinavia to promote the use of advanced Information and Communications Technology (ICT). They were funded from public funds for three years. This approach was seen as a way of letting people, especially farmers, experiment with different ICTs. Similar projects were subsequently replicated in other parts of Europe and North America.

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The Kenyan government, together with external stakeholders and private contractors, is increasing its ICT investments in order to reach the entire population regardless of the current demographic factors (Hallberg et al, 2011).The *Digital Villages Project* (*DVP*) is one of the largest efforts to do so. A Digital Village isa centred dedicated to providing access to Information Technology mainly through computers and usually located within rural areas where access to this information is normally limited

(ICTBoardofKenya,2010).

This helps encourage and enhance communication between the user and the outside world. Some Digital Villages also provide learning material through the use of either pre-loaded software or online courses from around the world, allowing a user to increase their knowledge in a particular field (Tole, 2012). In the Kenyan situation this would mainly focus on Agriculture, Health Care and Software development. Digital villages are referred to as *Pasha Centres* in Kenya, meaning "to inform", and are located in rural and resource-poor environments. This was birthed in 2007 when the Kenyan government through the then constituted ICT board set-up initiatives in order to allow communities locatedwithinremotepartsofthecountryaccessinformationandcommunicatebetterwiththe outside world. The main goals of the ICT Board of Kenya and Pasha projects were as follows (ICT Board of Kenya, Pasha Report, 2011):

1. Provisioning of telecommunications infrastructure by the governments.
2. Enable access to information by the occupants of rural areas.
3. Encourage communication between these communities and the outside world.
4. Encourage creation of other economic opportunities within these communities aided by ICT knowledge such as Software development and local content.
5. Enhance support of current economic activities within an area such as agriculture or tourism.
6. Introduce the concept of Business Process Outsourcing within the country which would allow the decentralization of government functions and access to information from local offices.

Whereas in Kenya these centres are referred to as Digital villages in other countries such as Sri Lanka they are commonly known as Tele centres (Hansson et al, 2010). A digital village in Kenya serves to provide services with regard to Internet and telecommunication. In addition, digital villages are also meant to provide certain training, education, and governmental services (e-Government).

'Pasha', the government Digital Villages' project was started in 2009; the aim was to establish a few Digital Villages within constituency level. The major goal of the Kenyan Government to take this approach was the reduction of rural/urban migration (Vision2030). The major benefit of the Digital Villages has been the introduction of government services online. This has resulted in digitalization of records from its ministries such as Ministry of Lands where users can now be able to gain access to this data through a public portal. This has in turn marginally helped reduce the number of people travelling to urban centres in search of these records.

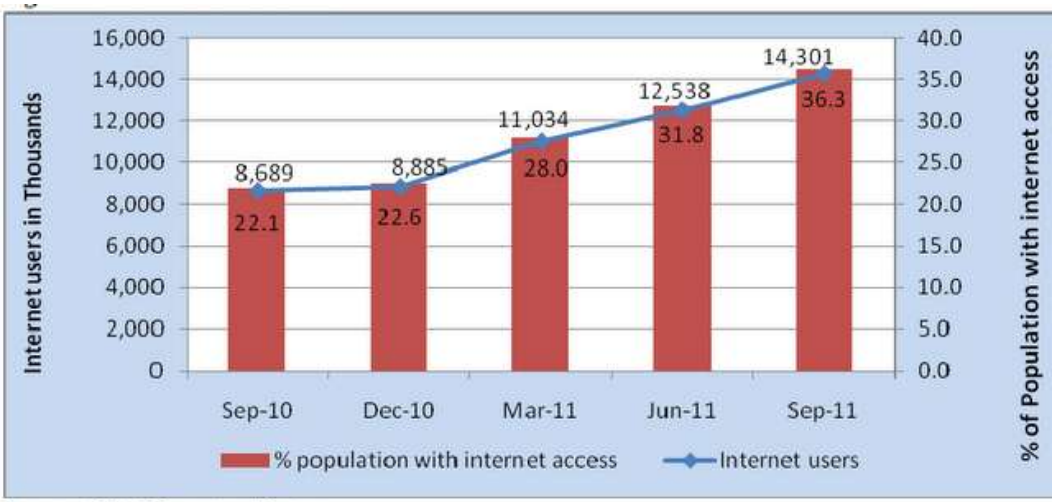
According to the CCK, out of the total population of 41 million, 34.9% have access to the Internet with over 95% of this figure accessing the Internet using mobile devices. CCK (Sector Report, Quarter1, 2011/2012) estimates that there are 27 million mobile subscribers in Kenya, representing a mobile penetration rate of 60%. This is shown from a CCK figure as below:

Source: CCK, Operators' Returns

Figure 1.1 Kenyan Mobile Penetration Rate, CCK Quarter 1 2011/2012

Even with these acknowledgeable strides key among the problems in Kenya's ICT development is the wide digital divide between rural and urban areas, with the latter having more access to these facilities? The problem lies in the fact that over 50% of this country's population resides within rural areas indicating the large economic potential of these areas (Kenya Economic Update, 2010). There have been numerous problems within rural areas such as poor transport network, limited access and the cost to the last mile that are resulting in a slower reach of ICT to these communities. As compared to urban areas, where Internet access is readily available and cheaper to access, it is considerably more expensive to obtain the same services in a rural area.

There are currently over 14 million Internet users in the country most of whom access using mobile devices. This is according to the latest sector report for quarter1 (2011/2012) from CCK. A figured is playing this is shown below:



Source: CCK, Operators' Returns

Figure 1.2 Internet Users in Kenya, (Source: CCK Quarter 1, Statistics Report 2011/2012)

Digital villages in Kenya were started in 2009. These Kenyan Pasha centres, have adopted an entrepreneurial model where ICT is used to bridge the digital divide and at the same time used by the

digital village entrepreneurs as a source of livelihood. These centers are run by entrepreneurs who have undergone training. A development loan from the revolving fund was awarded to these entrepreneurs who setup Pasha Centers. Normally availed loan was to be repaid hence the entrepreneurs had to come up with innovative ideas to ensure sustainability of the Pasha Centers.

The revolving fund was released to successful entrepreneurs who had vision and strategies that would enable the Pasha centers to grow. The first pasha center was then launched in 2009 in Kagundo, followed by other six centers across peri-urban and rural communities across the country. These were in Malindi, South Imenti, Garrisa, Siaya and Mukuru Kiaba.

These six centers acted as a pilot program that would provide future insights for other Pasha centers. These launches were made possible with the Kenya ICT Board working closely with Cisco Systems (Drury, 2011).

The Pasha project was met with a lot of optimism some six years ago mainly because the government had just unveiled the Kenya ICT board, comprised of private sector executives earning Word Bank-level salaries, and the expectations were high. The idea was to set up a digital center in each of the 210 constituencies in the country. The centers would provide digital services, mainly government services, allowing people to reduce the distance they needed to travel in search of government services.

The centers were also supposed to spur innovation and provide employment in rural areas, hopefully allowing more people to move from Nairobi, the capital, to the rural areas, decongesting the capital. However for all this time only about sixty three (63) centres have been opened with others failing to pick and others closed down as they could not break even. It's therefore important to assess the factors inhibiting the vision of the digital villages in Kenya.

2.4 Factors Inhibiting the Implementation of Digital Villages in Kenya

A large digital divide exists between most developing countries strong IT sector and the low levels of overall telecom and computer diffusion. This is the case in India, Brazil and Kenya. (Hallberg et al, 2011). As concluded Castells, (1998)"Technology does not help solve social problems". This has mainly been seen in developing countries where the problems incurred range from political interference to a surprising reluctance by communities to support development projects.

A report on the factors shaping successful Pro-poor ICT in a study done on Commonwealth Developing Countries (Commonwealth policy studies unit, 2005) indicated that most of the partnerships which participate in ICT village provision shave failed to succeed in delivering the goals they had initially projected. There was also no evidence on poverty assessment measures of these partnerships, thereby any indication of a timeline through the project and the benefits it had produced were not concrete (Sunden &Wicander, 2002).

In implementing the Pasha project partnerships can only be successful if the individuals all establish their roles and including the local communities in the project undertaken. The partnerships should not use a'one size fits all' approach to providing Digital Villages to rural communities as this bound to result in failure. Largely, failure of the Pasha project in Kenya is due to various factors inhibiting the vision of these villages in Kenya. These include factors that are working against the implementation of these villages;-

2.4.1 Infrastructures

Infrastructures are facilities and/or equipment's that are required by any telecentre or digital village to function adequately. They includes: Computer sets, printer, photocopier, fax machine, internet connectivity, power back up and others. According to Adul Razak (2009), for digital villages to be successful and serve as an agent of developing knowledgeable society, they should be (1) well equipped with computers both for community and digital villages operators, (2) the computers should be regularly

up-dated to meet up with the latest software in the market and ensure that they can be used for online purposes, (3) the digital villages should be equipped with Wireless Fidelity (WI-FI) for those who want to use their personal laptops or computers, especially when the computers in the digital villages are fully occupied (4) special arrangements should be made for disabled groups by providing assistive facilities.

Figure 1.3: The Settings of Mukuru (the picture is representative of many deprived environs in Kenya) and Mukuru Promotion Centre (Photo Source: David Hallberg, 2011)

If these are achieved, the digital villages will function effectively and serve as effective agents for community to have access to knowledge and achieve desirable outcomes. However it has been observed that lack of constant power supply, and affordable and stable connectivity as well as difficulties in maintaining the digital villages equipment's are the most common problems affecting telecentres success (Fillip and Foote, 2007).

According to Fillip and Foote, (2007) the unstable power supply causes serious impediments to the digital villages such as, loss of revenue, paralyze activities in digital villages and early break down of computer equipment's which affect the success and long term sustainability of the digital villages. Also, Gichoya (2005), in his work claimed that lack of infrastructures as one of the factors affecting implementation of ICT projects. In line with this, Islam and Hassan (2008) also argued that lack of reliable communications infrastructures and inadequate bandwidth is also a factor affecting the take up services in the digital villages.

According to Gyamfi (2005), poor quality infrastructures and complete absence of infrastructures'(such as electricity) and cost of connectivity created barriers to information, making it difficult for people to use ICT services in many Sub-Saharan countries. In Ghana for example, majority of the rural communities have no constant electricity supply as a result the digital villages cannot function effectively (Alemna and Joelm, 2006). In Dhar village in rural India, lack of basic infrastructure such as power supply and poor connectivity has prevented the digital villages from providing effective services (Conroy, 2006).

This paralyzes activities in the villages and prevents people from enjoying the benefits of the ICT projects. Consequently, Caroline, Brenda and David (2006), suggested that availability of infrastructures and other

items such as spare parts, hardware, and soft ware's and the irregular supplies in digital villages will help attain the vision. Thus if Kenya has to realize the vision for the digital villages then there is need for the infrastructure to be maintained in order to keep them functioning and maintain the support and interest of the community.

2.4.2 Political Interests

Public projects are often left uncompleted or delivered to a poor quality (World Bank, 2004). Failure to deliver these projects undermines citizen welfare and leads to an estimated loss of US$150 billion per year in public resources (World Bank, 2007). The extent of these failures varies within and across countries, driving national and global inequalities (Banerjee et al, 2007). Politicians are normally viewed as critically important agents in the delivery of public projects.

Politicians are elected by citizens to decide public policy, including the delivery of public projects like the digital villages. When faced by high levels of political competition in their constituencies, politicians may be incentivized to improve the quality of potentially vote-winning public projects. Consequently, they may seek to overcome barriers such as bureaucrats' inefficiency, inertia, or corruption.

However existing evidence suggests that political competition has hindered the delivery of public projects like the digital villages in Kenya. This is because politicians are able to influence the bureaucratic arm of government, to satisfy their short-term electoral concerns. Typically, because politicians do not undertake public projects themselves, they work behind the curtains to ensure that only those digital villages in their areas could take off because they can use these as campaign tools to better their political ambitions (Iyer and Mani, 2012).

Still in the Kenyan scenario even though the digital villages were started to aid the people the reason they've not made headway is because most sitting politicians often take up office and instead of improving or finishing the projects started by the previous regime they abandon them for new projects of their own because the thought is who will get the profit or is it the votes. In Kenya politicians are more interested in getting the credit for what they have implemented and in the process most good projects like the digital villages have failed or even stalled.

2.4.3 Literacy Levels/ Capacities and Knowledge

This is an important factor which according to many scholars or researchers influences digital village success. Leaders of digital villages need to have certain level of competency and experiences in order to manage the digital villages effectively and also enable them achieve their objectives. As Hunt (2001) suggests, qualified and well trained leaders, employees, volunteers and skilled technical support should be employed to run the affairs of digital villages. This according to him is because, without well trained leaders and staff, assisting users to use ICT and conducting activities in the centre cannot be possible.

Similarly Benjamin (2000) in his opening remarks at ICT international conference emphasized the importance and need for competent leadership to be engaged in digital villages. He further stated that community projects like digital villages need leaders who are competent, trained and adequate community support in order for them to be successful and sustainable. However this could not be the case in Kenya because the leaders of the digital villages only bought the idea because of what they expected as their returns their knowledge of the digital village notwithstanding. Moreover, it has been argued that in most cases, the success or failure of digital villages is determined by the skills and characteristics of the leaders (Rothschild, 2008).

According to Mphalele and Maisela (2003), and Bahaman et al. (2010), sound management and administrative skills are very crucial to the success of digital villages. While Colle, (2005), asserts that leadership, management quality and flexible leadership, ensures the success and sustainability of digital villages. Abdul Razak (2009) claimed that there is positive correlation between the personality of leaders

and digital village success, as they are charged with the responsibility of managing the activities in the digital villages. Based on available literatures it's therefore important to note that competency of leaders is an important factor that leads to digital village success.
Furthermore it's important to consider the literacy levels of the digital village user in the rural areas. Most people in the rural areas in Kenya are school dropouts, in most cases they've already given up on their lives and the introduction of such a project by the government is deemed of no benefit to them at all. Unless there are awareness seminars to educate the users of the importance of the project and what they'll gain at the end it will be difficult for these villages to make headway even if more money is pumped into them.
Managing an ICT centre requires qualified staff, technical staff with know how in the manipulation of computers were to be hired to execute services in these villages. However this was not the case, the entrepreneurs who started these projects also teamed up as the technical staff, this could have contributed largely to their failure to take off because without expertise knowledge in an area service delivery to the customer is limited.

2.4.4 Security

Computer security is the protection of the items you value, called the assets of a computer or computer system. There are many types of assets available in the digital villages, involving hardware, software, data, people, processes, or combinations of these. To determine what to protect, we must first identify what has value and to whom. Electronic appliances in most cases need protection from adverse effects of conditions like power outages. However it's sad to note that the entrepreneurs who rolled out these projects had no security measures to ensure that there were no casualties in case there was such a calamity. This could have affected the implementation of these villages because power outage is a norm in rural Kenya.

Furthermore clinical matters affecting electronic devices like infection of viruses could have set in. Due to the fact that most entrepreneurs who run these villages did not have technical know-how it's quite possible that most of the machines once infected were literally written off rendering them useless and unavailable for use by the customer. In some cases security matters include normal theft, rural areas in Kenya today is occupied by the poor, starting such a centre in the village could make it vulnerable to normal thieves who could steal the electronic appliances to sell and make quick cash, thus hindering the progress of the project.

2.4.5 Financial Resources

Combinations of factors have resulted in the slowed growth of the digital villages' project, a public private partnership initiative that was expected to deepen use of ICT in rural areas in Kenya. The Pasha fund was created to provide seed capital to entrepreneurs interested in setting up businesses in the 210 constituencies. It was presumed that the people would receive funds ranging from Ksh. 850,000 to 2 million (US$10,000 to $25,000). They would then set up the business, provide value addition and allow the business to sustain itself with time and repay the loan.

There was a rigorous application exercise and funds allocated to each entrepreneur would be repayable over a three (3) year period. These repayable funds received by the entrepreneurs could be used to finance set-up costs and or upgrading of an existing facility. However the entrepreneurs that received loans from the digital villages revolving kitty to set up the digital villages noted that the project failed to take off as initially expected.

This has been due to many license fees that the centres have to pay as well as the structuring of the loan that entrepreneurs received to start off the digital villages. These included licenses for training, offering connectivity, not understanding that the Centres were social enterprises in nature. Some of these were public services aimed at deepening digital literacy and the digital villages do not generate revenue from all these services as ICT knowledge is still dismal in the rural areas. There due to these lack of funds some of these villages were retarded and never picked up at all or failed along the way.

2.5 Location of the Digital Village

Bailey and Ngwenyama (2009) in their model of digital village success explained that the location of a digital village plays a very important role in determining their usage, which in turn leads to their success. Also, they argued that the location of a digital village and its operating environment determines the extent with which digital villages' services and facilities are utilized.

Islam and Hassan (2009), in their own part, argued that location of a digital village is very important and therefore, they should be in a place where people frequently visit and where they can easily gain access to.

For instance, studies have shown that one of the reasons why digital village in Thiruvadauur village, a rural community in India was not successful despite all efforts made by the operators, was because it is located far away from the community (Kumar and Best, 2000). This could also be the case in Kenya since even though these villages were set up in the rural areas they were secluded to the areas that were chosen by their entrepreneurs and this could not cater for all the users. According to Scott (2001), Holmes (1999) and Robinson (1998) digital villages should be located in a place known by the community as a stable place such as schools, libraries, museums, and other similar places. This will lead to success, attract more users and minimize the costs on them. Therefore it would have been better if areas like schools would have been chosen as the appropriate location of these villages to make them accessible to the common 'mwananchi'.

2.6 Generic Services

The generic services that are offered by the digital villages are likely to influence its adoption by the host; this should be sensitive to community requirements. The closer the software tools match the needs of the community, the more likely they will be used. The quality and responsiveness of management planning for maintaining suitable levels of products is important as well as the extent to which a digital villages is able to effectively network with other centres in order to share experiences, cross- fertilize ideas and promote joint learning (Harris, 2001). It's important to note here that the digital village failure to take off could have been due to the fact that though these villages were set up in the rural areas the services offered therein were not customized to the community in which they were set up.

Rural Kenya today is comprised of the small scale farmer and the business people; if such a project is setup in their neighbourhood it's in order for the services offered to take care of their needs. These villages should have taken care of the farmers input, soil sampling and how to interpret the results as well as modalities of how to market their produce. This would have served to educate the farmers and thus customized to the needs of the community. However since was not the case they could have been ignored by a larger portion of the population thus causing them to fail?

2.7 Government Bureaucracies

According to world health organization (2010) most countries in the region have not developed national policies, strategies or regulatory frameworks that are necessary for establishing common technical infrastructure, interoperability and standardization protocols. In addition countries also need to address ownership, confidentiality, security of data and quality of information (Kulecho, 2015).

All these bureaucracies when laid up in place interfere with the implementation of any project in a country the digital village project notwithstanding. This is because those who make rules and the procedure of regulation make them in such a way that they are tedious for those affected. Furthermore when tax bodies like Kenya revenue authority (KRA) set in it becomes cumbersome for the entrepreneurs especially if the project is nonprofit making like the digital village one. This could have led to the abandonment of the project all together.

2.8 Lack of Monitoring and Evaluation

According world health organization (2010) the majority of the ICT projects, initiatives, national plans or frameworks implemented so far in the East African region have not been adequately monitored or evaluated. Indeed, comprehensive frameworks for monitoring and evaluation have yet to be developed here in Kenya. The challenge is to ensure the availability of efficient systems for monitoring and evaluation and for sharing of experiences and lessons learnt (world health organization, 2010). Maybe if this is put in place in this country the digital villages will pick up and the hiccups being experienced

3.0 Conclusion

Table 1.1 Correlations between Effect of Implementation Strategy and Successful Implementation of Digital Villages

		Effect of Implementation Strategy	Success of Digital Villages
Effect of Implementation Strategy	Pearson Correlation Sig. (2- tailed) N	1 30	.218 .265 30
Success of Digital Villages	Pearson Correlation Sig. (2-tailed) N	.218 .265 28	1 30

Adopted from Obora *et.al*, 2014

This study depended highly on secondary data adopted from various sources, Table 1.1 was adopted from Obora et al, 2014, from the findings the Pearson correlation coefficient was 0.218, and this implies a very weak positive correlation. The level of significance on the other hand is 0.265>0.05 this implies that there is no significant relationship between effect of implementation strategy used and success of the digital villages.

This means that the strategy adopted by the KICTB towards the implementation of the digital villages in Kenya was not appropriate and hence resulted in the challenges that were experienced by the digital villages at their onset which consequently could have resulted in the failure of the digital villages.

From the data above, it's true that the digital villages in Kenya have not been successful at all. This is because of the very many factors that were inhibiting the implementation of these villages as highlighted in this study. As a result of all these factors this study proposes that the government should come up with a different policy separate from the ICT Policy that would give the digital villages mandate as a stand-alone project.

For starters the government should adopt the digital villages as a public project because they offer social services that should be of interest to the government especially in its quest to deepen ICT literacy in rural areas. Furthermore this policy should protect the villages from the Ministry of Educations (MOE) threats to close them down. This is because the ministry had threatened to close these villages down because they are not accredited to train. It should be clear that what these villages do is not educational training but digital literacy. Also there should be modalities on how to repay the revolving fund loans that were acquired for the operation of the digital villages. This should include accommodative methods to the entrepreneurs as a motivation for them to venture into this project some more.

Moreover there should have been trainings and workshops and seminars on what a digital village is and how it was going to benefit the society or the communities in which they were set up. The managers of this centres as well as the people who gave the services should have been given basic technical knowledge, this could have served to demystify the urban notion and encouraged people in the rural areas to embrace the same.

Finally a baseline study should have been carried out before the start of this project in order to measure the impact. This would have led to the project implementers developing project deliverables which would have served as a guide on how to run the project, maybe this would have helped to propel the project so that it doesn't stall.

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Information and Communication Technology (ICT) Tools for Persons with Disabilities Inclusivity in Development in Developing Nations: A Literature Review

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Abstract
*This paper presents a view of how Information and Communication Technology (ICT) tools can be used for the inclusivity of persons with disabilities in development in developing nations. ICTs play a growing role in the world's societies. ICTs have the potential to help disadvantaged groups such as persons with disabilities to increase their participation in social, political, and economic processes critical to sustainable development. Reports from reviewed literature show than one billion people live with some form of disability. Reports further show that 80%) of this population live in developing countries and that they live in poverty and are among the poorest and most vulnerable groups of the global population. Persons with disabilities were not included in the Millennium Development Goals (MDGs) and consequently excluded from many development initiatives and funding streams. In contrast, the Sustainable Development Goals (SDGs) has a historic achievement for persons with disabilities, since it explicitly includes and references them in a variety of areas such as education, employment, accessible cities, reducing inequalities, and disaggregation of data. This recognition is particularly important because it places persons with disabilities at the centre of poverty eradication. Although the principle of the 2030 Agenda for Sustainable Development is "**leave no one behind**," it is still not clear how this will be achieved for persons with disabilities in developing nations. The paper recognizes the fact that ICT have the potential for making significant improvements in the lives of persons with disabilities, allowing them to enhance their social, cultural, political and economic integration in communities by enlarging the scope of activities available to them. The paper posits that ICT tools should be designed to promote ICT accessibility and use for the social and economic development of persons living with disabilities. The method adopted in this research was integrated literature review research approach. To identify relevant research a traditional online search was conducted using the keywords "Information and Communication Technology and Persons with Disability", "Persons with disability inclusivity in development", "Persons with disability and Sustainable Development."*

Key words: *Information and Communication Technology, Persons with Disability,Inclusivity, Sustainable Development*

1.0 Introduction

Disability has been defined differently by different authors. The Disability Discrimination Act (DDA) defines a disabled person as someone who has a physical or mental impairment that has a substantial and long-term adverse effect on his or her ability to carry out normal day-to-day activities [1]. DDA further explains that a person is considered to be disabled if they have a mental or physical impairment and the impairment has an adverse effect on their ability to carry out normal day-to-day activities. World Health Organization (WHO) defines disabilities as impairments, activity limitations, and participation restrictions [2]. WHO expounds that impairment is a problem in body function or structure; an activity limitation is a difficulty encountered by an individual in executing a task or action; while a participation restriction is a problem experienced by an individual in involvement in life situations. Disability is therefore a complex phenomenon, reflecting an interaction between features of a person's body and features of the society in which he or she lives. The causes of disabilities are many and varied, and affect people of all cultural and social backgrounds. Living, environmental conditions and financial circumstances affect how people are able to manage their disabilities.

It is estimated that 15 per cent of the world population is living with disabilities which approximates to one billion people with disabilities. Various research reports show that persons with disabilities are more likely to live in poverty, face many obstacles, including stigma, invisibility and abuse. These obstacles and barriers hinder them in participating in all aspects of society hence they do not enjoy access to society, transportation, employment, education, justice, and political participation on an equal basis with others [3] [4] [5] which is essential in creating democracies, and citizenship. Persons with disabilities are more likely to experience adverse socioeconomic outcomes than persons without disabilities, such as less education, poorer health outcomes, lower levels of employment, and higher poverty rates [6]. A country's economic, legislative, physical, and social environment may create or maintain barriers to the participation of people with disabilities in economic, civic, and community life. These barriers include inaccessible buildings, lack of accessible transport, lower access to information and communication technology (ICT), inadequate standards, lower level of services and funding for those services, as well as too little data and analysis for evidence-based, efficient, and effective policies [7]. Poverty may increase the risk of disability through malnutrition, inadequate access to education and health care, unsafe working conditions, a polluted environment, and lack of access to safe water and sanitation. Disability may increase the risk of poverty, through lack of employment and education opportunities, lower wages, and increased cost of living with a disability [6] [7][8].

Discrimination exists in all sectors consequently people with disabilities face discrimination in all aspects of life. Discrimination can be direct such as when they are refused access to a job on the grounds of their disability, or indirect, such as when computerised systems such ATMs are not accessible. Many times people with disabilities don't benefit from the required adjustments hence they are often excluded from society [9]. Studies show that women with disabilities are two to three times more likely to be victims of physical and sexual abuse than women without disabilities, 20 million people in the world who need a wheelchair don't have one. Many more have inappropriate or worn-out machines. Data from the world health survey show that employment rates for men with disabilities (53 %) and women with disabilities (20 %) are lower than employment rates of men (65 %) and women (30 %) without a disability [6] [10].

Global awareness of disability-inclusive development is increasing. People with disabilities have the **same human rights as anyone else.** Recognition of these equal rights is recent and has been reaffirmed by the Convention on the Rights of Persons with Disabilities **(UNCRPD)**, adopted by the United Nations General Assembly in December 2006 and entered into force in May 2008 [3] [6] [10]. The United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) promotes the full integration of persons with disabilities in societies. The UNCRPD specifically references the importance of international development in addressing the rights of persons with disabilities. Its enjoyment starts from the local communities where they live, from home, and in their families. It stems from the recognition that all people with disabilities do have the capacity to make their own choices and be part of decision-making processes [11] [12]. The widespread adoption of the United Nations Convention on the Rights of the Persons with Disabilities (UNCRPD) in 2006 heralded a major step forward in advancing the inclusion of persons with disabilities, turning their socio-economic exclusion into a human rights issue. The UNCRPD places significant obligations on all state officials responsible for equal access to education and employment opportunities [13].

Persons with disabilities are very important to the development of a nation. When people with disabilities actively participate in society and their voice is heard, all the community benefits from it and brings about positive change. However, this is far from being a reality in many countries around the world; negative attitudes and traditional beliefs are other barriers hinder the participation in society by persons with disabilities [12]. The 2030 Agenda for Sustainable Development clearly states that disability cannot be a reason or criteria for lack of access to development programming and the realization of

human rights. The Sustainable Development Goals (SDGs) framework includes seven targets which explicitly refer to persons with disabilities and six further targets on persons in vulnerable situations, which include persons with disabilities. The SDGs address essential development domains such as education, employment and decent work, social protection, resilience to and mitigation of disasters, sanitation, transport, and non-discrimination all of which are important areas of work for the World Bank. The New Urban Agenda specifically commits to promoting measures to facilitate equal access to public spaces, facilities, technology, systems, and services for persons with disabilities in urban and rural areas. When persons with disabilities are empowered, the human solidarity is strengthened for everyone [4] [14]. They can contribute to society by generating ideas, products and inspiration for millions of other people given the opportunity they deserve [4] [14] [15]. The world would be stronger if the rights of the more than 1 billion persons living with disabilities in the world would be respected, protected and fulfilled. Information and Communication Technologies (ICTs) have the potential for making significant improvements in the lives of persons with disabilities, allowing them to enhance their social, cultural, political and economic integration in communities by enlarging the scope of activities available to them. The use of ICTs allows the removal of many of barriers faced by persons with disabilities [15] [13]. With ICTs increasingly integrated into every aspect of the modern world, these ubiquitous technologies have become a positive force of transformation and a crucial element of any personal development empowerment and institutional framework for inclusive development [16]. Accessible ICTs have the potential to provide persons with disabilities unprecedented levels of access to education, skills training and employment, as well as the opportunity to participate in the economic, cultural and social life of their communities [13] [17]. Considering that one billion people, has a disability that affects their access to modern communications, there is a dire need to improve their access to ICTs.

The paper examined the situation, trends and evolution of people with disabilities, identified link between disability and poverty, identified effects of including persons with disability (PWD) in development and identified ICT tools appropriate for the development of persons with disabilities in developing nations.

2.0 Material and Method

The method adopted was integrated literature review research approach. To identify relevant research a traditional online search was conducted using the keywords "Information and Communication Technology and Persons with Disability", "Persons with disability inclusivity in development", "Persons with disability and Sustainable Development". This resulted in identification of key research papers, technical reports and literature related to Information and Communication Technology (ICT) in Inclusivity of the Disabled both in developing and developed nations. A critical review of the selected literature addressing the study area was then conducted to identify barriers to inclusion of persons with disability and different ways ICTs can be used to enhance their inclusion in sustainable development.

3.0 Results

3.1 Global Situation, Trends and Evolutions

Disability covers a great variety of situations. The global disability situation reveals significant inequalities, as people with disabilities are not a homogeneous group. Poor people, women, and old people are more likely to experience disability than others [6]. While disability correlates with disadvantage, not all people with disabilities are equally disadvantaged. Women with disabilities experience gender discrimination as well as disabling barriers. In the World Report on Disability, the World Health Organization and the World Bank estimate that m**ore than one billion people live with a disability,** in one form or another; this constitutes approximately 15 % of the world population**. The report estimates that 110 million people** (2.2% of the global population) have very severe functional

difficulties and **80% of people with disabilities live in developing countries.** Disability disproportionately affects vulnerable populations. There is higher disability prevalence in lower-income countries than in higher income countries. People from the poorest wealth quintile, women, and older people have a higher prevalence of disability. Moreover, **20%** (1 in 5) **of the poorest people** living in developing countries have a disability.

In 2005 UNICEF, estimated there were **150 million children under 18 living with a disability**. **Children with disabilities are less likely to attend school** and have lower rates of staying and being promoted in schools. It was estimated that only 41.7% of women with disabilities have completed primary school, compared with 52.9% for other women. The World Report highlights trends and evolutions. The **number of people with disabilities is increasing,** partly because we live longer, and because chronic conditions such as diabetes and cardiovascular disease are increasing. Other environmental factors, such as road accidents and natural disasters, contribute to the increase of numbers in some contexts.

3.1 Persons with disability in developing nations

About 80 per cent of all disabled persons live in isolated rural areas in the developing countries [6] [18] [19]. In some of these countries, the percentage of the disabled population is estimated to be as high as 20% and, thus, if families and relatives are included, 50 per cent of the population could be adversely affected by disability. The problem is made more complex given that many disabled persons are also extremely poor. They often live in areas where medical and other related services are scarce, or even totally absent, and where disabilities are not and cannot be detected in time. In many developing countries, resources are not sufficient to detect and prevent disability and to meet the need for the rehabilitation and supportive services of the disabled population. Trained personnel, research into newer and more effective strategies and approaches to rehabilitation and the manufacturing and provision of aids and equipment for disabled persons are quite inadequate [18].

3.2 Links between Disability and Poverty

There is a strong link between disability and poverty. **Poverty rates are higher for people with disabilities than for those who do not have a disability.** Disability is both a cause and consequence of poverty [5] [10]. **This trend calls for equal empowerment for people living with disabilities for socio and economic development of nations and the world at large.** The relationship between disability and poverty is often described as a vicious circle, poverty leading to disability and disability worsening poverty as depicted in Figure 1 below.

Figure 1 The negative cycle linking disability, poverty and vulnerability. Source: Handicap International

From Figure 1, the main links between poverty and disability are [6] [10]:

i. **Dangerous and unhealthy living conditions**, such as inadequate housing, water and sanitation, and unsafe transportation and work conditions.
ii. **The absence or inaccessibility** of **timely and adequate medical care or rehabilitation**. People with disabilities are confronted with extra costs related to disability such as personal assistance, medical care or assistive devices. These additional costs increase their risk of being poorer than others. In low incomes countries, people with disabilities are 50% more likely to experience catastrophic health expenditure than non-disabled people.
iii. **Limited access to education and employment**. People with disabilities are more likely to be unemployed and are generally paid less when they are employed. The employment rates for men with disabilities (53%) and women with disabilities (20%) are lower than men (65%) and women (30%) without disabilities.
iv. **Social exclusion**: People with disabilities often do not have access to public spaces because of physical barriers, and often cannot participate in political decision-making.

3.3 The Cost of Excluding People with Disabilities in Development

The cost of excluding people with disabilities is high. This cost must be considered both at the individual level and for society at large [10] [15]. From an economic point of view, an individual experiences a doubling of the cost of disability. These are direct costs for treatment or rehabilitation, including user fees and transport costs and foregone income both for the person with a disability and their assistants or families. Poverty rates are also known to be higher in families with a person with a disability. In such families, members spend time and money taking care of the disabled who needs personal assistance and has not had access to the support services or rehabilitation that would lead to independent living.

4.0 Discussion

4.1 People with Disability Inclusivity in Sustainable Development

Recognition of the importance of including disability in development activities is based on many different arguments [10] [11] [13].

i. **Demographic arguments:** People with disabilities represent a significant proportion of the world population (15%) and therefore cannot be ignored or excluded from development efforts.
ii. **Social development arguments:** Societies cannot develop in a unified manner if a significant part of their members continue to be treated differently and discriminated against because of their disabilities
iii. **Economic development arguments:** Excluding people with disabilities from society has a significant cost. It is estimated that using universal design principles to make a community centre and a school accessible only add 0.47% and 0.78%, respectively, to the overall costs. It is also estimated that the rehabilitation needs of 80% of people with disabilities could be satisfied at community level. The remaining 20% are likely to require referral to some kind of specialist facility.
iv. **Legal arguments:**People with disabilities have the same rights as any other person, as stated by the United Nations Convention on the Rights of Persons with Disabilities (CRPD), and as such should benefit from development activities on an equal basis with others.

4.1.1Inclusive Development

Inclusive development consists of ensuring that all marginalized and excluded groups are stakeholders in development processes [6]. United Nations Development Programme (UNDP) maintains that many groups are excluded from development because of their gender, ethnicity, age, sexual orientation, disability or poverty. The effects of such exclusion are the causes of rising levels of inequality around the world. Development cannot effectively reduce poverty unless all groups contribute to the creation of opportunities, share the benefits of development and participate in decision-making. The goal of

inclusive development is to achieve an inclusive society, able to accommodate differences and to value diversity. International Disability and Development Consortium (IDDC) define disability-inclusive development as "ensuring that all phases of the development cycle (design, implementation, monitoring and evaluation) include a disability dimension and that **persons with disabilities are meaningfully and effectively participating in development processes and policies" [20].**Inclusive development implies a rights-based approach to development, understood in terms of a framework for human development as a process firmly grounded in international human rights standards and focused on the promotion and protection of human rights [21] [22].

Inclusive development is based on three principles: participation, non-discrimination and accessibility [6] [10] [14].

(i). **Participation: Participation is essential to ensure the relevance and sustainability of any development action.** The active involvement of people with disabilities is particularly important to overcome their isolation and invisibility. Overcoming barriers, especially social barriers, is only possible if there is a proactive effort to include people with disabilities. This requires positive action and the implementation of reasonable accommodation. The Convention on the Rights of Persons with Disabilities (CRPD Article 4.3 contains an obligation to "closely consult with and actively involve persons with disabilities, including children with disabilities, through their representative organizations in the development and implementation of legislation and policies to implement the present Convention, and in other decision-making processes concerning issues relating to persons with disabilities".

(ii). **Non-discrimination:**Discrimination is the key concept of the CRPD, which it aims to eliminate. There are two basic types of discrimination: **Direct discrimination refers to t**reating a person less favourably than another in a comparable situation (for example, refusing to include some children in computer literacy class because of their disability) whereas **Indirect discrimination occurs** when something that seems neutral results in a particular disadvantage for people with disabilities (for example, computer literacy for all is excluding people with disabilities if the keyboard is designed in such a way that it can only be used by those with fingers). Disability-inclusive development, therefore, means to ensure that no action contributes to creating new barriers.

(iii).**Accessibility:**Accessibility must enable persons with disabilities to live independently and participate fully in all aspects of life. The CRPD requires States Parties to take "appropriate measures to ensure to persons with disabilities access, on an equal basis with others, to the **physical environment, to transportation, to information and communications**, including information and communications technologies and systems, and to other facilities and services open or provided to the public, both in urban and in rural areas" (CRPD Article 9).

4.1.2 ICT Tools for Persons with Disability Inclusivity in Development

The importance of ICTs lies in their ability to open up a wide range of services, transform existing services and create greater demand for access to information and knowledge, particularly in underserved and excluded populations, such as persons with disabilities. **With the advent of ICTs, new hopes are emerging for Persons with Disabilities (PWDs) [23]. During the 2014 International Telecommunication Union (ITU) Plenipotentiary Conference held in, Busan, Republic of Korea, ITU Member States approved by consensus Resolution 175 "Telecommunication/Information and Communication Technology accessibility for persons with disabilities and persons with specific needs". Resolution 175 mandates ITU to make ITU an accessible organization for Persons with Disabilities and Persons with Specific Needs including age-related disabilities, and to promote ICT accessibility and access to ICTs for Persons with Disabilities and Persons with Specific Needs. Efforts are being undertaken to involve ICTs to counter issues around disability [24]. ICTs which include assistive technologies are offering**

new opportunities for PWDs. When using ICTs that is adapted to the abilities of everyone disabled persons are able to participate in all aspects of social life on more equal terms which is important for an inclusive and barrier-free Information Society. [13] [25]. With access to ICTs, they can access the Internet and digital libraries and access information about basic things for independent daily living, such as public health information. ICTs help the disabled use access their bank accounts through mobile banking, find their way around cities on their own guided by maps and GPS accessing crucial information such as public transport routes and use mobile apps such as UBER apps to request for transportation services. Through ICTs the disabled can benefit from e-government services and regularly make electronic payments.

A number of ICT tools have been instrumental in promoting inclusivity of the disabled persons in development. Such tools include but not limited to the World Wide Web and the Internet, mobile devices, radios and television services and assistive technology devices [6] [13].

4.1.3 World Wide Web (WWW) and the Internet

The advent of the Internet and the World Wide Web has ushered in a new age of information sharing and the proliferation of web-based services that serve disabled and non-disabled communities alike. Through the Internet, disabled persons can remotely participate in a range of activities such as tertiary, professional, lifelong education, employment, economic, government services and consumer activities. Opportunities for social participation also include social networking, news access, online interest groups, video, audio and text communication, cloud-based sharing and media interaction [13]. These services and content are made further accessible through both computer-based and web-based accessibility applications such as screen readers, speech recognition, video communication (for sign language communication and video relay interpretation), voice to text services (open and closed captioning, both real-time and embedded) and visual assistance. Websites can provide visual, audio and text output on demand and offer multimedia input opportunities to users. The World Wide Web and web applications have a greater impact in improving persons with disabilities' access to socio-cultural, educational and economic activities than any other ICT with the exception of mobile phones' impact on independent living.

4.1.4 Mobile devices and services

Mobile devices and services have had a great impact for persons with disabilities. At the basic level, mobile phones provide a means of on-demand communication for the user through both SMS, chats and voice calls which can enable independent living by ensuring that emergency services, family members, personal aides, assistive and everyday services are a call or text away [13]. Smart phones provide the disabled with access to the World Wide Web and Internet services. Smart phones also address the unique sensory, physical and cognitive needs of people with disabilities. A variety of smart phones are rated for hearing aid compatibility. Users with disability can enjoy open or closed-captioned multimedia content and use face-to-face video chat applications or dedicated video relay services to communicate via sign language. They are also able to access content non-visually through screen reading applications, customize alert settings to use a combination of audible, visual and vibration alerts and take advantage of voice-commands, adjustable font sizes, predictive text and a range of other innovative features, accessories, and third party applications. In addition, mobile devices are designed to be portable and are easily worn or carried by a user, unlike a laptop computer or television set. For persons with disabilities, having a mobile device increases independent living not only because of the wide range of services that can be accessed, but also because this type of device allows access to those services including emergency services immediately at the time of need and from anywhere in the network.

4.1.5 Webcasting and captioning

Webcasting and captioning are invaluable tools, which benefit persons with disabilities and specific needs [23]. Captions are text equivalents of the spoken word and other audio content. They allow the audio content of web multimedia to be accessible to those who do not have access to audio, primarily the Deaf and hard-of-hearing. It is hard for deaf and hard-of-hearing people to keep pace with their hearing colleagues in education, business, and the many professional fields that are becoming increasingly Web-centric. Inclusion by captioning webcasts has a meaningful impact on the lives of people who depend on communication access. Equal communication is essential for all. Captioning is the preferred form of communication access for an ever-growing number of deaf and hard-of-hearing persons. Promoting inclusion by captioning meetings, class sessions and conference sessions can enhance the inclusion of many people.

5.0 Conclusion and Recommendations

ICTs are emerging as increasingly valuable tools for including the physically disabled in the development of their nation. Without ICT inclusion, there is a very limited scope for the nation as well as regions to develop. Access to ICTs is vital for persons with disability to achieve full participation in all aspects of life and society. Without access to ICTs, which include assistive technologies or specially-developed ICTs, people with disabilities are denied equal access to education, culture, and everyday services. This is detrimental in restricting their job opportunities and their possibility for independent living.

Since access to ICTs is vital for persons with disability to achieve full participation in all aspects of life and society, governments of developing countries formulate new policies or/and re-enforce existing policies related to ICT and socioeconomic development of the disabled persons. In addition, the governments with support of non-governmental organizations and International organizations for persons living with disabilities should be provided with relevant assistive technologies, specialized mobile devices at subsidized costs or free just as the governments have been committed to providing wheel chairs, artificial limbs and special shoes to the physically disabled.

Modern centres equipped with relevant ICT tools and assistive technologies should be established across the country. In addition, existing centres of persons with disabilities should be upgraded to meet the required international standards. Persons with disability should be trained on the use of these technologies. With the support of the government and telecommunication companies, affordable internet access should be availed in the rural areas where most of the disabled live and the centres for persons with disabilities.

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Application of Information and Communiction Technology in Institutions of Higher Learning in Kenya

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Abstract
Technology in the 21st century has grown in leaps and bounds. Information and Communication Technology today is applied in nearly all spheres of human life. For institutions of higher learning, ICT has offered a window through which they efficiently carry out their day to day activities of teaching, research and community service. It was against this background that the current study sought to investigate application of ICT in academic and administrative realms of these institutions. The specific objectives were to: explore how ICT is applied to run administrative functions in Kenyan universities; investigate how ICT is applied to run teaching-learning activities in Kenyan universities; describe how ICT is applied to conduct research activities in Kenyan universities; identify barriers facing effective implementation of ICT in Kenyan universities and recommend solutions. The study applied a descriptive survey design. The study targeted the 70 public and private universities in the republic. Out of this population, 21 public and private universities were purposefully sampled to take part in the study. Respondents were sampled randomly. They comprised of 384 members of academic staff and 58 members from various departments of university administration. The researcher engaged the services of 21 research assistants who were responsible for administering questionnaires in the sampled institutions. The researcher tested the validity and reliability of this instrument by piloting it in one university which was not included in the final study. Data analysis was done by grouping data according to the study objectives. Quantitative data from the questionnaire was coded into categories based on the study objectives and fed into SPSS computer software version 20 which analyzed it using percentages and frequencies. Data was presented in frequency tables. The study established that ICT is applied in various domains such as: offering distance learning courses, delivering lessons, analyzing research data, conducting webinars, managing students' fees records, booking hostel rooms, processing examinations and submitting staff's performance appraisals. Among the challenges facing integration of ICT in these institutions included lack of enough computers with reliable internet, lack of political goodwill to implement the national ICT policy, inadequate time for lecturers to incorporate technology in teaching and lecturers' negative attitude towards use of ICT in teaching. In light of this, a number of workable recommendations were proposed to address these challenges.

Key Words: *Administration, Barriers, ICT, Teaching-Learning, Research.*

1.0 Introduction

Information and Communication Technology (ICT) refers to a set of technological tools and resources used to communicate, create, disseminate, store and manage information. They include technologies such as radio, television sets, video, telephone, computer hardware and software, and so forth (UNESCO, 2002). On the other hand, Pernia (2008) defines ICT as technologies used to communicate in order to create, manage and distribute information. These include computers, internet, telephone, television, radio and audio-visual equipment. Pernia further argues that ICT devices and applications are used to access, manage, integrate, evaluate, create and communicate information and knowledge. Use of ICT in institutions of higher learning in the 21st century has experienced phenomenal growth. It was against this background that the current study sought to investigate how institutions of higher learning in Kenya apply ICT to run their day to day functions. The specific objectives of this study were to:

1. Explore how ICT is applied to conduct administrative functions in Kenyan universities.
2. Investigate how ICT is applied to conduct teaching-learning activities in Kenyan universities.

3. Describe how ICT is applied to conduct research activities in Kenyan universities.
4. Identify barriers facing effective implementation of ICT in Kenyan universities and recommend solutions.

2.0 Literature Review

2.1 Literature on ICT in Administration

Use of ICT to run administrative functions of institutions of higher learning can play a major role in the efficient utilization of existing resources and simplification of administrative tasks. It reduces paper work as it replaces manual maintenance of records to electronic maintenance which helps in easy retrieval of any information of students and staff (Alam, 2006). In spite of this, Alam does not provide empirical data.

According to Ben-Zion et al. (1995), ICT can be applied in the following areas for effective educational administration in institutions of higher learning: general administration, payroll and financial accounting, administration of student data, inventory management, library system, and personnel records maintenance. Unlike the current study, Ben-Zion's study was not empirical.

Caroline and Salerno (2000) suggest the following ways of introducing technology in educational institutions' administration: sending email notices and agendas to staff instead of printing and distributing them manually, submitting lesson plans through email, asking parents to write email addresses on medical forms, insisting for all teachers to create a class web page, processing admissions through web enabled services and attending technology conferences to see what other institutions are doing. The current study provides empirical data to support Caroline and Salerno's arguments.

According to Hossein (2008), ICT provides many facilities and possibilities for education administrators to perform their tasks. They allow information to be transferred, stored, retrieved and processed by almost anybody who either works or studies in a given institution. Besides this, Hussein argues that use of ICT enhances managerial effectiveness and efficiency.

Mugenda (2006) argues that ICT fosters the dissemination of information knowledge by departing content from its physical location. This flow of information crosses geographical boundaries allowing remote communities to become integrated into global networks and making information, knowledge and culture accessible. Areas in which ICT can be applied include timetabling, student admission tracking, financial management, medical services, procurement and store management, data distribution and management. However, Mugenda fails to provide empirical data to support her argument.

Krishnaveni and Meennakumari (2010) did a study in institutions of higher education in India. The study divided information administration into three categories: student administration, staff administration and general administration. Student administration dealt with student information such as use of electronic media by students to apply for admissions, use of computers for student registration, availing teaching timetable to students in electronic format, using computers to maintain attendance registers, communicating academic information of students to their parents via e-media, use of e-media for notification regarding transportation and use of e-media for notifications regarding hostel accommodation. Staff administration focused on using computers to recruit and allot work to staff, automation of attendance and leave management, use of e-media for performance appraisal, communication with staff using e-media, e-circulars from the institution. On the other hand, general administration involved using e-media to schedule examination halls, use of e-media by students to apply for examinations, using e-media to process and display examination results, use of e-media by students to pay/activate fee payment and use of e-media by staff to submit claims. In general, the study established that 66% of respondents utilized technology for student administration, 46% for staff administration, and 37.6% for general administration. It was also established that 58.5% of respondents made use of technology for overall information administration. Unlike Krishnaveni and Meennakumari's study, the current study was based in Kenya.

2.2 Literature on ICT in Teaching and Learning

Information and Communication Technology being one of the building blocks of contemporary society has substantially changed the practices and procedures of nearly all forms of endeavor within academia and governance (Alam, 2016). The revolutionary transformation which is taking place in ICT has dramatic effects on the way institutions of higher learning carry out their functions of teaching-learning and research. This requires a shift in the delivery and pedagogy used in the current education system. Research evidence shows that use of ICT in instruction enables students to take a more active role in their learning rather than their more traditional role of being a passive observer and listener. Therefore, it's important to pay attention to the ICT implementation in education systems for imparting easily accessible, affordable and quality higher education.

Use of ICT in institutions of higher learning is a good strategy to bridge the gap of staff shortage. This is possible by creating networking laboratories, creation of databases, access to expert lecture and technological developments in industries and research institutions (Alam, 2016). Teaching and learning can further be improved by replacing traditional methods with innovative instructional methods such as *PowerPoint* presentations, animations, simulations, video clips and overhead projectors. This enhances the quality of learning and also helps instructors to elaborate difficult concepts in an effective and time conscious way (Ali et al., 2013). Unlike theoretical arguments by Alam and Ali et al., the current study emerged to provide empirical evidence on application of ICT in teaching-learning activities.

Guma, Faruque and Kushi (2013) studied factors influencing use of ICT in institutions of higher learning in Uganda to make teaching and learning effective. The descriptive survey sampled 165 respondents from five institutions of higher learning who included administrators and lecturers. The study established that access to ICT resources, pressure from peers, teachers' computer efficacy and gender were among the factors that had a big influence on staff's use of ICT to teach. However, since the study didn't focus on application of ICT in teaching-learning, it left a gap that the current study exploited.

Grims (2000) argues that "…teaching ICT skills in institutions of higher learning prepares students to face future developments based on a proper understanding…" (p. 363). In support of this, Branford and Cocking (2000) notes that "…use of ICT helps students and teachers to develop competencies needed for the 21st century." (p. 206). Besides this, Dede (1998) argues that use of ICT in education helps improve memory retention, increase motivation and enhances a student's comprehension of concepts. In spite of this, these studies are not empirical. This gap was filled by the current study.

For Forcheri and Molfino (2000), use of ICT in teaching-learning promotes collaborative learning such as through role playing and group problem solving activities. This corroborates an argument by Guma, Faraque and Khushi (2013) that many people recognize ICTs as propellers of change in working conditions, handling and exchanging information, teaching methods, critical thinking and peer discussions. However, these arguments are not based on empirical data. The current study addressed this gap.

Miller, Martineau and Clark (2000) emphasize the role of ICT in the teaching and learning process by arguing that technology-based teaching is very facilitative since it provides relevant examples and demonstrations, changes the orientation of the classroom, increase flexibility of delivery, increases access and satisfies public demands for efficiency. Apart from this, Louw, Muller and Tredoux (2008) say that ICT is very central in curriculum delivery. It has the ability to improve teaching-learning abilities and consequently improve learners' performances. However, these arguments are not based on empirical data. The current study addressed this gap.

Castro (2003) and Cawthera (2000) posit that technology aided teaching and learning develops in the learner cognitive skills, critical thinking skills, evaluation, synthesis skills and also help them access information easily. Like in most studies, Castro and Cawthera do not provide empirical data — a gap addressed by the current study.

2.3 Literature on ICT in Research

Integration of ICT in higher education enhances the quality of research work and more number of individuals enrolled in the research work in various fields. It facilitates the links across the world in all subject matter and social settings. It saves money, time and effort of researchers. Collection and analysis of large volumes of data becomes easier through the availability of various data software such as *Atlas, NVivo, NUDI Test, ANOVA, SPSS* and many more. The unprecedented growth in bandwidth and computing power provide opportunities to download a lot of information and can perform complex computations on them faster and get accurate and reliable information (Alam, 2016).

Gulbahar (2008) studied the level of usage of pre-service teachers' institutions and instructors' utilization of ICTs in Turkey. The factors that were found to have a significant influence on effective use of technology were: the quantity and quality of the lessons addressing technology in the curriculum, lack of in-service training for lecturers and insufficient technological infrastructure. However, this study left a gap since it didn't focus on how ICT is used to conduct research in institutions of higher learning. The current study provides empirical data to support this argument.

Educational technology continues to have a big impact on a range of services within universities. Harpe and Radloff (2008) argue that search engines and scholarly databases enable students and academicians to easily access information from a wide range of sources.

Emergence of ICTs as learning technologies has coincided with a growing awareness and recognition of alternative theories of learning. The theories of learning that hold the greatest sway today are those based on constructivist principles (Duffy and Cunningham, 1996). These principles posit that learning is achieved by the active construction of knowledge supported by various perspectives within meaningful contexts. Learning approaches using contemporary ICTs provide many opportunities for constructivist learning through their provision and support for resource-based, student centered settings and by enabling learning to be related to context and to practice (Barron, 1998).

2.4 Literature on Barriers Facing Implimentation of ICT

Barriers facing effective utilization of ICT in institutions of higher learning are many and they vary from one institution to another. The following are the most common:

Effective use of ICT requires availability of equipments. However, some institutions do not have them. Besides this, ICT requires up to date hardware and software. High speed internet connection is another prerequisite of integrating ICT into the teaching-learning process. However, internet access in most institutions is very poor.

Insufficient funds. Effective implementation of ICT in educational institutions requires adequate funding. ICT-supported hardware, software, internet, audio-visual aids and other accessories require huge sums of money. However, these costs are in most cases not catered for sufficiently.

Political factors. A Sharma (2003) state that lack of political will is a major impediment to implementation of ICT in most developing countries. It is worth to note that the vision and mission of governments change after change of power as they fix priority to some other sectors in the form of fund allocation and policy implementation.

Teachers' attitudes and beliefs about ICT. According to Mumtaz (2000), teachers' beliefs about teaching and learning with ICT are central to integration. To be successful in computer use and integration, teachers need to "…engage in conceptual change regarding their beliefs about the nature of learning, the role of the student and their role and as teachers..." (Niederhauser et al., 1999 p. 157). Therefore, successful use of ICT in classrooms depends on teachers' attitudes. If teachers want to successfully use technology in their classes, they need to possess positive attitudes to the use of technology. Such attitudes develop when teachers are sufficiently comfortable with technology and are knowledgeable about its use (Afshari et al., 2009).

Lack of appropriate knowledge and skills. According to Pelgrum (2001), success of educational innovations depends on the skills and knowledge of teachers. Teachers' lack of ICT related knowledge and skills are one of the main impediments to the use of ICT in education in both developed and developing countries. Integrating technology in the curriculum requires knowledge of the subject area, and understanding of how students learn and a level of technical expertise (Morgan, 1996). Moreover, Berner (2003) established that faculty's belief in their computer competence was the greatest predictor of their use of computers in the classroom.

Lack of time. Teachers are overwhelmed with heavy workloads. In these circumstances, they lack adequate time to design, develop, and incorporate technology into the learning process (Ihmeideh, 2009). Teachers need time to learn how to use the hardware and software, time to plan and time to collaborate with other teachers. Some teachers are unable to make appropriate use of technology in their classrooms, whereas others are unwilling to try because of anxiety, lack of interest or lack of motivation (Duhaney, 2001).

3.0 Research Design and Methodology

The study applied a descriptive survey design. According to Orodho (2009) a descriptive survey design is a method of gathering data from respondents under settings which have not been controlled or manipulated in any way. This design was suitable for the study since the researcher aimed at gather respondents' opinions without manipulating any variables by way of experimentation.

The target population was all the 70 public and private universities in the republic. A target population refers to the number of real hypothetical set of people, objects or events to which the researcher wishes to generalize their findings (Borg & Gall, 1989). Out of this population, a total of 21 universities (14 private and 7 public) were purposefully sampled to take part in the study. The former were more because they are more in the population. This sample represented 30 % of universities in Kenya. On the other hand, respondents were sampled randomly. They comprised of 384 members of university academic staff and 58 members from various departments of university administration.

The researcher engaged the services of 21 research assistants who were responsible for administering instruments in the sampled institutions. The main research instrument that was used was a questionnaire. According to Bryman (2008) a questionnaire is the most suitable tool to use in circumstances where respondents are scattered in a population and also when there is need to safeguard their anonymity. Since the study involved many respondents from different universities, a questionnaire was found to be the most suitable tool to use. The tool had closed ended items which were intended to limit respondents to specific choices that were pre-determined by the researcher.

Before the actual study was conducted, the researcher tested the validity and reliability of the instruments by carrying out a pilot study in one university which was not included in the final study. Validity refers to the extent to which theory and practical evidence supports the interpretation of test scores (Nachmias, 1996). In this study, the researcher validated his research instruments in terms of content and face validity. Validation of questionnaire items was done by seeking expert opinion from two Kenyatta University lecturers namely,Dr. Violet Wawire and Dr. Salome Nyamburawho are specialists in educational research. They advised on the appropriate length of the questions, suitability of language used and also the comprehensiveness of the content of the questions. The researcher adopted their recommendations to improve the validity of the instruments.

Reliability of the instruments was ascertained during piloting. According to Mugenda and Mugenda (2003), reliability is a measure of the degree to which an instrument used in research gives consistent results after a repeated trial. This exercise involved administering the questionnaires twice within a span of two weeks and doing a correlation of results. Responses given from the two sets of questionnaires were coded and fed into the SPSS version 20 computer software for correlation. Using Pearson's Product Moment formulae, a correlation coefficient was computed in order to establish the degree to which the

content of the questionnaire was consistent in eliciting similar results. The instruments were found to be reliable because they yielded a correlation-coefficient of 0.86. According to Gay (2003), when a correlation coefficient of between 0.7 and 0.8 is established, the research instrument is usually considered to be reliable.

Data analysis began by identifying and discarding all incomplete or ambiguous responses. After this, data was grouped according to the study objectives for analysis. Quantitative data from the questionnaire was coded into categories based on the study objectives and fed into SPSS computer software version 20 which analyzed it using percentages and frequencies. Data was presented in frequency tables.

4.0 Findings

Findings of the study were based on the study objectives, namely: to explore how ICT is applied to conduct administrative functions in Kenyan universities; to investigate how ICT is applied to conduct teaching-learning activities in Kenyan universities; to describe how ICT is applied to conduct research activities in Kenyan universities; to identify barriers facing effective implementation of ICT in Kenyan universities and recommend solutions. The following section presents these findings, starting with demographic information of each category of respondents.

4.1 Demographic information of members of university administration departments

Table 4.1: Gender of members of university administration

GENDER	FREQUENCY	PERCENTAGE
MALE	28	48.27 %
FEMALE	30	51.72 %
TOTAL	**58**	**100**

ADMINISTRATIVE DEPARTMENT	FREQUENCY	PERCENTAGE
Student finance	10	17.24 %
Vice Chancellor's office	6	10.34 %
Registry	19	32.75 %
Head of Academic Dept.	5	8.62 %
Salaries and Pensions	6	10.34 %
TOTAL	**58**	**100 %**

Table 4.2: Years worked in department

YEARS WORKED	FREQUENCY	PERCENTAGE
Below 1 year	3	5.17 %
2 – 3 years	9	15.51 %
4 – 5 years	21	36.20 %
Above 6 years	25	43.10 %
TOTAL	**58**	**100 %**

Responses of members of university administration departments on application of ICT in administration

Table 4.3: Application of ICT in administration

N= 58	FREQUENCY			PERCENTAGE (%)		
Variables	Yes	No	Not sure	Yes	No	Not sure
1. In the past two months, has important information in line with your work been communicated to you via *e-mail*?	32	16	10	55.17	27.58	17.24
2. Are student admission letters processed and sent to applicants via *e-mail*?	18	30	10	30.03	51.72	17.24
3. Are teaching and examination timetables generated electronically?	52	4	2	89.65	6.89	3.44
4. Do students use computer based software to register for units?	56	Nil	2	96.55	Nil	3.44
5. Are student fee payment records managed electronically?	56	Nil	2	96.55	Nil	3.44
6. Does your institution keep an inventory of books and store supplies in computerized databases?	42	11	5	72.41	18.96	8.62
7. Are university examination results processed and posted on the university website?	56	Nil	2	96.55	Nil	3.44
8. Do students book hostels online via the university website?	56	Nil	2	96.55	Nil	3.44
9. Do you periodically fill and send your performance appraisal reports electronically?	9	48	1	15.51	82.75	1.72

4.2 Discussion

The demographics of participants show that there were an almost equal number of male and female participants. This was necessary in order to guard against gender biases. The study findings also show that participants came from various administrative departments, with a majority coming from the university registry. The fact that over 40 % of respondents have worked in their current work stations for over six years means that the kind of information they gave was accurate because they have stayed in their work stations long enough and therefore were conversant with a number of issues revolving around administration.

The study findings established that ICT is applied in universities to perform various administrative functions. In this study, 55.17 % affirmed that in the last two months they had received important communication in line with their duties via *e-mail.* However, almost thirty percent answered on the contrary whereas a smaller percentage gave a not sure response. More than three quarters said that teaching and examination timetables in their universities are usually generated electronically. This ensures efficiency and effectiveness. Negligible percentages either gave contrary opinions or were not sure. Registration of units by students in most universities is automated. In almost all the universities, students register for units online. The same case applies for management of fees payment records. These findings converge with arguments by Alam (2006) that use of ICT to run administrative functions in institutions of higher learning can play a major role in the efficient utilization of existing resources and simplification of administrative tasks. It reduces paper work as it replaces manual maintenance of records to electronic maintenance which helps in easy retrieval of any information of students and staff. However, unlike Alam's theoretical argument, the current study provides empirical evidence on this issue.

Close to three quarters of respondents said that there exist electronic inventories of books and store supplies. On the other hand, almost all respondents said that examinations are usually processed electronically and posted online at the end of every semester. The same case applied to students' booking of hostels via universities websites. An area where ICT seems not to have taken root is electronic filling of staff performance appraisal reports. A majority said that this is usually done manually rather than

electronically. These findings based in Kenya add new knowledge on this topic unlike those of Krishnaveni and Meennakumari (2010) which were based in India — a country whose social and economic environments are different.

4.3 Demographic information of university academic staff

Table 4.4: Age of academic staff

AGE	FREQUENCY	PERCENTAGE
Below 30 years	28	7.29 %
31 – 35 years	62	16.14 %
36 – 40 years	206	53.64 %
Over 41 years	88	22.9 %
TOTAL	**384**	**100 %**

Table 4.5: Years worked as academic staff

YEARS WORKED	FREQUENCY	PERCENTAGE
Below 1 year	2	0.52 %
2 – 3 years	16	4.16 %
4 – 5 years	90	23.43 %
Over 6 years	276	71.87 %
TOTAL	**384**	**100 %**

Table 4.6: Gender of academic staff

GENDER	FREQUENCY	PERCENTAGE
MALE	256	66.66 %
FEMALE	128	33.33 %
TOTAL	**384**	**100 %**

Table 4.7: Academic rank

ACADEMIC RANK	FREQUENCY	PERCENTAGE
Professor	18	4.68 %
Associate professor	24	6.25 %
Senior lecturer	89	23.17 %
Lecturer	146	38.02 %
Assistant lecturer/ Tutorial fellow	107	27.86 %
TOTAL	**384**	**100 %**

Discussion

The demographics above show that the study did not have an equal number of male and female respondents. Perhaps this could be a suggestion that most members of university academic staff are male. A majority of respondents were aged between 36 and 40 years whereas a minority was aged below thirty years. This could be an indication that a number of university academicians join the university when they are a bit older. The fact that over 70 % of respondents had worked in the university for a period of over six years strengthens the study findings as it suggests that respondents were conversant with all the questions they responded to. Besides this, the study included different cadres of academic staff ranging from assistant lecturers to professors. This makes the study findings quite representative.

Responses of university academic staff on application of ICT in teaching-learning

Table 4.8: Application of ICT in teaching-learning

N = 384	FREQUENCY			PERCENTAGE (%)		
Variables	Yes	No	Not sure	Yes	No	Not sure
1. Currently, is the university offering distance learning courses that you are in charge of?	107	261	16	27.86	67.96	4.16
2. In the course of this semester, have you taught a lesson via *Power Point* presentation?	102	256	26	26.56	66.66	6.77
3. In the course of this semester, have you taught a lesson using videos clips?	102	256	26	26.56	66.66	6.77
4. In the course of this semester, have students submitted assignments to you via *e-mail*?	100	250	34	26.04	65.10	8.85
5. Do you often download lecture notes and other learning materials online?	384	Nil	Nil	100	Nil	Nil
6. Do students in your university assess the overall effectiveness of lecturers and submit feedback electronically?	104	269	11	27.08	70.05	2.86
7. Do you often submit your lesson plans to your superiors via *e-mail* or any otherelectronic means?	13	40	5	22.41	68.90	8.62

Discussion

The study findings show that ICT is significantly applied in conducting various teaching-learning activities. Slightly over a quarter of respondents affirmed that their university offered distance learning courses that they were in charge of. However, over two thirds gave a contrary opinion whereas few gave a not sure response. In classroom teaching, over a quarter of respondents agreed that in the course of the current semester they have taught a lesson using *Power Point* presentations which is a computer aided technology. A third gave a contrary response whereas few gave no response. Similar responses were also elicited with regard to use of video clips in teaching. Submission of student assignments was also seen to be aided by technology by using emails. Slightly over a quarter of respondents agreed with this whereas almost two thirds disagreed. Interestingly, all respondents indicated that they often download learning materials from online platforms. These findings collate to those of Ali et al., (2003) who says that teaching and learning can be improved by replacing traditional methods with innovative instructional methods such as *PowerPoint* presentations, animations, simulations, video clips and overhead projectors. This enhances the quality of learning and also helps instructors to elaborate difficult concepts in an effective and time conscious way. They also corroborate Miller, Martineau and Clark (2000) who argue that technology-based teaching is very facilitative since it provides relevant examples and demonstrations, changes the orientation of the classroom, increases flexibility of delivery, increases access and satisfies public demands for efficiency.

Assessment of instructors' teaching effectiveness also seems to be aided with ICT. Slightly over a quarter of respondents said that students assess them at the end of the semester and post the feedback online to the internal quality assurance department. However, this was practiced in few universities.

Responses of university teaching staff on application of ICT in research

Table 4.9: Application of ICT in research

N= 384	FREQUENCY			PERCENTAGE (%)		
Variables	Yes	No	Not sure	Yes	No	Not sure
1. In the course of your researches, do you often use data software to analyze data collected from the field?	380	4	Nil	98.95	1.04	Nil
2. In the course of your researches, do you do literature review using materials downloaded from the internet?	378	2	4	98.43	0.52	1.04
3. In the past one year, have you used the internet to search examples of peer reviewed journals and eventually published your research findings with them?	200	152	32	52.08	39.58	8.33
4. In the past one year, have you engaged with researchers and academicians from other universities to discuss research findings via webinars or teleconferencing?	28	336	5.20	7.29	87.50	5.20
5. Has your university library installed plagiarism detecting software in its IT systems?	109	115	160	28.38	29.94	41.66

Discussion

ICT is applied in the research process. The study established that almost all respondents often use computerized data processing software such as *SPSS, ANOVA* and *NUDI Tests* to analyze data collected from the field. In relation to this, a similar number said that they often use materials downloaded from the internet to carry out literature reviews. After doing their research, they use the internet to search for online peer reviewed journals where they end up publishing their studies. These findings converge with those of Alam (2016) who argues that integration of ICT in higher education enhances the quality of research work and more number of individuals enrolled in the research work in various fields. It facilitates the links across the world in all subject matter and social settings. Besides, they also address a knowledge gap left by Gulbahar (2008) who didn't focus on how ICT is used to conduct research in institutions of higher learning.

Use of internet to conduct webinars and teleconferences however, is not common. Only a small percentage of respondents said that they have engaged with researchers from other parts of the world to discuss research findings via webinars or teleconferences. A small percentage also gave a not sure response. Lastly, university libraries also seem to have integrated ICT to tackle cases of plagiarism. Out of the 21 universities, almost 30 % have computers installed with plagiarism detecting software which analyze soft copies of students' research proposals to test their originality. However, almost a similar number have not yet incorporated this technology whereas slightly over 40 % were not sure if these systems were in place.

4.4. Responses of members of university administration on barriers facing implementation of ICT

Table 4.10: Barriers facing implementation of ICT

Variables	FREQUENCY	PERCENTAGE (%)
a. Lack of enough computers with reliable internet connectivity.	20	34.48 %
b. Inadequate funds to buy ICT-supported hardware e.g. audio-visual aids, software etc.	12	20.68 %
c. Lack of political goodwill to fully implement ICT policy.	6	10.34 %
d. Lecturers' negative attitudes towards use of ICT in teaching.	15	25.86 %
e. Lecturers lack appropriate knowledge and skills on how to integrate ICT in the curriculum.	12	20.68 %
f. Lecturers lack adequate time to design, develop and incorporate technology into the learning process.	22	37.93 %

Discussion

The study found out that universities experience a number of challenges in their quest to integrate ICT in their day to day functions. The most notable ones were: lack of enough computers with reliable internet connectivity (34.48%), inadequacy of funds to procure ICT-supported hardware and software (20.68%), lack of political goodwill to fully implement the national ICT policy (10.34%), lecturers' negative attitudes towards use of ICT (25.86%), lecturers' lack of appropriate knowledge and skills on how to integrate ICT in the curriculum (20.68 %) and lack of adequate time by lecturers to design, develop and incorporate technology into the teaching-learning process (37.93 %). All these findings are related to arguments and studies like Afshari et al., (2009), Berner (2003), Morgan (1996), and Sharma (2003) among others. For instance, Sharma states that lack of political goodwill is a major impediment to implementation of ICT in most developing countries. The vision and mission of governments change after change of power as they fix priority to some other sectors in the form of fund allocation and policy implementation. On the other hand, Afshari et al., argued that successful use of ICT in classrooms depends on teachers' attitudes. If teachers want to successfully use technology in their classes, they need to possess positive attitudes to the use of technology. Such attitudes develop when teachers are sufficiently comfortable with technology and are knowledgeable about its use.

5.0 Conclusion

On a grand scale, this study concludes that ICT has revolutionalized the higher education sector. Virtually all universities in Kenya have integrated ICT in their routine activities though with varying degrees of success. In administration, areas that seem to have adopted ICT fully are student finance and registration of units. On the other hand, management of staff appraisal reports seems to lag behind. Comparatively, teaching and research also seem to have gone digital with students and staff having more access to an array of scholarly literature on the internet. In spite of this, teleconferencing and webinar as avenues of scholarly interaction seem to have made little headway in most of these institutions. In light of the various challenges facing application of ICT in institutions of higher learning, this study came up with some recommendations.

6.0 Recommendations

Based on the study findings, the researcher makes the following recommendations:

i. For public universities, the government should increase capitation to enable the institutions meet the high cost of integrating ICT in their functions.
ii. Members of university staff should be sponsored to attend more ICT seminars/workshops to fine tune their ICT skills.
iii. More members of academic staff should be employed in universities in order to ensure that lecturers have adequate time to develop lessons that are tech-savvy.
iv. Universities should invest in new technology as this enhances efficiency and effectiveness in service delivery.

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A Survey of Awareness of Social Engineering Attacks to Information Security Management Systems at Kibabii University

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Abstract
Computer based system are socio-technical system in nature. The security of the system depends both on technical aspect and also social aspect. The social aspect refers to people in contact with system commonly referred to as wetware. To attack the system you may consider to target the technical or wetware. Social engineering is based on exploiting human traits that make human susceptible to these attacks. The aim of this paper was establish how aware the staff of Kibabii are of these attributes and how these attributes could be used by social engineers to penetrate Information Security Management systems at Kibabii University. A survey research was adopted with a questionnaire being developed using Google application, was administered online to all staff members of Kibabii University. A descriptive analysis was carried out on feedback. The finding is that to a large extent the sampled staff are aware of these traits but there need for awareness training to enhance the information security managementsystem of Kibabii University.

Key words:

1.0Background

The increased dependency on reliable data communication networks has created a need for ever increasing computer security. Many technological options exist for security in both hardware and software and these implementations pose formidable threats for hackers. However social engineering bypasses the electronic security measures and targets the weakest component of networks - the human users (Kvedar et al., 2010).

Susceptibility to social engineering attacks stems from a lack of formal security management as well as limited education regarding social engineering. Computersecurity organizations such as SANS are pushing for increased defenses against social engineering (Allen 2004), but until the general business community realizes the threat, very little will be done to implement policies to protect themselves compared to the efforts made to establish electronic safeguards against traditional hacking techniques. Kvedar et al.(2010) carried out some research with the aim of proving the viability of social engineering as a method of network attack, as well as display the need to increase education and implement measures to protect against it.

Computers are designed to provide an unconditional response to a valid instruction set. The same instruction set is used to create different layers of security privileges for different category of users. Social engineering supersedes the explicit nature of machines and focuses on human emotion and tendency. Wetware has been coined to represent the human attached to the computer. Wetware is just as vital to the computer's security as any hardware or software (Allen 2004). It is this wetware that social engineering exploits.

Computers can completely secure information to prevent unauthorized access. This could easily defeat the goal of having information from being readily accessible when needed by privileged users. The goal for a social engineer is to manipulate these authorized users to gain access to privileged information. Dolan considers social engineering as the "management of human beings in accordance with their place and function in society" (Dolan 2004).

Social engineers prey on humans' desire to be helpful, tendency to trust people, fear of getting in trouble, and willingness to cut corners. They have found out that exploiting weakness in human nature is much

easier than exploiting flaws in encrypted software. Instead of physically breaking into bank's safe, it is much easier if one can get the lock pin combination code from a bank worker (Mbuguah & Wabwoba 2015).

Allen avers that the four phases of social engineering are: information gathering, relationship development, execution, and exploitation (Allen 2004). During the first phase, information gathering, information about company is gathered with the aim of finding weakness that can be exploited and ways of avoiding arrest within the organization. The second phase, relationship development, rapport and trust are developed with contact person within the organization. The third phase is actual execution of the attack where the information is actually exchanged. Finally, the last phase is utilizing information.
Thornburgh (2004) says that an attack is successful only if the target feels compelled to give up the information in spite of their gut instinct. While Manske (2000) saysthat a successful attack bypasses anything that would be in place to ensure security, including firewalls, secure routers, email, and security guards. This causes unrest and beats the security of encryption.
Winkler and Dealy (1995) provide advice on how to secure a network against social engineering. The list includes not relying on common internal identifiers within an organization, implementing a call back procedure when disclosing protected information, implementing a security awareness program, identifying direct computer support analysts, creating a security alert system, and social engineering to test an organization's security. Dolan (2004) beef up the list by adding; password policies, vulnerability assessments, data classification, acceptable user policy, background checks, termination processes, incident response, physical security, and security awareness training.

Social engineering tactics include impersonation of an important user, third-party authorization, in person attacks, dumpster diving, and shoulder surfing. Dumpster diving involves sifting through a target's waste in search of critical information. However shredders should be used to shred any documents destined tothe dustbin. Shoulder surfing is a basic social engineering attack based on attempts tosteal passwords and login information by watching a user input the data. This especially true in automated teller machine (ATM) halls, where users do not take precaution to block any other users from seeing them keying their pin numbers. The result is that a lot of clients have lost their funds. One person lost some money from his MPESA account when he unknowingly let a young man know his pin number. The young man picked the phone and transferred money from the person account to his. However forensic audit helped track down the culprit (Mbuguah & Wabwoba 2015).
Attackers prefer to remain unidentifiable to protect themselves, some tell-tale signs of an individualattempting a social engineering attack include refusal to give contact information, rushing the process, name-dropping, intimidation, small mistakes, and requesting forbidden information or accesses.
Reverse social engineering tact involves creating a situation where the targeted individual actually seeks the attacker for assistance, which provides the attacker with the opportunity to establish trust (Dolan 2004). A common tendency in human nature is for one to feel indebted to their benefactors. Reverse social engineering preys on this tendency. Not only does the target trust the individual, but also feels indebted the attacker, and will share out information he may not otherwise share out to settle that debt.
In Kenya people have been conned by people pretending to be business men expecting a certain a transaction to go through (Mbuguah & Wabwoba 2015). After they have developed rapport with the victim they initially ask some money before gradually increasing the amount then finally logging off, leaving the victim high and dry. Another type of fraud executed by Kamiti maximum prisoners is to exploit the greed of their victim. They call the victim informing them that they have won some lottery. They require some information from them, including their MPESA pin numbers. Only for the victim to realize that the conmen have cleared what money they had in their accounts. Once again audit trail by service provider Safaricom located the location of the scam to Kamiti and other prisons in Kenya.

2.0Related studies

One of key study was entitled Understanding Scam Victims: Seven Principles For Systems Security .The researchers tried to find out on thepsychology of scam victimsAl, L. E. (2009). Researchers then identified traits that make people vulnerable to scams. These traits were published in ACM vol 54 journal as shown in table 1.

Table 1: Scam Victims

Principle	Cialdini (1985-2009)	Lea et al, (2009)	Stajano-wilson (2009)
Distraction		~	X
Social compliance(Authority)	X	-	-
Herd (Social proof)	X		-
Dishonesty			X
Kindness	~		X
Need and greed (Visceral Triggers)	~	X	-
Scarcity (related Time)	X	-	~
Commitment and Consistency	X	-	
Reciprocation	X		~
~ -------Lists a related Principle Also lists this principle X First identified this principle			

Source (ACM Vol 54)

Wilson (2011) says that the finding support their thesis that systems involving people can be made secure only if designers understand and acknowledge the inherent vulnerabilities of the human factor. Their three main contributions were: First hand data not otherwise available in literature; Second they abstracted seven principles; Third they applied the concept to more a general system point of view.

They argued that behavioral patterns are not just opportunities for small scale hustlers but also of the human component of any complex system. They suggested that system security architect should acknowledge the existence of these vulnerabilities as unavoidable consequence of human nature and actively build safeguards to prevent their exploitation Wilson, F. S. (2011) However they did not attempt to model the relationship between the traits and system attackability(Mbuguah et al. 2013).

The identified human traits are dishonesty, social compliance, Kindness, Time pressure, Herd mentality, greed/need and distraction. Personality traits models do exist. Researchers have identified traits that make human beings susceptible to social engineering attacks and have extended this to system view. Researchers have also identified that the human being is the weakest link in system security (Mbuguah et al.2013)

Mbuguah et al (2013) did extend these concepts by not only modeling the traits as applied to software systems but also introduced some metrics that are theoretically and empirically sound. He also published algorithm for determination of these metrics.

This paper is then application of these concepts to Kibabii University in a bid to assess the level of awareness of social engineering attacks at Kibabii University.

3.0 Methodology

For this paper a survey methodology consisting of twenty questions was administered online to Kibabii University staff through their email addresses. The staff numbers members are three hundred and thirty (330) and respondents were thirty three (33) which constituted about 10% which is an appropriate sample size (Mugenda & Mugenda 2003). The questionnaire was set on Google application. Questions were set out and the participant requested to respond by clicking on appropriate button. On completion participant pressed a submit button to relay the information back to the researchers. The application did

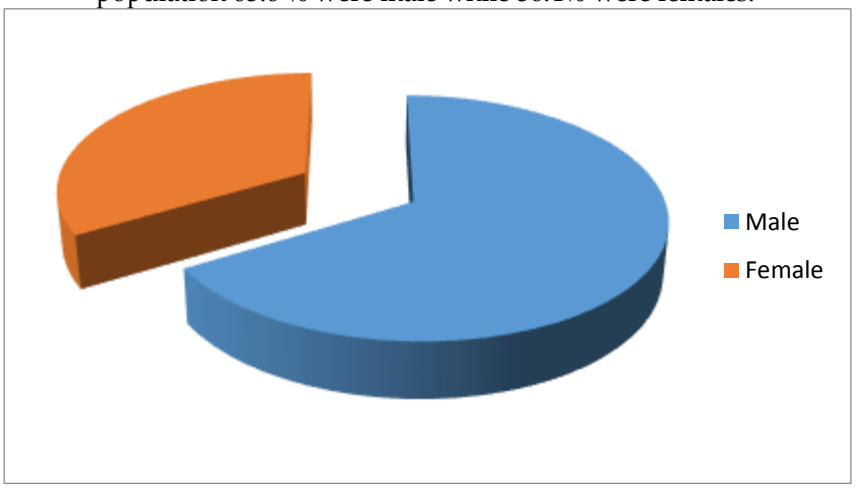
compute the percentages for each response. Test retest was applied to seven attributes and average score computed. Hence descriptive analysis was done whose findings are represented below.

4.0 The results

The first five questions were general information and the trends

4.1 General information

a) Question one was on the gender composition of the respondents. The results were that of sample population 63.6 % were male while 36.4% were females.



b) Job Category

The distribution of the respondents as far job category was:

Administrative – 48.4%, Technical – 30.3% and Academic – 21.2 %

c) The question sought to find out whether the staff new who a social engineer was and only 60.6% could correct define a social engineer while 39.4 % could not.

d) Whether people seek the identification of strangers before serving them by requesting for ID or gate pass. 87.5% did while 12.5% did not.

e) This Question sought to find out whether they could allow a visitor mess up in their office whether the visitor had some identification document or not. 97% declared they could while 3% could take no action.

4.2 Seven Attributes

a) Social compliance-a tendency for people to obey authority or do as required of them by their superior or people in authority. The question was to find out whether the members of staff were aware that this trait exploited by conmen to take advantage us.

QUESTION	Strongly Agrees	Agree	Do not Know	disagree	Strongly
7	90.9	9.1	0	0	0
14	24.2	24.2	12.2	24.2	15.2
9	24.2	18.2	21.2	27.3	9.1

For this attributes the positives that strongly agrees and agree (100+ 48.4+ 42.4 = 190.8)

The average 190.8/3 = 63.6

The result indicates that 63.6 % are aware that social compliance can be exploited by con artist to penetrate systems. 36.4 % are not aware. This is higher percentage that can be easily exploited; hence the need of training to enhance the awareness.

b) Time pressure-a trait of a psychological urgency attributed to insufficient time for completing required tasks. The question wanted to find out whether the participants were aware that conmen to take advantage us by hurrying us.

QUESTION	Strongly Agrees	Agree	Do not Know	disagree	Strongly
8	78.8	21.2	0	0	0
13	30.3	51.5	6.1	9.1	3
15	42.2	33.3	6.1	9.1	9.1

This gives a total of 257.3 and an average of 85.8%.
This means that 85.8% of the staff members are of the effect of time pressure but 14.2% are not aware. There is need for training to reduce this gap.

c) Kindness- compassion. The trait of a person having a high level of agreeableness in a personality test, usually the person is warm, friendly, and tactful. Or having an optimistic view of human nature and getting along well with others. The trait can be used by conmen to take advantage of us.

QUESTION	Strongly Agrees	Agree	Do not Know	disagree	Strongly
11	81.8	15.2	0	3	0
16	27.3	42.4	6.1	18.2	6.1

The average for the positive or correct answer 83.3% and 16.7 % are not aware. There is need for training to breach this gap.

d) Greed/Need-Greed refers to a human trait of wanting more and more of something. While need is the want of something urgently and desperately. This trait can never be exploited by conmen breaking into information security systems.

QUESTION	Strongly Agrees	Agree	Do not Know	disagree	Strongly
12	63.6	33.3	3.1	0	0
17	42.4	30.3	0	9.1	18.2

The participant who responded positively were 84.8% and negatively 15.2%. There is need for awareness training.

e) Herd Mentality-the trait of a tendency for an individual to follow group thinking. To do something because most people are doing the same even though this may be against their better judgment. This trait could be negatively exploited by conmen to take advantage us.

QUESTION	Strongly Agrees	Agree	Do not Know	disagree	Strongly
10	21.2	48.5	12.1	15.2	3
18	51.5	33.3	3	12.1	0

The Positives responses were 77.25% and negative 22.75%. The aspect of herd mentality requires more training.

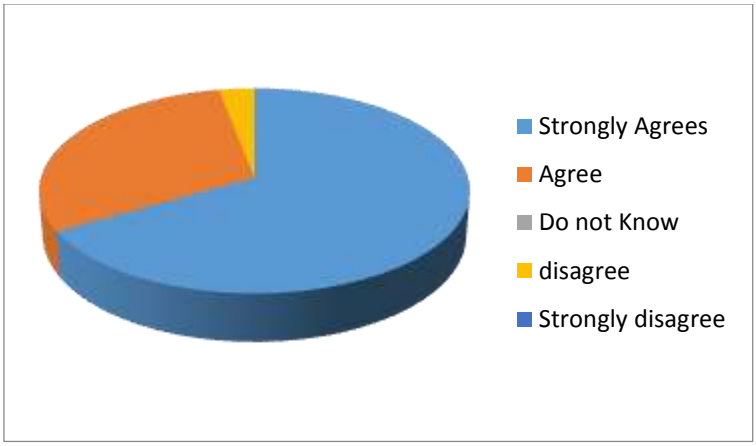
f) Distraction. The trait when a secondary task obstructs/slows the user from efficiently and effectively fulfilling the time-critical main task. This trait could be negatively exploited by conmen to take advantage of us.

QUESTION	Strongly Agrees	Agree	Do not Know	disagree	Strongly
6	90.9	9.1	0	0	0
19	36.4	51.5	3.0	3.0	6.1

The positive were at 81.85% and negative were at 18.15%. There is need for training to reduce this gap.

g) Dishonesty – the trait of being not truthful or cheating. This trait could be negatively exploited by conmen to take advantage of us in penetrating security barriers.

QUESTION	Strongly Agrees	Agree	Do not Know	disagree	Strongly disagree
20	66.7	30.3	0	3	0



People appear to appreciate that dishonesty can lead to social engineering attack. The positive respondent was at 97% while the negative was at 2%

5.0 Conclusion

We can conclude that in general the sampled staff are to a large extent aware of the human traits that can make one susceptible to social engineering attack. However there is still a significant mass that requires further awareness training to reduce the vulnerabilities of the Kibabii University system. Everybody should be fully aware of the ever changing scenario of attacks to make the system impenetrable.

The recommendation is further training for members of staff plus further monitoring including penetration testing

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Sub-Theme 5:

Emergiging Trends in Science and Technology for Global Security and Sustainable Development

Genetic variability within and among HypobioticHaemonchuscontortus isolates from goats in Kenya

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Abstract

Haemonchuscontortus (order Strongylida) is a common parasitic nematode infecting small ruminants and causing significant economic losses worldwide. Knowledge of genetic variation within and among *H. contortus* populations can provide a foundation for understanding the biology and transmission patterns and might contribute to the control of haemonchosis. Infective larvae of *H. contortus* were cultured from eggs collected from goats raised on six farms located in different geographical regions in Kenya. The second internal transcribed spacer (ITS-2) of the nuclear ribosomal DNA and mitochondrial nicotinamide dehydrogenase subunit 4 gene (nad4) were amplified by polymerase chain reaction (PCR) and sequenced directly. The sequence variations and population genetic diversities were determined. Nucleotide sequence analyses revealed 18 genotypes (ITS-2) and 142 haplotypes (nad4) among the 152 worms, with nucleotide diversities of 2.6% and 0.027, respectively, consistent with previous reports from other countries. Population genetic analyses revealed that 92.4% of nucleotide variation was partitioned within populations; there was no genetic differentiation but a high gene flow among Kenyan populations; some degree of genetic differentiation was inferred between some specimens from China and those from other countries. This is the first study of genetic variation within *H. contortus* in Kenya. The results revealed high within-population variations, low genetic differentiation and high gene flow among different populations of *H. contortus* Kenya. The present results could have implications for studying the epidemiology and ecology of *H. contortus* in Kenya.

Key words:*Haemonchuscontortus,* Genetic variation

1.0 Introduction

Haemonchuscontortus (order Strongylida) is a common parasitic nematode infecting small ruminants and causing significant economic losses worldwide (Roeber*et al*. 2013). Knowledge of genetic variation within and among *H. contortus* populations can provide a foundation for understanding the biology and transmission patterns and might contribute to the control of haemonchosis.Hypobiosis, which is a phenomena first described by Anderson *et al*. (1965) as a temporary halt in parasitic phase of development at a specific point in the nematode's life cycleischaracterized by depressed metabolism. This phenomena not only ensures the survival of the nematodes through to another generation, but of more importance to the host is that clinical disease may ensue as a result of the emergence and maturation of inhibited larvae leading to heavy losses.

It has long been suspected that the presence of inhibited L4s may assisted in the development of anthelmintic resistance. The L4 stage is harder to kill than adult worms(Anderson *et al*., 1965), (assumed to be due to lower metabolic rate and for large populations of these, there will be a greater chance that some individuals would receive a sub-lethal anthelmintic dose and may be selected for anthelmintic resistance.It also appears that there are strains with a greater or lesser propensity to "go hypobiotic", certainly between environments and perhaps within regions(Gilleardand Beech, 2007). Indeed a recent

study in bovine lungworm identified differences in gene expression between hypobiotic and non-inhibited strains, but no mechanistic link was postulated (Ref). Thus studying genetic variation in parasitic worms does not only haveimplicationswith regard to their population genetics, epidemiology and evolution (Nadler, 1995; Anderson *et al*., 1998; GilabertandWasmuth, 2013), but also may provide an explanation the genetics of hypobiosis and its association with AR. This study was therefore designed to investigaate the genetic variability among and within hypobiotic*H. contortus* populations as a preliminary step towards undrstaanding the relationship between anthelmintic resistance and hypobiosis

2.0 Materials and Methods

Hypobiosis was established as described by Siamba*et.al.* (2009) using larvae from cultures of eggs recovered from female *Haemonchuscontortus*worms isolated from abomasa of slaughtered goats from three geographical locations in Kenya, namely, Kitale, Marigat and Naivasha. These sites represented warm wet, hot dry and dry cold environments, respectively. Twenty three (23)**[**Kitale (KT) -4, Marigat (KJ) – 14 and Naivasha (HM)-5] hypobiotic larvae of *H. contortus* worms were recovered from abomasa of slaughtered experimental goats artificially infected with stressed L3.The worms were preserved in 70% ethanol and stored at −20°C, until DNA extraction was performed.

2.1 Isolation of genomic DNA

Individual hypobiotic larvae were ground in a sterile mortar, in which liquid nitrogen was used to disrupt the cells. DNA extraction kits (Qiagen) were used for extraction of DNA from the worm pellets, according to the manufacturer's protocols.

2.2 PCR amplification and sequencing

Internal Transcribed Spacers of ribosomal DNA (ITS rDNA) ITS-2 (~350 bp) was amplified using the forward and reverse primers [**ITSF**: 5′-ACGTCTGGTTCAGGGTTGT-3′, **ITSR**: 5′-TTAGTTT CTTTTCCTCCGCT-3′]. PCR was performed in a total volume of 50 µlcontaining 1 × PCR buffer (20mM Tris–HCl, pH 8.4, and 50mM KCl), 1.5mM $MgCl_2$, 0.2mM deoxynucleoside triphosphate mixture (dATP, dCTP, dGTP and dTTP), 100 pmol of each primer, 2.5 units (U) Thermusaquaticus (Taq) polymerase, 0.1 µgof extracted parasite genomic DNA and nuclease-free sterile double-distilled water up to 50.0 µl.The resulting mixture was then subjected to a precise thermal profile in a programmable thermocycler (Biometra) . Initial denaturation was made at 94°C for 120 s;35 cycles at 94°C for 40 s, 36°C for 40 s and 72°C for 60 s; then followed by a final extension at 72°C for 600 s. The resulting PCR amplicons (10–15 µl) were analysed using 1.5% agarose gel electrophoresis

The PCR amplicons of the proper predicted size were gel purified using a DNA gel purification kit (ABgene).The PCR DNA amplicon products were directly sequenced with the same primers used to generate PCR amplicons, using the BigDye Terminator v.3.1 Cycle Sequencing Kit on an automatic sequencer(3500 Genetic Analyzer; Applied Biosystems)

2.3 Data analysis

Sequences were aligned over a consensus length (231 bpfor ITS-2) using the program Clustal W within MEGA v.5.0. Phylogenetic tree was constructed using the neighbourjoining method of the MegAlign program from the Laser Gene Biocomputing Software Package (DNASTAR, Madison, Wisconsin, USA)

3.0 Results and discussions

Agarose gel electrophoretic analysis of the PCR amplicons as presented in figure 1 indicated that amplified DNA fragments encoding the ITS2 corresponded to the expected lengths of about 231 bp

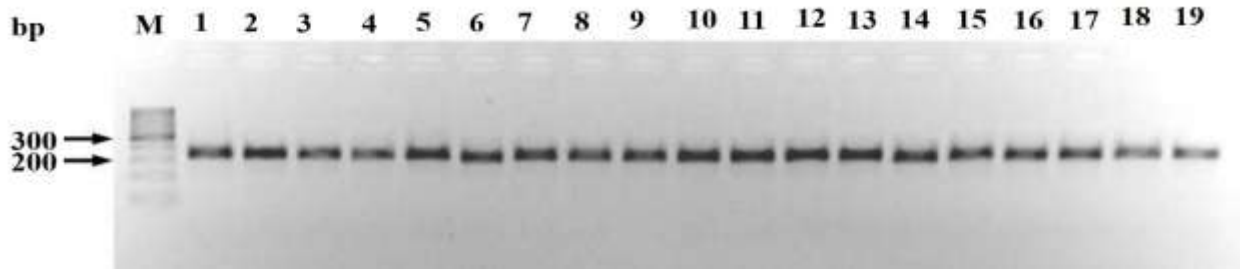

Figure 1. PCR amplicons of amplified DNA fragments encoding the ITS2

Sequences analysis of the 23 ITS-2 sequences revealed 6 distinct genotypes (Figure 2) with sequence identities ranging from 97.4% to 100%, when compared with each other. The nucleotide diversities and genotype diversities among the 23 ITS-2 sequences of hypobiotic*H. contortus*ranged from 0.0054 to 0.0084 and from 0.989 to 1.00, respectively indicating that variation between isolates and between sites was low

The highest nucleotide diversity estimated was for the *H. contortus*population from Marigat and other sites. This suggested that gene flow occurs from Marigat to other areas.

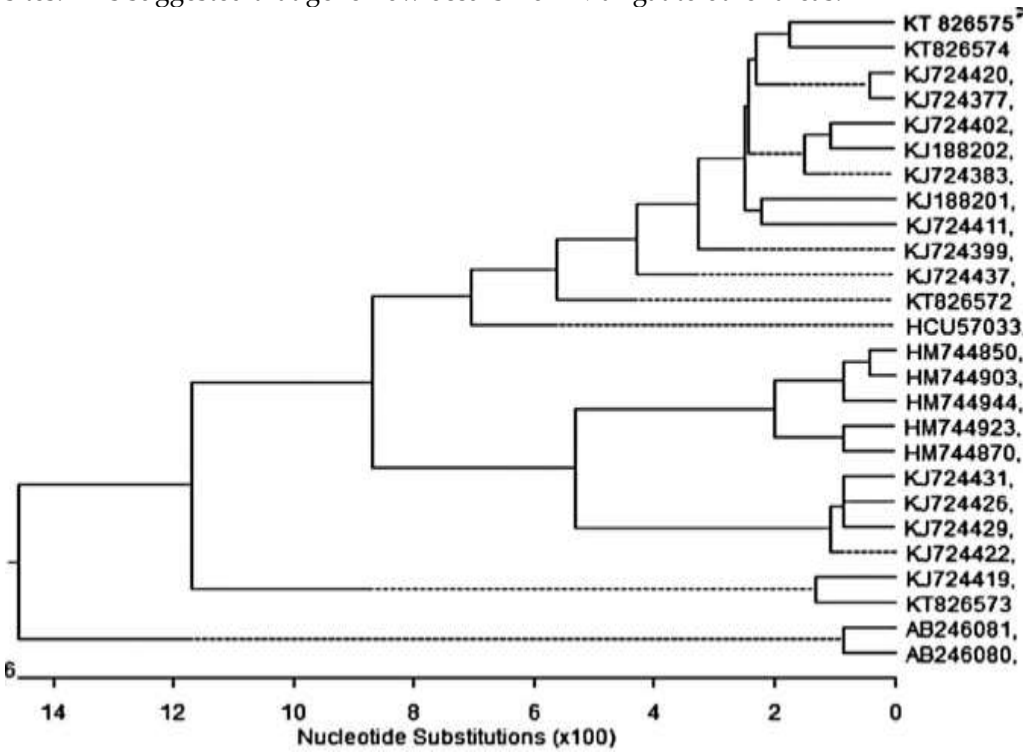

Figure 2. Phylogenetic tree analysis based on consensus length (231 bp)of ITS-2 of the isolates.

The alignment of all 23 ITS-2 sequences with the reference sequence X78803 revealed six substitutions at the nucleotide positions (10, 18, 21, 22, 123 and 196; These substitutions represented four transversions(one A < –>C, one G<–>C and two A < – > T substitutions) and two transitions (T < –>C). in conclusion, this is the first time data on the DNA structure of hypobiotic*Haemonchushas been* collected from Kenyan goats indicating that there is low variation within and between hypobiotic larvae population and hypobiosiscould be simply an exhibition of phenotypic plasticity rather than a genetic diversity.

4.0 Acknowledgment
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Thermodynamic Properties of an Interaction between Cooper Pairs and Electrons in Bismuth Based Cuprate Superconductivity

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Abstract
A theoretical study considering Bi2201, Bi2212 and Bi2223 bismuth based cuprates whose critical Temperatures (T_C) are 20K, 95K and 110K with one, two and three CuO_2 planes respectively; based on an interaction of Cooper pair and an electron in Bismuth based cuprates oxide shows that there is a direct correlation between energy of interaction and the number of CuO_2 planes at the T_C. The specific heat for a mole of Bismuth based cuprates at T_C was found to be $7.471\times10^{-24}JK^{-1}$ regardless of the number of CuO_2 planes; though the specific heat per unit mass, Sommerfeld coefficient as well as entropy per unit mass decreased with an increase in the number of CuO_2 planes. The entropy of a mole of Bismuth based cuprates at T_C was found to be $5.603\times10^{-24}JK^{-1}$ irrespective of the T_C or mass. The peak Sommerfeld coefficient temperature was noted to occur at the ratio T/T_C=0.66 in the bismuth based cuprates.

Key Words *— Superconductivity, Sommerfeld Coefficient, Specific Heat, Entropy*

1.0 Introduction

Cuprates superconductivity has been studied for the past three decades due to the foreseen applications that will revolutionize the world if the microscopic mechanism behind high temperature superconductivity is discovered. Superconductivity was first discovered by Kamerligh Onnes in 1911 (Onnes, 1911), and a further discovery of High Temperature superconductivity (HTS) by Bednorz and Mueller in 1986(Bednorz and Mueller, 1986) inspired intensive research in this area of cuprates high temperature superconductivity resulting to the discovery of Y-Ba-Cu-O (Wu *et al.*, 1987), Bi-Sr-Ca-Cu-O (Maeda *et al.*, 1988), Tl-Ba-Ca-Cu-O (Sheng and Hermann, 1988) and Hg-Ba-Ca-Cu-O (Schilling *et al.*, 1993). The highest achieved experimental critical temperature (T_C) is 140 K in optimally oxygen doped mercury cuprates superconductor $HgBa_2Ca_2Cu_3O_x$ at ambient pressure (Onbasli, 2009) and 156 K under 2.5×10^{10}Pa pressure in the same substance (Ihara *et al.*, 1993). Iron based HTS was discovered in 2008 (Kamihara, *et al.*, 2008), whereas in 2015 the highest experimental T_C of 203 K under pressures of 200 GPa was found in a non - cuprates Sulfur Hydride (H_2S) (Drozdov *etal.*, 2015).

The discovery of Bismuth based superconductor was first done by Michel *et al.*, in 1987 (Michel, *et al.*, 1987). The T_C for this bismuth based cuprates ranged between 7 and 22 K containing Bi-Sr-Cu-O. This discovery was overshadowed by the nearly immediate discovery of $YBa_2Cu_3O_{7-\delta}$ which achieved a T_C of 93 K (Wu *et al.*, 1987). However in January 1988, Maeda *et al.*, reported a new compound of bismuth based cuprates after adding calcium to the initial compound used by Michel *et al.*, and achieving a T_C of about 110 K (Maeda *et al.*, 1988). This encouraged researcher in this area to focus on bismuth based compound because the material's T_C was above liquid nitrogen boiling point, an indication that nitrogen can be used as a cryogenic material rather than the expensive mercury. Bismuth based HTS cuprates compounds can be described by the general formula $Bi_2Sr_2Ca_{n-1}Cu_nO_{2n+4+\delta}$ (n = 1, 2 and 3) where n imply the number of CuO2 planes, which results to three bismuth superconducting cuprates $Bi_2Sr_2CuO_{6+x}$ (one CuO_2 plane with T_C=7-22 K), $Bi_2Sr_2CaCu_2O_{8+x}$ (two CuO_2 planes with T_C=85 K) and $Bi_2Sr_2Ca_2Cu_3O_{10+x}$ (three CuO_2 planes with T_C=110 K) abbreviated as Bi2201, Bi2212 and Bi2223 respectively (Maeda *et al.*, 1988). The maximum T_C increases with increasing number Of CuO_2 planes (Mourachkine, 2002; Odhiambo *et al.*,2016

(a) and (b)). This gave rise to the expectation that $T_C$may increase further when the structural cell has more CuO_2 layers (Chen and Lin, 2004). Superconductivity occurs predominantly in the CuO_2 planes (Kuzemsky and Kuzemskaya, 2002). Interlayer and intra-layer interactions in layered HTS Cuprates sway HTS' T_C (Mourachkine, 2002; Sigei, 2013; Tesanovic, 1987), whereas T_C has been found to be proportional to the number of Cu–O layer in Bi–Sr–Ca–Cu–O and Hg–Ba–Ca–Cu–O compounds (Greenblatt *et al.*, 1990; Odhiambo *et al.*, 2016). Table 1 below shows the number of cuprates plane and the T_C of Bismuth based HTS cuprates.

Table 1: Bismuth based cuprates phases, their T_C and Number of CuO_2 planes

Cuprate Compound	Short hand notation	Maximum T_C (K)	No of Cuprates planes
$Bi_2Sr_2CuO_6$	Bi2201	20	1
$Bi_2Sr_2CaCu_2O_8$	Bi2212	95	2
$Bi_2Sr_2Ca_2Cu_3O_{10}$	Bi2223	110	3

The Bi-based HTSC are superior to the YBCO in respect of higher T_C. This class of superconductors (unlike YBCO) are resistant to water or humid atmosphere and have the advantage of compositional / oxygen stability, e.g. some of its superconducting phases do not gain or lose oxygen, when the material is annealed at 850°C (Mourachkine, 2002). Another advantage of the BSCCO materials relates to the fact that BiO layers being Van der Waal bonded, this material can be easily rolled. This property has been utilized successfully for tape-casting and its texturing. Furthermore, Bi-2223 has been used in making superconducting tape magnet for maglev train (Md. Atikur *et al.*, 2015) and wires for large-scale and high-current applications (Cyrot and Pavuna, 1995). This magnet is very successful and a train using this magnet has been shown to achieve a speed of up to 500 km/h (Md. Atikur *et al.*, 2015). However, it is generally agreed that Bi2212 samples have not reached the degree of purity and structural perfection obtained in YBCO (Mourachkine, 2002), hence a theoretical study is advised. In this study we investigate the effect of the number of CuO_2 planes on the T_C of BSCCO.

2.0 Theoretical Formulation

The order parameter of an interaction between Cooper pair and electron is given by a ket (1).

$$|\Psi\rangle = \prod_{k,q=1}^{n} \left(u_k + v_k a_k^{\dagger} a_{-k}^{\dagger}\right) a_q^{\dagger}|0\rangle \ldots\ldots (1)$$

From (1), Cooper pair in momentum state k, comprises of two electrons creation operators in state k, i.e. spin up $a_k^{\dagger}$, and spin down $a_{-k}^{\dagger}$. The independent electron in an excited state q is created by $a_q^{\dagger}$ in a vacuum $|0\rangle$. Note that u_k is the probability of a vacuum state $|0\rangle$ in momentum state k being unoccupied by the Cooper pair $a_k^{\dagger}a_{-k}^{\dagger}$ whereas, vk is the probability of a vacuum state $|0\rangle$ in momentum state k being occupied by the Cooper pair$a_k^{\dagger}a_{-k}^{\dagger}$. The complex conjugate for the order parameter is shown by a bra in (2) below

$$\langle\Psi| = \prod_{k,q=1}^{n} \langle 0|a_q(u_k{}^{*} + v_k{}^{*} a_k a_{-k}) \ldots\ldots (2)$$

The Hamiltonian for the interaction between Cooper pair and an electron based on Froehlich equation is given as

$$H = \sum_q \epsilon_q \, a_q^{\dagger} a_q + \sum_k \epsilon_k \, a_k^{\dagger} a_{-k}^{\dagger} a_{-k} a_k + \sum_{k,q} V_{k,q} \, a_q^{\dagger} a_q a_k^{\dagger} a_{-k}^{\dagger} - \sum_{k,q} V_{k,q} \, a_q^{\dagger} a_q a_{-k} a_k - \sum_{q,k} U_k \, a_q^{\dagger} a_k^{\dagger} a_{-k}^{\dagger} a_{-k} a_k a_q \ldots\ldots (3)$$

From (3), ϵ_q and ϵ_k are the kinetic energies for an electron and Cooper pair respectively. $V_{k,q}$ is the positive interaction potential between the electron and the Cooper pair whereas U_k is the negative Coulombs potential between the electron and the Cooper pair. The average energy needed during the interaction is written as

$$E_k = \langle \Psi | \hat{H} | \Psi \rangle \ldots\ldots\ldots (4)$$

Inserting (1) and its conjugate (2) as well as (3) into (4) and obeying the anti-commutation rule, the ground state energy E_k is determined.

The following are the conditions for determining specific heat (C_V), Sommerfeld coefficient (γ), entropy (S) and critical temperature (T_C) of the system

$$C_V = \frac{dE_n}{dT} \ldots\ldots\ldots\ldots\ldots (5)$$

$$\gamma = \frac{C_V}{T} \ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

$$S = \int C_V \frac{dT}{T} \ldots\ldots\ldots\ldots\ldots (7)$$

$$\left(\frac{\partial C_V}{\partial T}\right)_{T=T_C} = 0 \ldots\ldots\ldots\ldots (8)$$

3.0 Results and Discussion

(a) Energy of the System

From figure 1 (a), the energy of Bi2201, Bi2212 and Bi2223 is 0.747×10^{-22} J, 3.548×10^{-22} J, and 4.109×10^{-22} J respectively at the T_C per mole. The energy per unit mass is found to be 0.05977 JKg^{-1}, 0.2466 JKg^{-1} and 0.2466 JKg^{-1} respectively at T_C as shown in figure 1(b). The shape of the graph relating energy to temperature in figure 1 is half – stretched sigmoid curves. This shape of curve was also observed by Ayodo *et al*., (2010); Kibe (2015); Odhiambo *et al*., (2016 a, b); Rapando *et al*., (2015) and Sakwa *et al*., (2013). For the Bismuth based cuprates, a decrease in temperature results to a decrease in energy (figures 1). The λ discontinuity at the T_C; takes place at different energies for each HTS cuprates compound. This λ discontinuity takes place at the T_C (Mourichkane, 2002; Saxena, 2010). Energy gap has been observed to increase with a decrease in the T_C for the under doped cuprates Bi2212 (Ino *et al*., 2013). The effect of number of particles on the thermal properties of a heavy nuclei system showed that a decrease in temperature leads to a reduced particle interaction with a decrease in energy (Ndinya and Okello, 2014). This concurs with observations in figures 1, that a decrease in temperature results into a decrease in energy which effectively implies a reduction in particle interaction as a result of reduced temperature. Comparatively the energy at $T=T_C$ for an electron – Cooper pair interaction for Tl2201, Tl2212 and Tl2223 is 3.548×10^{-22}J, 3.922×10^{-22}J, and 4.669×10^{-22}J respectively (Odhiambo *et al*., 2016 (a)); whereas the energy of interaction for an electron – Cooper pair at $T=T_C$ is found to be 3.661×10^{-22}J, 4.781×10^{-22}J, and 5.043×10^{-22}J for Hg1201, Hg1212 and Hg1223 respectively (Odhiambo *et al*., 2016 (b)). The ARPES measurements on BSCCO indicate a *d*-wave energy gap with Δ_0~30 meV (Norman *et al*., 1995) and Δ_0~27 meV (Ding *et al*., 1995). From the comparative results it is noted that the experimental technique applied during experimental measurement determines the likely energy of interaction and it is close to our prediction for Bismuth based cuprates.

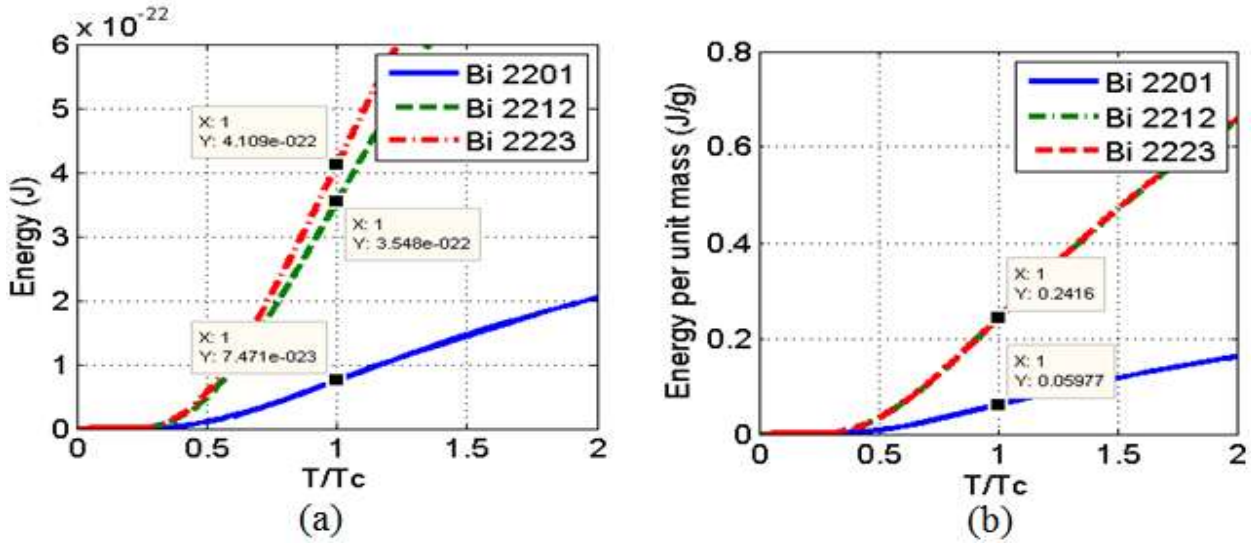

Figure 1: Energy of Bismuth based Cuprates as a function of Temperature (a) for a mole and (b) per unit mass.

(b) Specific Heat of the System

The graph for specific heat as a function of T/Tc shown in figures 2, are skewed Gaussian shaped curves. This has been observed by other scientists for varied materials under varied conditions (Abdel-Hafiez *et al*., 2015; Bagatskii *et al*., 2015; Bhattacharyya *et al*., 2015; Kibe, 2015; Kim *et al*., 2015; Lu *et al*., 2015; Ndinya and Okello, 2014; Odhiambo *et al*., 2016 (a), (b); Sakwa *et al*., 2013). The specific heat in a mole of Bismuth based cuprates is found to be $7.471\times10^{-24}JK^{-1}$ at the Tc of Bi2201, Bi2212 and Bi2223 as shown in figure 2 (a). The specific heat per unit mass in Bismuth based cuprates is found to be 5.977 $mJg^{-1}K^{-1}$, 5.064 $mJg^{-1}K^{-1}$ and 4.393 $mJg^{-1}K^{-1}$ for Bi2201, Bi2212 and Bi2223 as shown in figure 2 (b). Peak specific heat occurs at critical temperature (Saxena, 2010). Comparatively Kibe (2015) while studying the pairing symmetry of the singlet and triplet pairing observed specific heat capacity of $4.8\times10^{-23}JK^{-1}$ at Tc. It has been noted that at T=Tc, the specific heat for Tl2201, Tl2212 and Tl2223 is 5.337 $mJg^{-1}K^{-1}$, 4.597 $mJg^{-1}K^{-1}$, and 4.038 $mJg^{-1}K^{-1}$ respectively (Odhiambo *et al*., 2016 (a)) whereas Hg1201, Hg1212 and Hg1223 has specific heat per unit mass of 7.463 $mJg^{-1}K^{-1}$, 5.839 $mJg^{-1}K^{-1}$, and 4.965 $mJg^{-1}K^{-1}$ respectively (Odhiambo *et al*., 2016 (b)). We notice that at the Tc for Bismuth based cuprates just as in the case for Thallium and mercury based HTS, as the number of CuO_2 planes increases, the specific heat decreases proportionally (Odhiambo *et al*., 2016 (a), (b)).

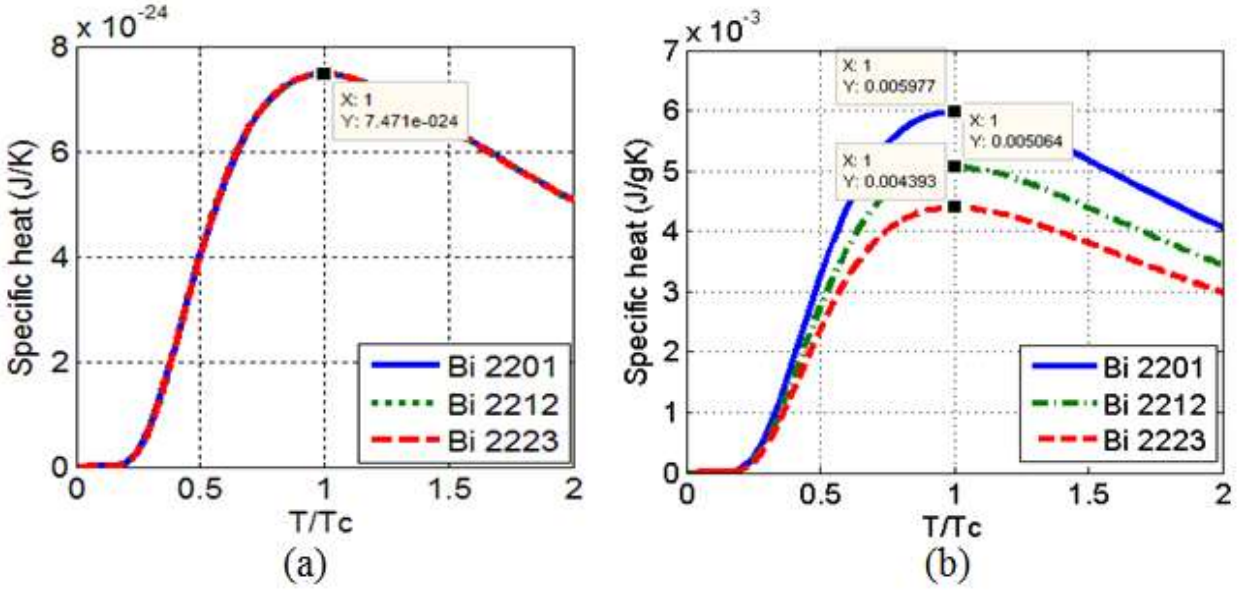

Figure 2: Specific heat for Bismuth based cuprates as a function of Temperature for (a) a mole of Bismuth based cuprates (b) a unit mass of bismuth based cuprates.

(c) Sommerfeld Coefficient of the System

The Sommerfeld coefficient sometimes called electronic specific heat is a ratio of specific heat to the temperature. In the case of a mole of Bismuth based cuprates it is found to be $4.633\times10^{-25}JK^{-2}$, $0.9763\times10^{-25}JK^{-2}$ and $0.8432\times10^{-25}JK^{-2}$ at the T_C of Bi2201, Bi2212 and Bi2223 respectively as shown in figure 3 (a). The Sommerfeld coefficient per unit mass in Bismuth based cuprates is found to be $7.413mJg^{-1}K^{-2}$, $6.287mJg^{-1}K^{-2}$ and $5.454mJg^{-1}K^{-2}$ for Bi2201, Bi2212 and Bi2223 respectively as shown in figure 3 (b).

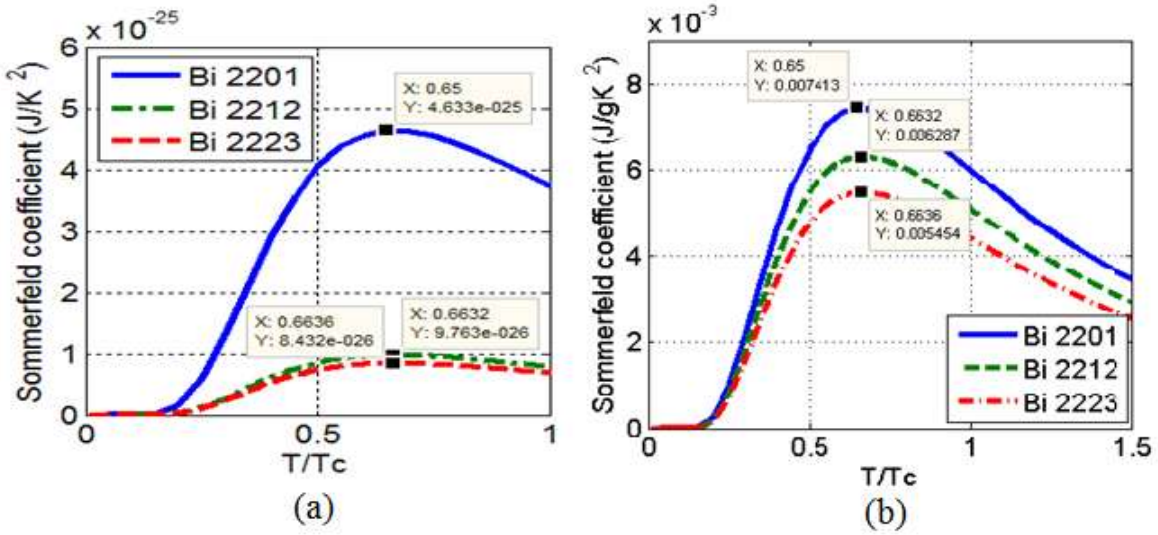

Figure 3: Sommerfeld coefficient as a function of temperature for Bismuth based cuprates in (a) a mole of BSCCO (b) a unit mass of BSCCO.

Comparatively the Sommerfeld coefficient for Tl2201, Tl2212 and Tl2223 is 6.975×10^{-5} $Jg^{-1}K^{-2}$; 5.436×10^{-5} $Jg^{-1}K^{-2}$; and 4.01×10^{-5} $Jg^{-1}K^{-2}$ respectively (Odhiambo *et al.*, 2016 (a)); whereas for Hg1201, Hg1212 and Hg1223 the Sommerfeld coefficient is 9.455×10^{-5} $Jg^{-1}K^{-2}$; 5.664×10^{-5} $Jg^{-1}K^{-2}$ and 4.567×10^{-5} $Jg^{-1}K^{-2}$ respectively (Odhiambo *et al.*, 2016 (b)). The discrepancy between Sommerfeld coefficients arises from different extent

of imperfections in samples of HTS cuprates used, as well as from inaccurate normalization that arises from imprecise oxygen composition determination (Bessergeven *et al.*, 1995; Royston 2001). The structure of bismuth clip rates is very similar to the structure of thallium cuprates such as TI220I, T12212 and TI2223, with bismuth replaced by thallium, and strontium replaced by barium. In spite of similar structural features of bismuth and thallium compounds, there are differences in superconducting and normal-state properties (Mourachkine, 2002). From figure 3, the peak Sommerfeld coefficient occurs at a truncated temperature T/TC=0.6 for all Bismuth based cuprates. This has also been observed in mercury based cuprates (Odhiambo *et al.*, 2016 (a)), and thallium based cuprates (Odhiambo *et al.*, 2016 (b)). In conclusion, the number of planes of CuO_2 is inversely proportional to the Sommerfeld coefficient as noted by Odhiambo *et al.*, (2016 (a), (b)).

(d) Entropy of the System

Entropy is the disorder experienced in the material media. In case of a mole of Bismuth based cuprates is found to be $5.603\times10^{-24}JK^{-1}$ at the T_C of Bi2201, Bi2212 and Bi2223 as shown in figure 4 (a). Nearly similar entropy has been found per mole for: YBCO with value 3.036×10^{-24} Junit $cell^{-1}K^{-1}$ (Loram *et al.*, 1993); whereas Rapando *et al.*, based on theoretically study using the dipole mediated t-J model (t-J-d) found entropy to be $5.04693 \times 10^{-22}JK^{-1}$ (Rapando *et al.*, 2015). The specific heat per unit mass in Bismuth based cuprates is found to be $4.482mJg^{-1}K^{-1}$, $3.798\ mJg^{-1}K^{-1}$ and 3,295 $mJg^{-1}K^{-1}$ for Bi2201, Bi2212 and Bi2223 as shown in figure 4 (b).

When the temperature is lowered from a higher value to a lower value, the entropy also decreases and the HTS Cuprates material becomes more ordered. Other scientists have also made similar observation on the trend of entropy below T_C (Rapando, 2015; Sakwa *et al.*, 2013; Odhiambo *et al.*, 2016 (a), (b)). Comparatively, the entropy for Tl2201, Tl2212 and Tl2223 was found to be 4.003 $mJg^{-1}K^{-1}$, 3.448 $mJg^{-1}K^{-1}$ and 3.028 $mJg^{-1}K^{-1}$ respectively (Odhiambo *et al.*, 2016 (a)), while Hg1201, Hg1212 and Hg1223 had entropy per unit mass of 5.597 $mJg^{-1}K^{-1}$, 4.38 $mJg^{-1}K^{-1}$ and 3.794 $mJg^{-1}K^{-1}$ respectively (Odhiambo *et al.*, 2016 (b)). From the results, entropy decreases with an increasing number of CuO_2 planes in bismuth based cuprates as observed in thallium based cuprates (Odhiambo *et al.*, 2016 (a)), and mercury based cuprates (Odhiambo *et al.*, 2016 (b)).

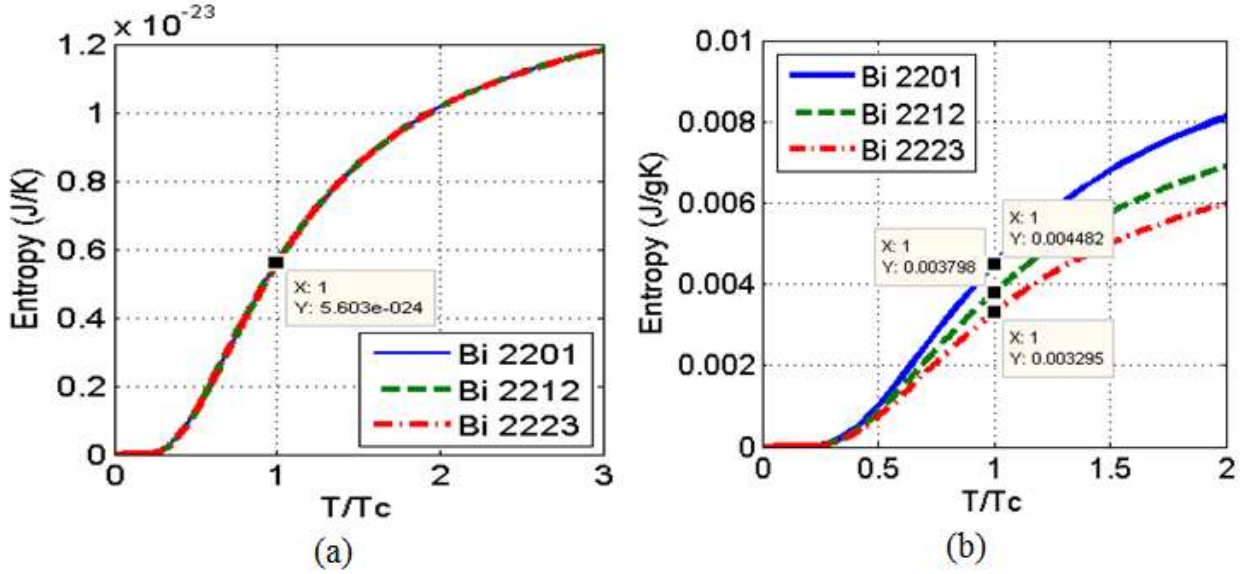

Figure 4: Entropy as a function of temperature for Bismuth based cuprates for (a) a mole BSSCO (b) a unit mass of BSSCO

4.0 Conclusion

In conclusion we notice that at $T=T_C$ the energy of interaction increases with increase in the number of CuO_2 planes. The specific heat per unit mass decrease with an increase in the number of CuO_2 planes. Sommerfeld coefficient decrease with increase in number of CuO_2 planes, Specific heat and entropy per mole are constants not depending on CuO_2 planes. According to our findings, entropy per unit mass decreases with an increase in the number of CuO_2 planes.

Acknowledgments

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Conventional versus Ecological Economics: Some Reflections on Non-renewable Natural Resource Exploitation and Sustainable Development

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Abstract

A natural resource is any form of matter or energy obtained from the physical environment which meets human needs through resource extraction and processing technology. Resources can be classified as renewable(those that either come from an essentially inexhaustible source or that can be replenished relatively rapidly by natural and artificial processes, if well-managed)or non-renewable(those which are finite and exhaustible). This paper's objective is to reflect on the civilizing world and non-renewable resource exploitation amidst rapid world population growth and industrial activities. Based on document analysis, it explores the question as to whether earth's non-renewable natural resources are being depleted, and if so, there is need to sustain their use. That raises another question-can development be truly sustainable? Evidences from this paper indicate a gobbling of these resources, yet they are finite and will be gone forever once depleted. Recent studies by World Bank have estimated world population to be growing at about 0.8% annually since 2010 and will reach about 8.9 billion people with urban population being twice the rural one then. Concomitant with this reality will be a rise of the middle class and an increase in consumption levels of goods and services. This will ultimately lead to resource exhaustion and environmental damage. This paper, therefore, concludes that the remedy for promoting appropriate global development without non-renewable resource depletion and environmental degradation is for us to be emphatic upon a new paradigm and ideology-sustainable development. This is about ecological economics- a progressive transformation of the economy, society and the environment. It's not about conventional economics of simply increasing industrial output while compromising environmental health. That would be a" lose-lose" scenario in which mankind ultimately loses. Ecological economics concerns a "win-win" situation in which earth's ability to provide non-renewable resources for all life on the planet is secured.

Introduction

Humans and their enterprises are augmented by resource harvesting from the environment. Incase human economic systems are growing over time, much larger resource amounts are needed. Consequently, there is an inextricable link between economic and ecological systems. This link involves resource flows from ecosystems and the environment into the human economy, and flows of un-used materials, by-products and heat (all sometimes called "wastes") from the economy into the environment. The problem which arises from these interchanges of materials and energy are many kinds of damages caused to natural and managed ecosystems, which are in turn , caused by disturbances linked to the harvesting of natural resources , by emissions of pollutants or by other stressful activities related to economic systems and industrial societies.

Environmental science has the ultimate goal of understanding how resource use and environmental quality can contribute to a sustainable economic system and to the quality of human life. In a nutshell, a sustainable economic system is one that runs forever-the rates of resource use are equal or smaller than the rates at which they are regenerated or recycled (Freedman, 2004:187).Beyond the resource-related aspects, sustainability, in general, also includes the environmental damages that occur due to the extraction and management of natural resources and, so, the environmental cost calculations that have to be made in the light of these damages. Simply put, anthropogenic economic systems should not only aim for industrialization, profit-making and prosperity without considering the cost implications of causing harm to the biosphere.

These impacts negatively on human health and societal well-being. The panacea for biospheric quality protection and management of non-renewable resources is for all humankind to aspire for prosperity but with sobriety. However, technological optimists (Cornucopians) and their ideological ilk-the advocates of the Anthropocentric World View strongly contend that earth's resources are abundant and inexhaustible and that humans have the right to take whatever they want from nature for subsistence or gain. This is conventional economics which inadvertently or deliberately ignores environmental quality management within economic systems. Conversely, environmentalists, technological pessimists (Malthusians) and utilitarian thinkers aver that the source of human pleasure is a resourceful and clean environment which when conserved protects resources for the"greatest good, for the longest time"(Cunningham, *et al*;2005:35). This is ecological economics which incorporates environmental sustainability into anthropogenic activities.

Sustainable development, in our case, is about progress towards an economic system which extracts and processes non-renewable natural resources by neither depleting their stock nor compromising their availability for use by future generations of humans. We shall, therefore, discuss what non-renewable natural resources actually are and the increased global consumption of these materials amidst rapid population growth especially in developing countries in Asia and Africa. We then look at the impact of the exploitation of these resources and the essence of sustainable development, and finally, the way forward towards sustainable anthropogenic activities.

Non-renewable Natural Resources

These are resources present in the environment in finite amounts and do not regenerate after they have been harvested or used , or if they do, the time scales to do so are so long by human standards that the resources will be gone once present supplies are exhausted(Cunningham, et al,2005:501-2). Such resources include metal ores, coal, petroleum, uranium and natural gas. Take note that much as continuing exploration may discover new stocks and known exploitative reserves substantially increased of such resources, they are still found on earth in finite quantities (de Blij and Murphy, 1999:456). Implicit in this definition is that once non-renewable resources are used, their remaining stocks in the environment become depleted and cannot be used in a sustainable way.

Natural geological processes taking place over millions of years have created varying deposits of such metallic and non-metallic minerals. When these are extracted, they are not replaced first enough to be useful. The easily available and highly concentrated deposits of these non-renewable minerals are depleted first. This would then require examining carefully and digging deeper to reach the remaining reserves which are usually of lower mineral concentration. This is normally more costly especially where improvements in resource location and mining technology **are minimal or absent altogether. Thus something is useful as a resource only if it can be** available at a reasonable cost (Miller, Jr, 1985:7).

Non-renewable resources can be recycled or re-used but some cannot, as we shall see later. Recycling involves collecting and re-melting or reprocessing a resource, whereas re-use involves using a resource over and over again in the same form. Examples are metallic or non-energy mineral ores from which metals such as copper, aluminum and iron ore can be extracted. It also includes deposits of non-metallic minerals such as phosphate rock from which fertilizer nutrients are extracted. Some resource economists talk of *infinite substitutability* for non-renewable resources. For instance, steel is still used in car manufacture but this is now widely being substituted with aluminum and plastics. Indeed, aluminum has replaced copper for electrical wiring. But infinite substitutability is not always applicable due to the unique properties of some minerals. For

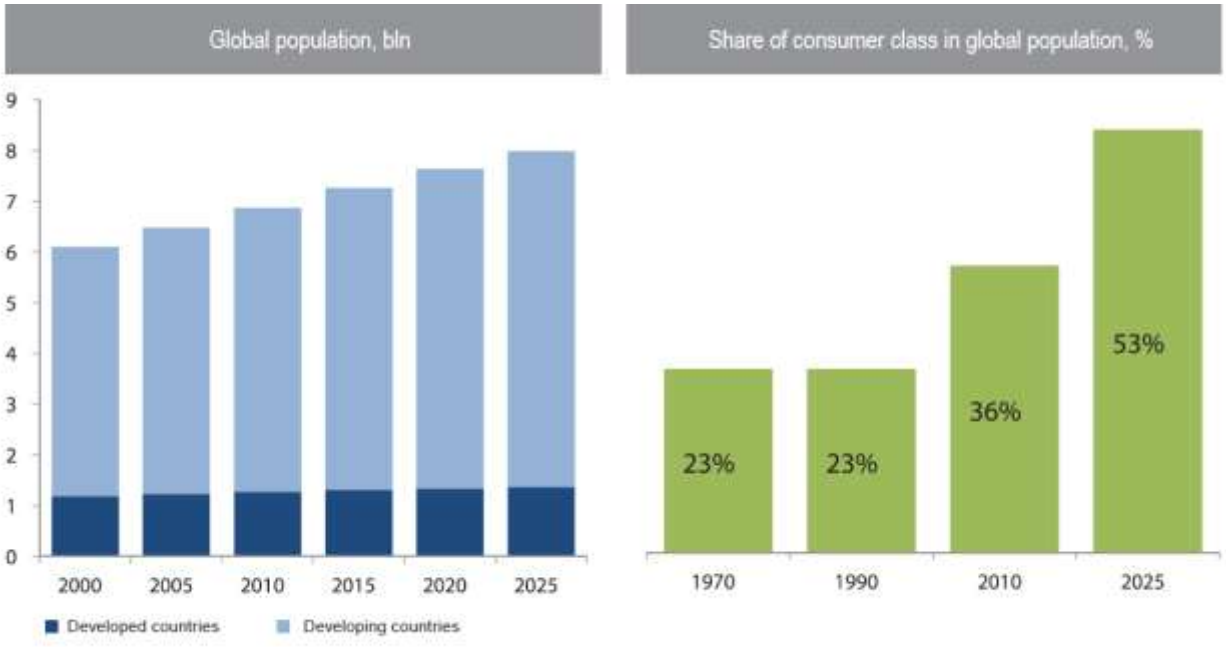
example, there is no known replacement for steel and concrete in the construction of skyscrapers and dams.

If recycling and re-use and infinite substitutability are any technological measures to give hope to the managed exploitation of non- renewable resources, most of these resources will be gone, after all, once they have been exhausted. The list includes non-metallic mineral energy resources, such as fossil fuels (coal, oil and natural gas) and uranium which is used in nuclear power generation. Oil, coal and natural gas were formed from fossilized and compressed remains of decayed plants and animals under anaerobic conditions by great heat and pressure in the earth's crust over millions of years; geological and climatic conditions that no longer exist. Once these deposits are used up, they will be gone since regeneration would take hundreds of millions of years .Secondly, fossil fuel energy cannot be recycled; once it is burned, it is eventually radiated from earth into outer space as low-grade heat that cannot be re-used(Miller,Jr,1985:8).Similarly, deposits of uranium will be rapidly depleted if nuclear energy is widely used, unless nuclear breeder reactors are developed that can convert some non-usable forms of uranium into required forms or other chemical innovations emerge that can be used to generate nuclear power.

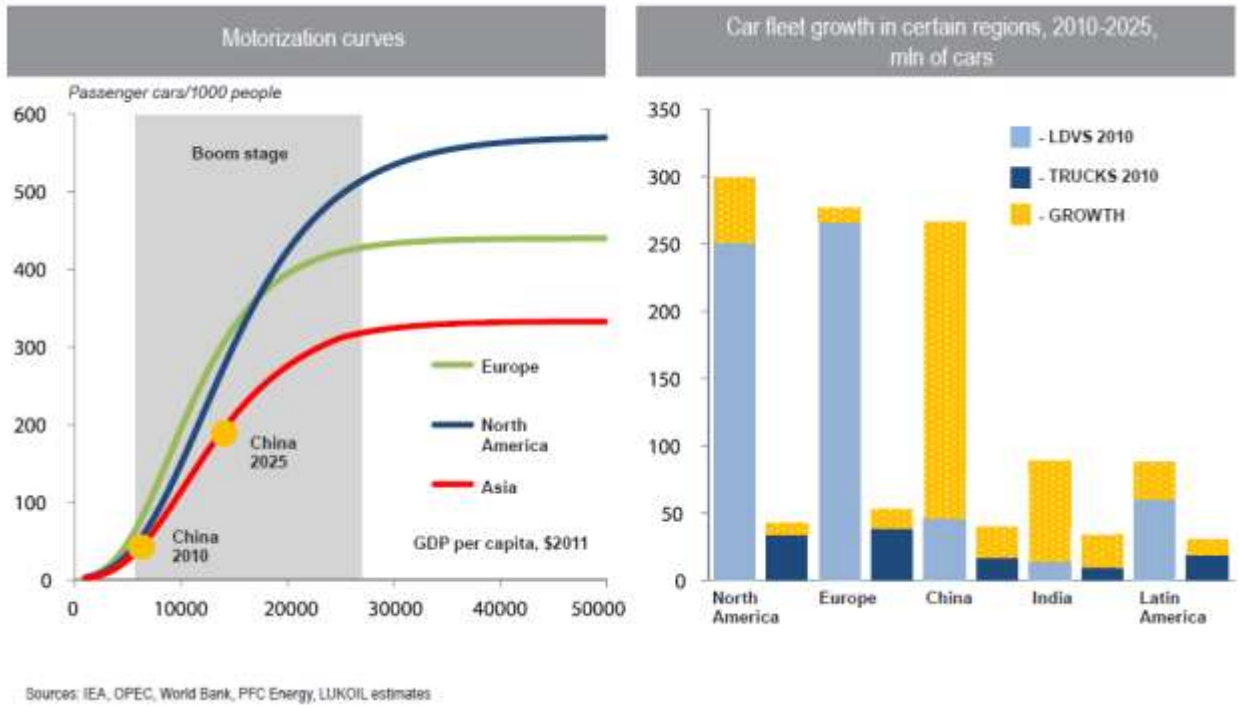
Global Population Growth and Non-renewable Energy Consumption

The world is presently witnessing rapid population growth, especially in Asia and Africa. According to LUKOIL, a leading research organization on Global Trends in oil and gas markets, and according to World Bank studies, world population is growing and will continue to grow rapidly. It will increase by more than 1.1 billion people between 2010 and 2025, with high growth rates expected first, in India, which will become the world's most populous by 2020. Global population is estimated to grow at a pace of 0.8% per annum and will reach about 8.9 billion people by 2040 with the urban population becoming double the rural one at that time (LUKOIL, 2008). Concomitant with this situation is a rapid global urbanization process which, though varying from one world region to another, indicates an ever rising proportion of urban to total population and the urban areas themselves being large and growing (Fellman, *et al*,2008:341).

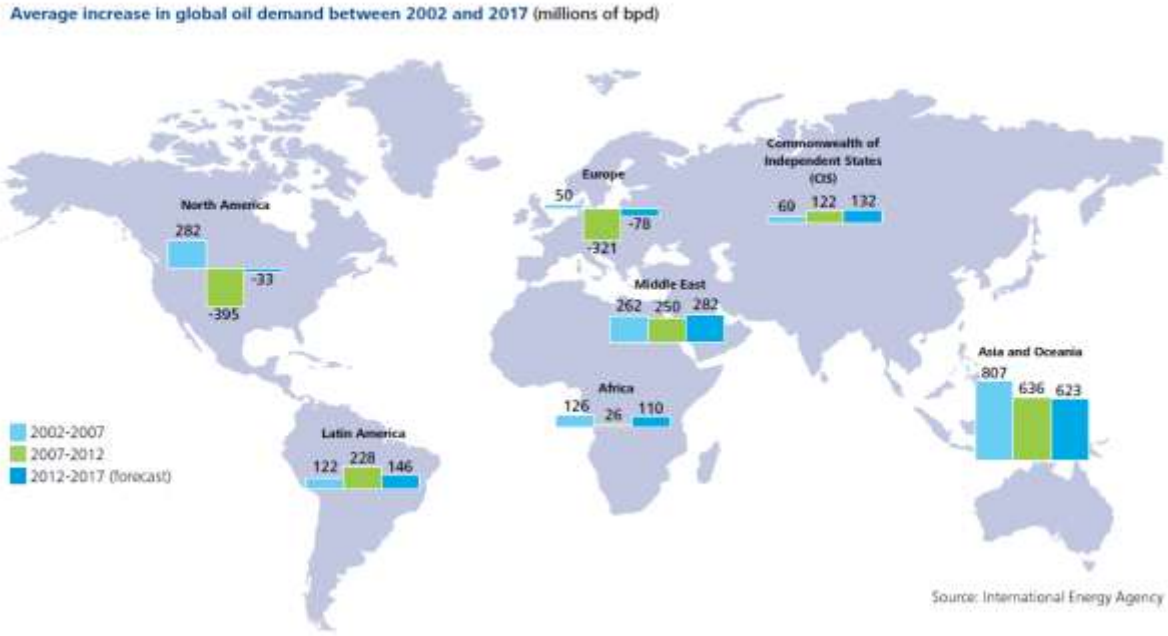
Furthermore, improvements in socio-economic conditions and quality of medical services will cause explosive population growth in African countries as millions of people continuously drift to urban environments as' refugees' from impoverished rural districts and , by their numbers and high fertility rates, they accelerate urban expansion (Fellman, *et al*, 2008:341). Rapid urbanization, especially in Asia and Africa, will result in increased consumption levels by 2025 due to a rise of the middle class. This will in turn raise the demand for real estate, infrastructure, cars, hi-tech goods and, consequently, energy resources (Fig.1).

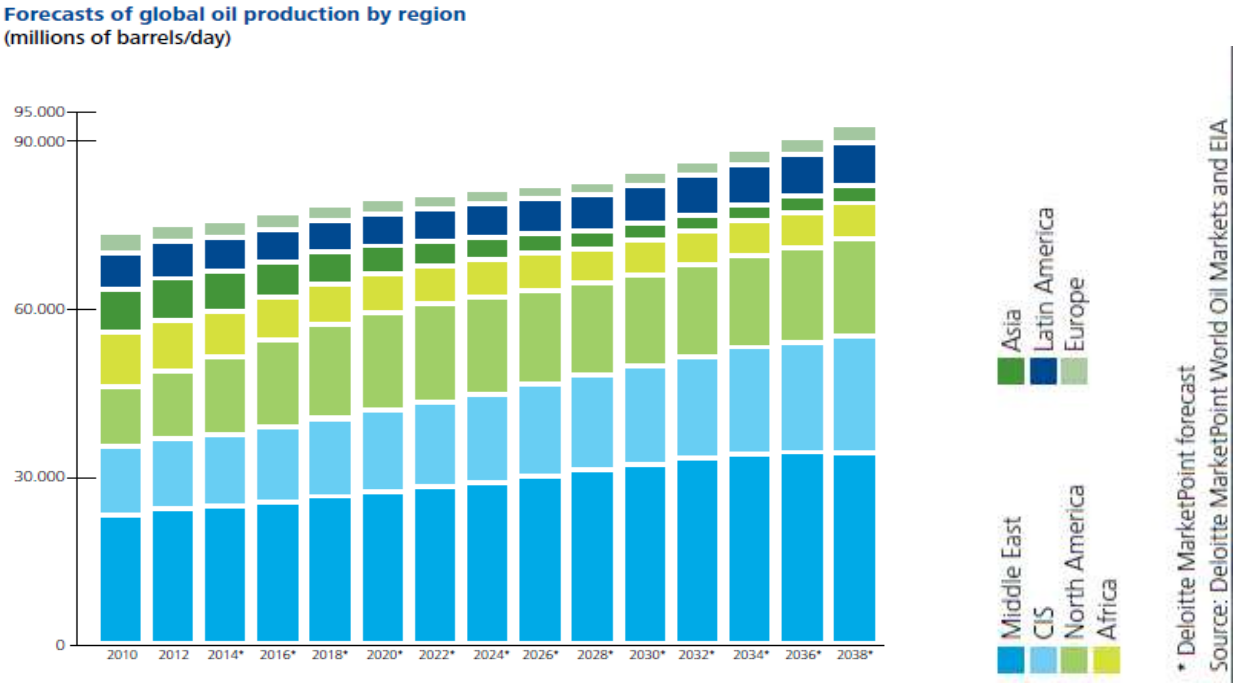


Indeed, projections suggest that by the middle of the 21st century, worldwide demand for energy resources will be at least twice what it is today owing to increased population and industrial growth in developing countries (Arms,1994:170). In terms of motorization, China and India are already registering a large number of cars per 1000 people (currently in china, it is 40 cars per 1000 people and by 2025, this will be about 200 cars per 1000 people). This will lead to a 220 million car fleet between 2010 and 2025. India and other Asian countries will follow suit and eventually Africa (see Fig.2).



Implicit in these data on world population growth and a rise of the middle class, especially in developing countries, is that the demand for non-renewable resource products is also rising as indicated in figure 3. The base case predictions by Monitor Deloitte assumes that global demand for oil will reach 100 million barrels per day (mb/d) in 2040. The Middle East and Caspian Sea as well as Russia and the Commonwealth of Independent States (CIS) of former USSR will have an increase in production, but a fall in Asia, Europe and Africa (see Fig. 4).





Other forms of non-renewable energy include coal, natural gas and uranium. Coal, a hard, brittle carbonaceous rock, usually black or brown in color, is formed from partially decomposed and fossilized plant material and used as a fuel. In its distilled form, it becomes coal gas- a flammable gas. Natural gas is a source of fuel extracted from underground or the sea-bed. Compared to petroleum reserves, natural gas reserves have been less extensively prospected. However, some extensive' unconventional' gas deposits such as methane hydrate were recently discovered in the Arctic permafrost and beneath deep ocean sediments. Deeply entrenched in frozen water, the known 50 oceanic and a dozen land deposits are altogether believed to contain some 10,000 gigatons (10^{13} tons) of carbon or twice as much as the combined amount in coal, oil and conventional natural gas(Cunningham *et al*, 2003:486).

Another form of non-renewable energy exploitation is nuclear power. It significantly contributes to the energy we consume and the electricity we produce albeit at relatively lower quantities compared to that from fossil fuels. Through a process of fission, purified and concentrated uranium is produced after uranium-235 atoms are bombarded with neutrons causing a collision which splits the uranium atoms into smaller ones and then releases two or more neutrons together with energy and radiation. After many years in the reactor, the fuel loses its potency to generate adequate energy and has to be replaced with fresh fuel. Some of this used fuel may be reprocessed to recover any usable uranium and plutonium that may be left; the rest is disposed of as radioactive wastes (Brennan and Withgott, 2005:551). Nuclear energy is viewed, since its first support by President Dwight Eisenhower of the USA in 1953, as cheaper once produced and cleaner to the environment. He described it as 'too cheap to meter' and technology and engineering would tame the evil genie of atomic energy and use its enormous power to do useful work (Cunningham, 2008:291). Today, many states have taken to nuclear energy use, albeit, controversially in some such states.

The Need forSustainable Development

The phrase 'Sustainable Development' has its roots in a United Nations Conference of the World Commission on Environment and Development whose deliberations resulted in a report published in 1987 commonly referred to as the' Brundtland Report'(after the Chair, Dr. Gro Harlem Brundtland) which defined sustainable development as development having a goal of ' meeting the needs of the present without compromising the ability of future generations to meet their own needs'(Cunningham and Cunningham, 2008:342). The report was emphatic on global per capita income growth through efficient technologies while consuming fewer materials and energy resources than at present. Elements of sustainable development include:

- sufficient growth of energy supplies to meet human needs
- energy efficiency and conservation measures
- recognizing the public health risks inherent in energy resources
- protection of the biosphere and prevention of more localized forms of pollution (Njuguna, 2007:30)

Both the 1992 Rio de Janeiro Earth Summit(Brazil) in its key outcome, Agenda 21, and the 2002 Johannesburg World Summit on Sustainable Development(South Africa) clearly emphasized the need for global action against wanton gobbling of environmental resources, changing unsinkable patterns of production and consumption and conserving the natural resource base. Many environmentalists contend that we must undergo a paradigm shift – adopt a new way of thinking and acting , a new ideology- sustainable development, whose focus is on making social, economic and political progress to satisfy global human needs, desires, aspirations and potential without

damaging the environment. One country should not disproportionately use global resources or cause irrevocable environmental degradation (McKinney& Schoch, 2003:622).

a) Conventional Economics

This is a development approach espoused by traditional economists and industrialists who strive towards production systems that foster progress, prosperity and human welfare at any cost and societal consumption is as if goods and services were isolated from the environment. Traditional economic theory largely ignored the environmental costs of extracting source materials from the natural environment, such as costs of depletion to future generations. It was, too, oblivious of the environment as a sink for waste and pollution. Basic economic texts still often describe air, water and other resources as 'free goods'.

Technological proponents of this economic theory (Cornucopians) strongly argue that resources of all kinds, renewable or non-renewable will never be depleted since human ingenuity and emerging technological capacity will result in a world of growing affluence and well-being; that population control is uncalled for since it will plummet naturally through economic growth in Less Developed Countries. In line with this school of thought is the Anthropocentric World View which is deeply grounded within the Judeo-Christian ethic that is based on the biblical myth of creation in which divine providence empowered humans over natural resources. Consequently, humans have the right to draw from the environment whatever they want for subsistence or economic benefit, as to them, this is inexhaustible (White, 1967).From the pure ecological perspective, this is an arrogant attitude but which, unfortunately permeates world dominant cultures and religions; dogmatic principles and tendencies out of touch with sustainability.

b) Ecological Economics

Also known as Green Economics, this approach views society and the natural environment as a single system. It treats both the short-term need for jobs and the long-term need to protect the environment as goals. In contrast to conventional economics, ecological (environmental) economics incorporates environmental considerations in its theory and practice. Firstly, society has greatly increased in size while the environment and its resources have remained finite. The gist of this theory is that the environmental costs and benefits of resource extraction, pollution and production activities have to be included in economic calculations. Secondly, at the onset of conventional (traditional) economics, human populations and technological impacts were much smaller than now (McKinney & Schoch, 2003:566). Ecological economics concerns sustainable growth, not the reverse, as the latter is basically anchored on the idea of 'infinite' resources, maximum resource use and thus resource depletion, what economist, Kenneth Boulding, has called 'cowboy economics' (Mckinney& Schoch, 2003:566).

Ecological economics has been strongly supported by pessimists, who have warned that the world is headed for economic collapse, increased political instability and a threat to global nuclear war. Rapid population growth will compound the problem if attitudinal changes in resource extraction and consumption are not reinforced. In their studies on environmental ethics and philosophy, the Utilitarians, spearheaded by Jeremy Bentham (1748-1832) and his brilliant protégé, John Stuart Mill (1806-1873) aver that the greatest pleasure for the greatest number of humans is to be educated and to act according to enlightened humanitarian principles. This kind of utilitarianism inspired Gifford Pinchot and the early conservationists who argued that the purpose of conservation is to protect the resources for the' greatest good, for the longest time' (Cunningham, *et al*, 2005:35).

Sustainable development is, so to speak, synonymous with ecological economics. It may be viewed as part of the modern trend of economics of development, which has been globalized-

becoming more interwoven locally, regionally and globally into a seamless network of causes and effects (Rees, 1990).

Challenges to sustainable growth are still lingering. For instance, the United States of America, the world's most powerful democracy and highly industrialized economy, is notleading the way in protecting the less- industrialized global south from global warming and climate change. While the Chinese Middle Class is a monumental force in pushing for government action to guarantee cleaner air, President Donald Trump of the USA, the world's second largest emitter of greenhouse gases, after China, is reneging on climate change reduction. He has denied climate change, calling it a 'hoax' created by the Chinese (Daily Nation, November 17,2016).This sounds fallacious and worrying indeed. His actions amount to backtracking on America's role against greenhouse gas emissions, yet his predecessor, President Barrack Obama passed the Clean Power Bill and assented to the Paris Accord on climate change. President Trump views agreements against global warming and climate change, ostensibly, as potentially slowing down America's industrialization. The import of this action is that he subscribes to the conventional economic theory of development. From the ecological perspective, this is a non-conformist school of thought in environmental conservation and the world should unequivocally condemn this and ignore President Trump's eccentricism. No right-thinking world policy makers on climate change should be ambivalent on this serious matter.

Environmental Impacts of Non-renewable Resource Exploitation

As the world aspires for maximum use of these resources, among others, concerns have increasingly been raised about damages visited to the biosphere from anthropogenic activities. We cite examples of such impacts from the exploitation of coal, oil and nuclear energy, among others. The harm to the environment and human health is worrying.

a) Coal Extraction

- destruction of large chunks of land from surface strip-mining
- massive soil erosion and siltation and chemical run-off into water bodies
- collapsing shafts and tunnels from underground mining leading to possible injury and death of mine workers
- coal dust inhalations from dynamite blasts hence respiratory infections such as the black lung disease.
- pond digging for collection of sludge hence affecting local ecological diversity

b) Fossil Fuel Extraction

- emission of greenhouse gases from fossil fuel burning in industries, agricultural activities and transport systems leading to global warming and changed weather regimes
- carcinogenic effect of hydrocarbons such as benzene on human and animal skin
- acid precipitation over land, lakes, oceans and dams
- eye irritation and asphyxiation
- corrosion of roofs of buildings from oil-based chemicals
- Oil leaks and flows over land and oceans hence affecting flora and fauna due to pollution. The Niger Delta, Nigeria's former bread basket, has become a virtual wasteland from gas spills and gas flaring by international drilling companies such as Shell Petroleum since the 1930s

c) Nuclear Energy Exploitation

- large amounts of energy, land and materials required in nuclear plant building
- huge water quantities needed for routine cooling

- Enormous amounts of energy and materials needed for decommissioning of power plants (McKinney& Schoch, 2003:208).
- Leaking of radioactive wastes into the environment (Brennan & Withgott, 2005:551). This is now a major headache in the USA, Canada, Russia and Japan.
- Reactor safety from faulty actions by plant engineers as happened at Chernobyl (Ukraine) in 1986, leading to many deaths from radiation, and the Three Mile Island Nuclear Plant (USA). Natural events such as an earthquake/tsunami can also rock such plants into a radioactive fallout as recently occurred north-east of Japan(Tohoku Region) at the Fukushima Daiichi Nuclear Power plant in which a heavy death toll and extensive evacuations were witnessed.
- A potential weapon of 'mass destruction. The activities of states such as North Korea, Pakistan, Iran and Syria are suspect; but a nuclear war would be national suicide for any state, and worst of all, a full-scale one.

The Way Forward

Environment is the totality of conditions and influences that affect the way things live and develop and also includes made technological components and the entire social, political and economic systems. It is defined in terms of air,land and water, plant, animal and human life. It also encompasses any solid, liquid, gas, odor, heat, sound, vibration or radiation that may directly or indirectly affect ecological diversity (Njuguna,2007:9). We rely on the natural environment to provide all the physical aspects of our existence. As our numbers grow, our collective demands on the environment escalateand, consequently, accelerate the rate ofenvironmental deterioration.

Economic progress should be synchronized with ecological sustainability and environmental health. We must not leave a degraded environment to the future simply in order to lead a certain lifestyle in the present. What is urgently required, among other policy measures is:

- Viewing the environment as a sink for waste and pollution for adoption of precautionary strategies
- Making economic calculations of the environmental costs and benefits of mining, pollution and productive activities
- Increasing material recycling (instead of, for example, burying aluminum in landfills or even burning this material in incinerators)
- Creating emphatic consumer awareness programs, with national government policy frameworks leading the way through mass and electronic media, field days, workshops, school curriculum integration of environmental studies and so on
- Developing firm environmental legislation to sustain environmental health and ecological diversity. Kenya's move to ban the use of the non-biodegradable thermoplastic polythene, widely used for packaging shop items, is an environmental-friendly action
- Evolving policies that are accompanied by incentives to monitor population growth rates and resource exploitation. Nordic countries such as Norway, Finland and Sweden are way ahead in this.
- Reviewing consumption levels and patterns, especially among highly developed countries. The focus should be more on well-being rather than increased exploitation and consumption. One country should not gobble global resources or cause irrevocable environmental degradation that affects other peoples or the entire planet.
- Undergoing attitudinal change among humans and viewing natural non-renewable resources as truly finite and not inexhaustible, through appropriate education and development of enlightened humanitarian principles of conserving nature, and

- Permanent burial of nuclear energy's highly dangerous wastes. Finland is preparing to inter its highly radioactive wastes for 100,000 years on the tiny island of Olkiluoto, off the country's west coast ; described as the world's costliest and longest-lasting burial ground for radioactive wastes (Daily Nation, June 8,2016)

Conclusion

Sustainable development is based on sustainable earth ethics in which environmentalists urge us to adopt a sustainable earth or a conserver world view based on the principle that nature is not primarily for human use alone but for all living species and that matter and energy resources are finite and must not be wasted. This is ecological economics which takes note that since the onset of anthropogenic activities, human populations and technological impacts have greatly grown over time and proper care must be taken to conserve the environment. Let us not extract and consume resources as if there shall be no life tomorrow, for our children and grandchildren and for posterity. That would be a 'lose-lose' scenario as humans will ultimately lose. In the wise words of Mahatma Gandhi of India, 'there is enough for everybody's need but not for everybody's greed' (Miller, Jr, 1985:454).In a 'win-win' situation, we learn to appreciate that what is good for the environment can also be good for us. We can have it both ways; if we learn from what science teaches us, if we think creatively and willfully act on our ideals through sustainable development, then humankind will survive and thrive. We have to harmonize our social and economic objectives with ecologically sound management, in a spirit of self-reliance, satisfaction of basic needs, a new symbiosis of man and earth, another kind of qualitative growth, not zero growth, not negative growth(Glaeser, 1984). If the environment' loses' through our impacts on it, then so will we.

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Modular Representation of the Unitary Group U3 (4) As Linear Codes

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Abstract
Coding theory deals with methods of constructing and analyzing error-correcting codes and decoding them in an efficient manner. In this paper, we construct some binary linear codes from modular representation of Unitary $U_3(4)$ and determine their properties. We aim to determine linear codes from primitive permutation representations of $U_3(4)$ group using modular representation method ,determine the properties of codes obtained from $U_3(4)$ group and to establish the relationship of these codes with some designs, graphs and finite geometries. We use Magma and meat axe softwares to determine irreducibility of modules. We develop algorithm that determine these codes and add the algorithm to the Magma software. The codes constructed from this group are used in the encoding and decoding of messages, error detection and error correction.
Mathematics Subject Classification: 05B05, 20D45, 94B05

Key Words: *Binary Codes, Combinatorics, Designs and Graphs, Modules*

1.0 Introduction

In 1982, the classification of the finite simple groups was completed and were classified into: cyclic group with prime order, an alternating group of degree at least 5, a simple group of Lie type and ,the 26 sporadic simple groups based on external structures .This classification took many years and involved many researchers. The current research is about these classified groups and their internal structure. We use coding theory to study the internal structure consists of these simple groups. Coding theory emerged following the publication of Shannon's seminal 1948 paper [3]. Coding theory deals with methods of constructing and analyzing error-correcting codes.

Brooke in [3, 4] has found all codes obtainable this way from the primitive permutation representations of the simple groups $PSU_4(2)$ and $PSU_3(3)$. In particular they examined all binary codes arising from primitive permutation representations of these groups. The simple group $PSU_4(2)$ of order 25920 has an especially rich structure. In [3], representations of $PSU_4(2)$ on the 27 lines of the general cubic surface, five primitive permutation representations of degrees 27, 36, 40, 40 and 45 lead to 6, 10, 6, 10 and 22 codes respectively (excluding the zero code and the ambient space).

The group $PSU_3(3)$ has order 6040 and has four permutation representations of degrees 28, 36, 63 and 63 leading to 4, 10, 26 and 42 codes, respectively, all of which are inequivalent except for the repetition code and its dual appearing in both degree 63 representations. In each case the complete lattice of submodules is given. Irreducible modules of degrees 1, 6, 8, and 14 are involved. Further the weight distribution of subcodes (that is, submodules) with respect to the standard basis was determined.

Taking G to be a permutation group of degree n, and V the corresponding F2 permutation module, the submodules of V can be regarded as being G invariant binary linear (n,k) codes in V. In [4] a search is carried out when (G, V) corresponds to one of the four primitive permutation modules associated with the simple unitary group $G = U_3(3)$, of order 6048. The approach is to regard G as acting 2-transitively on a certain Steiner system S (2, 4, 28), and then to obtain the other primitive representations of G in terms of the action of U3(3) on various geometric and algebraic objects that

live in S(2,4,28). Of particular interest is the description of S(2,4,28) in terms of the Cayley integers and therefore provide an explicit isomorphism between $U_3(3)$ and $G0_2(2)$.
Codes have been constructed from some unitary groups e.g.PSU_4 (2), $PSU_3(3)$ and $U_3(3)$ using different methods. The properties obtained from these codes have been determined. Geometrical shapes of $U_3(4)$ have been worked out[10], but no codes have been constructed from $U_3(4)$. Thus in this paper, we are interested in constructing codes from $U_3(4)$ and establishing properties of some of the codes. The purpose of the paper is to construct binary linear codes from modular representation of Unitary $U_3(4)$ and determine their properties. The specific objectives of this paper are: determine linear codes from primitive permutation representations of $U_3(4)$ group using modular representation method, determine the properties of codes obtained from $U_3(4)$ group and establish the relationship of these codes and with some designs, graphs and finite geometries.

2.0 Literature
The aim of this section is to bring together a selection of mostly standard results from modular representations.

2.1 Modular representations
Let F be a field of characteristic p and let V be an F vector space. Let G be a finite group of order n. Then we define a linear representation V of G over F as a homomorphism $\emptyset: G \to GL(V)$. We say that the representation is faithful if $\emptyset$ is injective. Representations are similar or equivalent if they correspond to isomorphic FG-modules. A module M is irreducible or simple if the only submodules are M and 0. If not then M is reducible. M is decomposable if there exist non-zero submodules M_1 and M_2 such that $M = M_1 \oplus M_2$. M is completely reducible if it can be written as the direct sum of irreducible submodules [17].

2.2 Binary Linear Codes
A binary linear (n, k) code C is a k-dimensional subspace of the n-dimensional vector space over $GF(2)$. A code C of length n, dimension k, and minimum weight d, is denoted by $[n, k, d]$. The Hamming weight $w(c)$ of a codeword c is the number of non-zero components in the code word. The Hamming distance between two codewords $d(x; y)$ is the number of places in which the codewords x and y differ. The minimum (Hamming) distance of a code C is the minimum distance between any two codewords in the code. In general, a code that has minimum distance d can be used to either detect up to $d - 1$ errors or correct up to $[(d - 1)/2]$ errors. [1, 2, 8].The larger the d, the more errors it corrects.

2.3 Designs
An incidence structure $D = (P, B, I)$, with point set P, block set B and incidence I is a t-(v, k, λ) design, if |P| = v, every block $\beta \in$ B is incident with precisely k points, and every t distinct points are together incident with precisely λ blocks. A design D is symmetric if it has the same number of points and blocks. A $t - (v, k, 1)$ design is called a Steiner System. A $2 - (v, 3, 1)$ Steiner system is called a Steiner Triple System. A $t - (v, 2, \lambda)$ design D can be regarded as a graph with ρ as points and β as edges [1, 2].

2.4 Graphs
A graph G is an ordered pair(V, E), where V is a non-empty finite set of vertices and E is a set of pairs of distinct vertices in G, called edges .The valency of a vertex is the number of edges containing the vertex. A graph is regular if all the vertices have the same valence, and a regular

graph is strongly regular of type (n, k, λ, μ) if it has n vertices, valence k, and if any two adjacent vertices are together adjacent to λ vertices, while any two non-adjacent vertices are together adjacent to μ vertices. [1, 2]

3.0 Methodology

In this paper, we use the following analytical methods:

1. Generate the permutation representations of $U_3(4)$ of degree 65 and 208 from the Atlas of finite groups.
2. Use Magma and meat axe softwares to:
   I) Determine the permutation modules of the permutation representations
   II) Use permutation modules to determine dimensions of all maximal submodules of the permutation module. Remove the Isomorphic copies of the maximal submodules.
   III) Derive codes from the maximal submodules and then determine the properties of some of the codes and then link these codes to designs and graphs.

4.0 Results and Discussion

4.1 The permutation representations of PSU3(4)

We consider G to be the simple linear group PSU3(4) denoted in the ATLAS [10] over F2. This group has order 62,400. There are four primitive permutation representations of degrees 65, 208, 416 and 1600 respectively (see [10]).Using Meat Axe and Magma, we determine the irreducible constituents of the primitive 2- modular permutation representation and from these we determine the dimensions and constituents of all submodules of each of the subspaces.

Maximal Subgroups Specifications

Table1: Maximal subgroups

Order	Degree	Structure	G.2	G.4	Character	Abstract	Unitary
960	65	2^{2+4}:15	$:2^{2+4}:(3\times D_{10})$	$:2^{2+4}:(3\times D_{10}).2$	1a+64a	$N(2A^2)$	Isotropic point
300	208	$5\times A_5$	$:D_{10}\times A_5$	$:(D_{10}\times A_5).2$	1a+39ab+64a+65a	N(5ABCD)	Non-isotropic point
150	416	$5^2:S_3$	$5^2:D_{12}$	$: (4\times S_3)$	1a+39ab+52abcd+64a+65a	$N(5^2)$	Base
339	1600	13:3	13:6	:13×12	-	N(13ABCD)	$U_1(64)$

We summarize the information obtained for the group and use notations for the objects which are permuted in each of its primitive permutation representations.

4.2 The 2-Modular representations of U3(4)

Each conjugacy class of maximal subgroups of $U_3(4)$generates a permutation module over F2. We consider these F2-modules, and a chain of all their invariant maximal submodules under the action of $U_3(4)$. Each maximal submodule constitutes in turn the binary code that is invariant under $U_3(4)$. After eliminating isomorphic copies, we obtain a lattice of submodules. In this way, we classify and enumerate all submodules, hence codes invariant under $U_3(4)$. Taking the submodules as the working modules, its corresponding maximal submodules are found recursively. The recursion terminates as soon as we reach an irreducible maximal submodule or a maximal submodule of dimension 1. In doing so we determine all codes associated with the permutation module of a given dimension and invariant under the group.

The sections that follow present the calculations on these modules. The vectors in each submodule form a code, over F2, whose length is the dimension of the permutation module and whose dimension is the dimension of the submodule.

4.3 The representation of degree 65

The permutation module splits into two absolutely irreducible constituents of dimensions 1 and 64 with multiplicities 2 and 1. There are only two irreducible maximal submodules of dimension 1 and 64.

Theorem 1: (i) $C_{65,1}$ and $C_{65,2}$ are binary codes with parameters $[65,1,65]_2$ and $[65,64,2]_2$ respectively.

(ii) $C^{\perp}_{65,1} = C_{65,2}$ and $C^{\perp}_{65,2} = C_{65,1}$

(iii) $C_{65,1}$ is a cyclic, maximum distance separable, equidistant and perfect code

(iv) $C_{65,2}$ is a cyclic, maximum distance separable, even and projective code.

(v) $F_2^{65} = C_{65,1} \oplus C_{65,2}$

Proof: (i), (ii), (iii) and (iv) are deduced by Magma.

Binary Codes from Degree 65 and their properties

Binary code	**n k d**	**Properties**							
		cyclic	**Maximumdistance separable**	**equidistant**	**even**	**Projective**	**perfect**	**Dual**	**Hull**
$C_{65,1}$	65,1,65	✓	✓	✓	×	×	✓	65,65,1	65,0,65
$C_{65,2}$	65,64,2	✓	✓	×	✓	✓	×	65,1,65	65,0,65

Some Designs from codes derived from degree 65 and their properties

Binary code	Design	Simple	Uniform	Linear space	Balanced	Complete	Steiner	Point & Block graphs from design
[65,1,65]	**1-(65,65,1)** with 1 block	True	True	True	True	True	True	Transitive, symmetrical and Regular
[65,64,2]	**1-(65,2,64)** with2080 blocks. **2-(65, 2, 1)** with 2080 blocks	True	True	True	True	True	False True	Transitive, symmetrical and regular.

$C_{65,1} = [65,1,65]_2$. The dual, $C^{\perp}$ is $[65, 64, 2]_2$ over F2 with 2080 words. This code is cyclic, maximum distance separable, equidistant and perfect. The code produces a 1-(65,65,1) design with 1 blocks, 2-(65,65,1) design with 1 blocks, 3-(65,65,1) design with 1 blocks etc .Some properties of the design and incidence structures are simple, trivial, uniform, nearly linear space, linear space and balanced, complete and steiner. The graphs constructed from this design are the Incidence graph, Point graph and the Block graph. The point and Block graphs are symmetric, transitive and regular.

$C_{65,2} = [65,64,2]_2$. The dual, $C^{\perp}$ is $[65, 1, 65]_2$ over F2 with 1 word. This code is cyclic, maximum distance separable, even and projective. The code produces a 1-(65, 2, 64) design with 2080 blocks, 2-(65, 2, 1) design with 2080 blocks .Some properties of the designs and incidence structures are simple, trivial, uniform, nearly linear space, linear space and complete. 1-(65, 2, 64) design is balanced -64,Design-64 and not steiner. 2-(65, 2, 1) design is balanced-1,design-1 and is steiner.

The graphs constructed from these designs are the Incidence graph, Point graph and the Block graph. The Incidence graphs for both designs are edge transitive. The point graphs for both designs are transitive; edge and vertex transitive. They are symmetric, distance transitive and distance regular. For the Block graphs, they are transitive, vertex transitive.

(iv) Magma shows that the dimension of hull ($C_{65,1}$) and hull($C_{65,2}$) is zero respectively. Therefore, $C_{65,1}$ and $C_{65,2}$ are subspaces of F_2^{65} such that $\dim(C_{65,1} + C_{65,2}) = 1 + 64 - 0 = 65$. This implies the assertion. Magma also shows that binary codes obtained from these modules are full space F_2^{65}.

4.4 The representation of degree 208

The permutation module splits into irreducible constituents of dimensions 192 and 16 with multiplicities [5, 1, 3, 4, 2, 2, 1, 1, 2, 4, 3, 1]. There are only two irreducible maximal submodules of dimension 1 and 16. These submodules are absolutely irreducible .By recursively determining a chain of maximal submodules of the permutation module, we find that the permutation module has three maximal submodules of dimension 144,192 and 207.From the 144-dimensional submodule we get two non-isomorphic maximal submodules of dimension 128 and 143 respectively. From the 192-dimensional submodule we get two non-isomorphic maximal submodules of dimension 128 and 191 respectively. From the 144-dimensional submodule we get two non-isomorphic maximal submodules of dimension 143 and 191 respectively. Continuing recursively in this manner, we get 33 non-isomorphic submodules of dimension 114,192,207,128,143,191,127,155,91,154,79,90,142,153,67,78,89,130,141,55,66,77,118,129,54,65,117,53,81,17,80,16,64.

Theorem 2: (i) $C_{208,1}$ and $C_{208,2}$ and $C_{208,3}$ are binary codes with parameters $[208,16,72]_2$, $[208,17,72]_2$ and [208,1,208] respectively. Other 31codes are (n,k) codes.

(ii) $C^{\perp}_{208,1} = C_{208,2}$ and $C^{\perp}_{208,2} = C_{208,1}$

(iii) $C_{208,1}$ is a self orthogonal, even, doubly even and projective code.

(iv) $C_{208,2}$ is a self orthogonal, equidistant, even, doubly even and projective code.

(v) $C_{208,3}$ is a self orthogonal, Perfect, even, doubly even and cyclic code.

(vi) $Hull(C_{208,2}) = C_{208,2}$; $Hull(C_{208,1}) = C_{208,1}$; $Hull(C_{208,3}) = C_{208,3}$

Proof: (i), (ii), (iii), (iv) and (v) are deduced by Magma.

Binary Codes from Degree 208 and their properties

Binary code(c)	n k d		PROPERTIES							
		self - orthogonal	even	doubly even	projective	equidistant	Cyclic	Perfect	Dual(c)	Hull(c)
30. $C_{208,1}$	208 17 72	✓	✓	✓	✓	✓	×	×	[208,17,72]	[208,17,72]
32. $C_{208,2}$	208 16 72	✓	✓	✓	✓	×	×	×	[208,16,72]	[208,16,72]
34. $C_{208,3}$	208,1,208	✓	✓	✓	×	×	✓	✓	[208,1,208]	[208,1,208]
1.	[208,144]	×	×	×	✓		-	-	[208,64]	[208,0]
2.	[208,192]	×	×	×	✓		-	-	[208,16]	[208,16]
3.	[208,207]	×	✓	×	✓		-	-	[208,1]	[208,1]
4.	[208,128]	×	×	×	✓		-	-	[208,80]	[208,16]
5.	[208,143]	×	✓	×	✓		-	-	[208,65]	[208,1]
6.	[208,191]	×	✓	×	✓		-	-	[208,17]	[208,17]
7.	[208,127]	×	✓	×	✓		-	-	[208,81]	[208,17]
8.	[208,155]	×	✓	×	✓		-	-	[208,53]	[208,53]
9.	[208,91]	×	✓	×	✓		-	-	[208,117]	[208,53]
10.	[208,154]	×	✓	×	✓		-	-	[208,54]	[208,54]
11.	[208,79]	×	✓	×	✓		-	-	[208,129]	[208,65]
12.	[208,90]	×	✓	×	✓		-	-	[208,118]	[208,54]
13.	[208,142]	×	✓	×	✓		-	-	[208,66]	[208,66]
14.	[208,153]	×	✓	×	✓		-	-	[208,55]	[208,53]
15.	[208,67]	×	✓	×	✓		-	-	[208,141]	[208,65]
16.	[208,78]	×	✓	×	✓		-	-	[208,130]	[208,66]

17.	[208,89]	×	✓	×	✓				[208,119]	[208,53]
18.	[208,130]	×	✓	×	✓				[208,78]	[208,66]
19.	[208,141]	×	✓	×	✓				[208,67]	[208,65]
20.	[208,55]	×	✓	×	✓				[208,153]	[208,53]
21.	[208,66]	×	✓	×	✓				[208,142]	[208,66]
22.	[208,77]	×	✓	×	✓				[208,131]	[208,65]
23.	[208,118]	×	✓	×	✓				[208,90]	[208,54]
24.	[208,129]	×	✓	×	✓				[208,79]	[208,65]
25.	[208,54]	✓	✓	×	✓				[208,154]	[208,54]
26.	[208,65]	✓	✓	✓	✓				[208,143]	[208,65]
27.	[208,117]	×	✓	×	✓				[208,91]	[208,53]
28.	[208,53]	✓	✓	✓	✓				[208,155]	[208,53]
29.	[208,81]	×	✓	×	✓				[208,127]	[208,17]
31.	[208,80]	×	✓	×	✓				[208,128]	[208,16]
33.	[208,64]	×	✓	×	✓				[208,144]	[208,0]

Some Designs from codes derived from degree 208 and their properties

Binary code	Design	Simple	Uniform	Balanced	Steiner	Point & Block graphs from design
[208 17 72]	1-[208,72,144] with 416 blocks	True	True	True	False	Transitive, symmetrical and Regular
[208 16 72]	1-[208,72,144] with 416 blocks	True	True	True	False	Transitive, symmetrical and Regular.
[208 1 208]	1-[208, 208, 1] with 1 blocks				True	Transitive, symmetrical and Regular.

5.0 Conclusion

We constructed and studied the binary codes obtained from all the permutation representations of the group PSU3(4) of degrees 65 and 208 and proved that the codes are binary and those of degree 65 are full space. All the codes of degree 208 are not self dual, all are projective except the code $[208,1,208]_2$ which is perfect. [65,1,65] from degree 65 is also perfect.(Perfect codes have had a wide application in correcting many errors because has maximum minimum distance). The point and Block graphs obtained from some of the designs from the codes are transitive, symmetrical and regular. Our construction is based on the computer program magma. Using this method, we can construct and examine designs and codes from any finite primitive permutation groups.

Appendix

Magma version 22-8(Student) June 2017 was used . / /The program, where G = PSU(3,4) and m is one of the maximal subgroups

```
G<x,y>:=PermutationGroup<65| \[
2,1,5,7,3,10,4,12,13,6,16,8,9,20,21,11,24,25,27,14,15,31,32,17,18,
35,19,37,38,40,22,23,44,42,26,47,28,29,51,30,43,34,41,33,55,52,36,57,58,59,
39,46,62,60,45,61,48,49,50,54,56,53,64,63,65]
,\[
3,4,6,8,9,1,11,2,14,15,17,18,19,5,22,23,7,26,28,29,30,10,33,24,34,
12,36,13,39,41,42,43,16,45,46,48,49,50,20,52,21,53,54,44,25,56,40,27,57,60,
61,47,31,32,63,35,37,51,64,38,58,59,65,62,55]
>;
print "Group G is U3(4) < Sym(65)";

G<x,y>:=PermutationGroup<208| \[
1,2,4,3,6,5,9,10,7,8,14,15,17,11,12,21,13,23,24,26,16,29,18,19,33,
```

```
20,35,36,22,39,40,42,25,45,27,28,49,50,30,31,54,32,43,46,34,44,47,59,37,38,
57,61,62,41,65,67,51,69,48,70,52,53,73,74,55,75,56,77,58,60,80,81,63,64,66,
86,68,88,83,71,72,91,79,93,95,76,98,78,101,102,82,92,84,106,85,108,109,87,112,113,
89,90,117,118,120,94,123,96,97,127,128,99,100,131,132,134,103,104,138,105,140,130,107,143,125,
126,110,111,146,122,114,115,150,116,151,136,137,119,141,121,139,156,124,158,149,129,147,161,145,133,
135,166,163,159,155,142,169,144,154,171,148,173,153,174,175,152,178,168,157,181,160,183,162,164,165,
186,187,167,190,191,170,182,172,192,196,176,177,199,193,179,180,184,189,198,202,185,197,194,188,200,
205,195,207,206,201,204,203,208]
,\[
2,3,1,5,7,8,4,11,12,13,6,16,18,19,20,9,22,10,25,27,28,30,31,32,14,
34,15,37,38,17,41,43,44,46,47,48,21,51,52,53,23,55,24,56,57,26,58,60,39,61,
29,49,63,64,66,33,68,35,54,36,71,72,40,59,69,42,76,45,78,79,50,82,83,84,85,
80,87,65,89,67,90,62,92,94,96,97,99,100,70,103,104,73,105,74,107,75,110,111,77,114,
115,116,81,119,121,122,124,125,126,86,129,130,108,88,133,135,136,137,91,139,93,141,142,95,113,
140,144,145,98,147,148,149,101,150,102,152,153,154,155,109,106,157,158,159,160,161,112,162,163,164,
165,117,118,167,120,168,123,170,127,128,172,131,132,134,176,177,138,179,180,143,182,146,184,185,186,
151,188,189,156,192,183,193,194,195,197,198,196,166,200,201,191,169,171,181,173,203,174,175,204,178,
206,205,187,207,208,190,199,202]
>;
print "Group G is U3(4) < Sym(208)";

a1,a2,a3:=CosetAction(G,G);
g1:=PermutationModule(G,GF(2));
IsIrreducible(g1);
ConstituentsWithMultiplicities (g1);
m1:=MaximalSubmodules(g1);m1;
c1:=LinearCode(Morphism(m1[1],g1));
Length(c1 );
Dimension(c1);
minwt:=MinimumWeight(c1);
minwt;
wds := Words(c1, minwt);
A:=Hull(c1);
Dimension(A);
minwt:=MinimumWeight(A);
minwt;
A:=Dual(c1);
Dimension(A);
minwt:=MinimumWeight(A);
minwt;
D := Design< 1, Length(c1) | wds >;
D;
#G;
#AutomorphismGroup(c11);
IsEven(c11);
IsCyclic(c1);
IsSelfDual(c1);
IsSelfOrthogonal(c1);
IsPerfect(c1);
IsDoublyEven(c1);
IsProjective(c1);
IsSimple(D) ;
IsTrivial(D) ;
IsSelfDual(D) ;
IsUniform(D) ;
IsLinearSpace(D) ;
IsBalanced(D, 1) ;
IsComplete(D) ;
IsSymmetric(D) ;
IsSteiner(D, 1) ;
K:=IncidenceGraph(D) ;
L:=PointGraph(D) ;
M:=BlockGraph(D) ;
```

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Linear Codes Obtained from the Projective Symplectic group$PsP(8,2)$.

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Abstract
We discuss some binary codes constructed from the primitive permutation representation of degree 120 from the Projective Symplectic group $PsP(8,2)$. Some of these codes have interesting properties. We establish some properties of these codes and nature of the codewords.

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Keywords: *Code, Design, Projective Symplectic Group, Self- Orthogonal Codes, Cyclic Code, Block Code, Autormorphism Group.*

1.0 Introduction

The knowledge of linear codes with special properties and the corresponding designs and graphs if they exist is an interesting topic in coding theory and combinatorics. Based on the description of the primitive representation of degree 120 of the simple symplectic group S_8 (2) and on a result of [1], in this paper we determine and discuss codes, designs and graphs associated to this representation. We examine the properties of the codes and use the knowledge to gain some insight into the associated designs and graphs.

The paper is arranged as follows: - section one covers a brief preview of past related work, section two outlines our terminology and some background, section three gives some preliminary result that will be used in the sequel, section four gives the results obtained, section five the conclusion and finally the references.

In [2, 3], Key and Moori considered the primitive actions of the Janko groups $J1$ and $J2$ and constructed designs, codes and graphs with $J1$ and $J2$ as a group of automorphisms. Together with Rodrigues, they extended the results of [1] by applying the same method to the groups $PSpn(q)$, $A6 \cong PSL2(9)$ and $A9$ in [4]. Their aim was to construct designs $\boldsymbol{D}$ from the action of a group G such that $Aut(\boldsymbol{D})$ and $Aut(G)$ have no containment relationship. In [5], the authors considered the design $\boldsymbol{D}$ and binary code $\boldsymbol{C}$ constructed from the action of the McLaughlin group on 275 points and proved that $Aut(\boldsymbol{C}) = Aut(\boldsymbol{D}) = McL{:}2$. Also, they examined some designs and their binary codes constructed from the primitive permutation representation of degree 2300 of the sporadic simple group $Co2$ [6] . Motivated by the method used in [1,2] , M . R . Darafsheh et al . considered all of the primitive actions of the groups $PSL2(q)$, $q = 11$, 13 , 16 , 17 , 19 and 23 and found the parameters of all the designs and determined their automorphism groups [7] . These results were extended in [8] to the groups $PSL2(q)$, $q = 8$, 25 , 27 , 29 , 31 and 32 and in [9] to the groups $PSL2(q)$, $q = 37$, 41 , 43 , 47 and 49 . Therefore, the authors completed the construction of 1-designs using the primitive actions of the groups $PSL2(q)$, q a prime power less than 50 . Moreover, a certain 1−design $\boldsymbol{D}$ from the group $PSL2(q)$, q a power of 2 , are found such that $Aut(\boldsymbol{D}) \cong Sq+1$ [10] . In [11] following, M . R . Darafsheh et al . constructed the binary codes for all of the designs obtained from the groups $PSL2(8)$ and $PSL2(9)$ and found the parameters and determined their automorphism groups. They extended these results to the groups $PSL2(11)$ and $PSL2(13)$ in [12] and [13] , respectively. In [14] self-orthogonal designs and self-orthogonal codes from the primitive representations of the

projective symplectic groups $S_4(3) and S_4(4)$ were determined. It was found that some of the codes were optimal or near optimal for the given length and dimension, and the dual codes of some designs and those of some complimentary designs admit majority logic decoding [14]. In [15] non-trivial binary codes and their associated designs from the primitive 2-modular permutation representations of the projective special symplectic group $S_6(2)$ were determined. The weight structure of the codes, their automorphism groups and the submodule lattice of the permutation modules determined. In [16] all the binary codes constructed from the primitive permutation representations of the group $PSU_2(16)$ of degrees 68 and 136 were examined. It was shown that the groups $PSU_2(16)$:4 and S17 are full automorphism groups of the constructed binary codes.With the completion of the classification of finite simple groups in 1982 by Gorenstein, it was found that the classical groups make up more than half of the finite simple groups [16]. Using various methods, the knowledge of the codes determined from these groups, their special properties and the corresponding designs and graphs is an interesting topic in combinatorics and coding theory, which greatly aids in understanding the internal structures of the respective group. In this paper, we determine binary codes obtained from the projective symplectic group $S_8(2)$, their properties and the corresponding design and graphs for the primitive permutation representation of degree 120.

1.1 Background and notation

Our notation will be standard and it is as in [17], [18] and ATLAS [19]. For the structure of groups and their maximal subgroups, we follow the ATLAS notation. The basic structure in which essentially all coding work takes place is that of a finite dimension vector space over a finite field. Let F_q be the finite field F with q elements, q a power of a prime, which is unique up to isomorphism. Let F_q^n denote the vector space of dimension n over F_q, realized as the set of n- tuples over F_q, which is also unique up to isomorphism. An (n, M, d, q) code C is a subset of F_q^n for which $M = |C|$ and $d = \min\{ d(x,y) | x, y \in C, \ x \neq y \}$ [5].A q-ary linear code of length n is a subspace C of the vector space F_q^n of ordered n-tuples of elements of the field F_q of q elements. If all the codewords are sequences of the same length n, the C is called a block code of length n [1]. The (Hamming) weight $w(x)$ of an element $x \in F_q^n$ is the number of non-zero co – ordinate positions of x and the (Hamming) distance $d(x,y)$ between elements x and y of F_q^n is the number of coordinate places in which they differ, $d(x,y) = w(x-y)$ [2].A binary code C is doubly even if all the codewords of C have weight divisible by four. The minimum distance of a linear code C is the minimum weight of the code. In general, a code that has minimum distance d can be used to either detect up to d -1 errors or correct up to $[\frac{d-1}{2}]$ errors [16]. The dual code or orthogonal code of C denoted by $C^{\perp}$ is the orthogonal under the standard inner product. A code C is self- orthogonal if $C \subseteq C^{\perp}$ and self-dual if $C = C^{\perp}$. The hull of a code C is $C \cap C^{\perp}$.Two linear codes are isomorphic if they can be obtained from one another by permuting the coordinate positions. An automorphism of a code is any permutation of the coordinate positions that maps codewords to codewords. The binary field $F_2 = GF(2)$ plays an important role in coding theory and is widely used in digital computers and digital data transmission (or storage) systems.

Our notation for designs will be standard. An incidence structure D=(P,B,I), with point set P, block set B and incidence I is a $t-(v,k,\lambda)$ design, if $|P| = v$, every block $B \in$B is incident with precisely k points, and every t distinct poins are together incident with precisely λblocks. Let $S = \{1, 2, \ldots \ldots, v\}$, a collection D of distinct $k-element$subsets of S is called a $t-(v,k,\lambda)$ design if $0 < t \leq k < v$, $\lambda \geq 0$ and every $t-element$ subset of S is contained in exactly λ of the sets in D [1]. The sets of D are called blocks, the number of blocks in D is denoted by b. The set S is called

the base set. If D is a (v, k, λ) design, the binary $b \times v$ matrix $A = (a_{ij}) = \begin{cases} 1 & if the i^{th} block contains j \\ 0 & otherwise \end{cases}$ is called the incidence matrix of the design [2]. The code C_F of the design D over the finite field F is the space spanned by the incidence vectors of the blocks over F [3]. Weight enumeration of codes is important in finding designs among the codes. Any perfect code can be associated with a t – design.

Terminology for graphsis standard [17, 18, 19]. A graph $\Gamma = (V, E)$ consists of two components: - the finite set of vertices V, also called points or nodes, and the finite set of edges E, also called lines or arcs, connecting pair of vertices. The degree or valence of a vertex is the number of edges connected with it. A graph is regularif all the vertices have the same valency; a regular graph is strongly regular of type (n, a, c, d) if it has n vertices, valency a, and if any two adjacent vertices are together adjacent to c vertices, while any two non-adjacent vertices are together adjacent to d vertices [2]. The adjacency matrix $A(\Gamma)$ of a graph Γ is the $n \times n$ matrix $A(\Gamma) = \begin{cases} 1 & if v_i and v_j are adjacent \\ 0 & otherwise \end{cases}$ for $v_i and v_j \in V$. An incidence matrix $I(\Gamma)$of $\Gamma$is the $n \times m$ matrix $I(\Gamma) = \begin{cases} 1 & if vertex v_i is incident to edge e_j \\ 0 & otherwise \end{cases}$ for $v_i \in V and e_j \in E$. The notion of group actions on graphs has many applications to constructions of combinatorial design which are important in error correcting codes and cryptography. The adjacency matrix of a graph can be interpreted as the incidence matrix of a design or as a generator matrix of a binary code [2].

2.0 Preliminaries

The linear, unitary, symplectic and orthogonal groups generalize the familiar classical groups, whose description involves heavy use of the properties of finite fields. The general linear group $GL_n(q)$ is made up of all the $n \times n$ matrices with entries in F_q that have non-zero determinant. $GL_n(q)$ is the group of all linear automorphisms of an n dimensional vector space over F_q. The special linear group $SL_n(q)$ is the subgroup of all $n \times n$ matrices with determinant 1. Let V be a vector space overF_q. A function $f(x, y)$ defined $\forall x, y \in V$ and taking values in F_q which satisfies:

i) $f(\alpha_1 x_1 + \alpha_2 x_2, y) = \alpha_1 f(x_1, y) + \alpha_2 f(x_2, y)$
ii) $f(y, x) = -f(x, y)$
iii) $f(x, x) = 0$

Is called an alternating bilinear form or symplectic form [1]. The kernel of such a form is the subspace of x such that $f(x, y) = 0 \; \forall y$. The nullity and rank of f are the dimension and codimension of its kernel. A form is called nonsingular if its nullity is zero. The rank of a symplectic form is necessarily an even number.

For an even number $n = 2m$, the symplectic group $Sp_n(q)$ is defined as the group of all elements of $GL_n(q)$ that preserve a nonsingular form $f(x, y)$ [1]. Any such matrix has determinant 1 so that the general and the special symplectic groups coincide.

Let $J = \begin{pmatrix} 0 & I_n \\ -I_n & 0 \end{pmatrix}$. The symplectic group of rank n over F is defined to be; $Sp_n(q) = \{g \in M_{2n}(F) : g^t J g = J\}$ [12]. It is evident that $Sp_n(q)$ is a subgroup $GL_{2n}(q)$. If the bilinear form is skew symmetric and non-degenerate, then $\dim V$ must be even, since the matrix of the bilinear form relative to any basis of V is skew symmetric and has a non-zero determinant.

Our results for the binary codes are based on the following standard construction.

3.0 Result 3.1

Using a chain of maximal submodules of a permutation module induced by the action of the group G on various objects, we construct linear binary codes invariant under G [14]. This construction method requires that we decompose the permutation module into all its submodules. This results in G- invariant codes.

3.1 Binary codes from PsP_8 (2)

Using Magma [20], PsP_8 (2) has seven distinct primitive representations of degree 120, 136, 240, 255, 272, 2295 and 5355. For any permutation representations of degree n, we denote the constructed codes by $C_{n,1}, C_{n,2}, \ldots, C_{n,r}$ if r codes are obtained and by C_n if we only have one code up to isomorphism.

4.0 The representation of degree 120.

Using Result 3.1, nine codes $\mathbf{C_{120,1}}, \mathbf{C_{120,2}}, \ldots, \mathbf{C_{120,9}}$ are obtained from the permutation representations of degree 120. Their respective parameters are listed in table 1.

Code $C_{n,r}$	Parameters	Dual $C_{n,r}$	Hull $C_{n,r}$	Self-Dual	Self-Orthogonal
$C_{120,1}$	[120, 119, 2]	[120, 1, 120]	[120, 1, 120]	False	False
$C_{120,2}$	[120, 111, 4]	[120, 9, 56]	[120, 9, 56]	False	False
$C_{120,3}$	[120, 85, 8]	[120,35, 24]	[120, 35, 24]	False	False
$C_{120,4}$	[120, 84, 8]	[120, 36, 24]	[120, 36, 24]	False	False
$C_{120,5}$	[120, 36, 24]	[120, 84, 8]	[120, 36, 24]	False	True
$C_{120,6}$	[120, 35, 24]	[120, 85, 8]	[120, 35, 24]	False	True
$C_{120,7}$	[120, 9, 56]	[120, 111, 4]	[120, 9, 56]	False	True
$C_{120,8}$	[120, 1, 120]	[120, 119, 2]	[120, 1, 120]	False	True
$C_{120,9}$	[120,0,120]	[120, 119, 2]	[120, 0, 120]	False	True

Table 1

Theorem 4.1

i) $C_{120,1}$ is cyclic and nearly perfect.
ii) $C_{120,1}, C_{120,2}, C_{120,3}, C_{120,4}$ are even and projective codes
iii) $C_{120,5}, C_{120,6}, C_{120,7}$ are self-orthogonal, even, doubly even and projective codes.
iv) $C_{120,8}$ is a cyclic, self-orthogonal, perfect, even and doubly even code.

Proof

i) to iv) are deduced by Magma.

Theorem 4.2

i) $C_{120,1}^{\perp} = C_{120,8}$
ii) $C_{120,2}^{\perp} = C_{120,7}$
iii) $C_{120,3}^{\perp} = C_{120,6}$
iv) $C_{120,4}^{\perp} = C_{120,5}$

Proof

The above are all deduced by Magma.

Computations with Magma show that: -

i) the code $C_{120,1}$ generates a $1-(120,2,119)$ complete balanced design with 7140 blocks and a $2-(120,2,1)$ Steiner design with 7140 blocks.

ii) The code $C_{120,2}$ generates a $1-(120,4,\ 1071)$ design with 32130 blocks and a $2-(120,4,27)$ design with 32130 blocks.

iii) The code $C_{120,4}$ generates a $1-(120,8,\ 765)$ design with 11475 blocks whose point graph is transitive, symmetric and primitive and a block graph that is transitive and primitive. The code $C_{120,4}$ also generates a $2-(120,8,\ 45)$ design with 32130 blocks, whose point graph is transitive, primitive and symmetric while the block graph is transitive and primitive.

Theorem 4.3

i) The dual of $C_{120,1}$ is equal to it's hull.

ii) The dual of $C_{120,2}$ is equal to it's hull.

iii) The dual of $C_{120,3}$ is equal to it's hull.

iv) The dual of $C_{120,4}$ is equal to it's hull.

Proof

The above results are deduced by Magma.

5.0 Conclusion

We determined and studied the binary codes obtained from the primitive representation of degree 120 of the group $S_8(2)$ and proved that there are no self-dual codes. Our construction method is based on the result of [1]. Generally using this method and appropriate computer software, we construct and examine codes, designs and graphs from any finite primitive permutation group.

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Binary Linear Codes from the Group A_5

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Abstract
We examine all of the binary codes constructed from the primitivepermutation representations of the group A_5 of degrees 5, 6 and 10 using modular representation method ,determine the properties of codes obtained and establish the relationship of these codes with some designs and graphs. We use Magma and meat axe softwares to determine the irreducibility of the maximal modules. We develop algorithms that determine these codes and add the algorithms to the Magma software. These codes will be used in communication channels for error detection and error correction.

Mathematics Subject Classification: 05E15, 05E20, 05B05.

Key Words: *Binary Codes, Combinatorics, Designs and Graphs, Modules*

1.0 Introduction

In a modern society, exchange and storage of information in an efficient and reliable manner is of fundamental importance. Any communication may be affected by noise. In order to detect and correct errors that occur, the information is represented in digital form. The reliability of a communication system may depend on error-correcting codes and the decoding algorithm being used. Coding theory emerged following the publication of Shannon's seminal 1948 paper, "A mathematical theory of communication,"[2]. Coding theory deals with methods of constructing and analyzing error-correcting codes and decoding them in an efficient manner.

Error-correcting codes that have large automorphism groups whose properties are extensively studied can be useful in applications as the group can help in determining the code's properties, and can be useful in decoding algorithms. Primitive representations of the simple Janko groups J_1 and J_2 are considered in [1]. For each group, using Magma, they constructed designs and graphs that have the group acting primitively on points as automorphism group, and, for a selection of small primes, codes over that prime field derived from the designs or graphs that also have the group acting as automorphism group. In each case they found codes with good parameters. For each code, the code automorphism group at least contains the associated Janko group, but in fact they did not find any in which it was bigger

All non-trivial binary linear codes from the 2- modular representations of $L_3(4)$ were constructed using a chain of maximal submodules of a permutation module induced by the action of $L_3(4)$ on objects like lines, hyperovals, baer subplanes and unitals of $PG_2(4)$. The geometry of these objects was used to gain some insight into the nature of possible codewords, particularly those of minimum weight. In addition, several optimal codes and self – dual codes invariant under $L_3(4)$ were obtained [4]. For proper decoding, codes need some structure and so codes constructed from these mathematical objects are important as the properties of the underlying structure determine the properties of the codes. The properties of each code depend solely on the group.

2.0 Literature

This section brings together a selection of mostly standard results from the theory of groups, representations, modules, codes, designs and graphs which will be required in subsequent sections..

2.1 Simple Groups

A simple group is a group G that does not have any proper normal subgroups except for the trivial group and G itself. All finite simple groups have been classified and the classification theorem (CFSG) precisely states that every finite simple group is isomorphic to one of the following groups.

1. A cyclic group of prime order Z_p
2. An alternating group A_n for $n \geq 5$
3. One of the finite groups of the lie type (classical or exceptional)
4. One of the 26 sporadic simple groups.

2.2 Alternating group (A_n)

Let G be the set $\{1,2,...,n\}$, then the symmetric group of degree n is the group of all the permutations of G under the binary operation of composition of maps. It is denoted by S_n and has order $n!$

The subgroup of S_n consisting of all the even permutations is called the alternating group. The group is denoted by A_n. The order of A_n is $\frac{n!}{2}$.

2.3 Representation

Let G be a finite group and V be a vector space over a field F. A representation of G with a representation space V is a homomorphism T: $G \rightarrow GL_F(V)$. If V is a vector space over F, then T will sometimes be called an F- representation of G. If T is 1-1, then the representation will be called faithful. If T is a representation of G on V, then the degree of T, deg T is dim V. If G is a group and $\check{T}$ is a homomorphism $\check{T}$: $G \rightarrow GL(n,F)$. Then $\check{T}$ is said to be a matrix representation afforded by T. Let G be any finite group, G = {g_1= 1, g_2,---,g_n}. Choose a vector space V of dimension n, and basis {v_1,v_2,---,v_n}. If $g_i.g_j = g_k$, define $T(g_i)v_j = v_k$. Then T is a representation of G on V called the regular representation. Let G be a group of permutations of S = { 1,2, ---,n}. Pick an ordered basis { v_1,v_2,…,v_n} for an n- dimensional vector space V over any field F. Define $T(g)v_i = v_{g(i)}$. Then T is a representation of G on V called the permutation representation. If T is a representation of G on V, then a subspace W of V is called T- invariant (stable) iff T(g)w ϵ W for all gϵG and wϵW. If {0} and V are the only T-invariant subspaces of V, then T is called irreducible (otherwise T is reducible). Let f: $G \rightarrow GL(n,F)$ be a representation of G over the field F. The function $\chi : G \rightarrow F$ defined by $\chi(g)$ = trace (f (g)) is called the character of f. Let G be a group. Let f: $G \rightarrow GL(n,F)$ be a homomorphism. Then we say that f is a matrix representation of G of degree n (or dimension n), over the field F. Let G be a finite group. Let T be a representation of G on V over a field F whose characteristic is 0 or a prime which does not divide $|G|$. If T is reducible, then T is completely reducible. An irreducible representation is called primitive if it is not induced from any proper subgroup.

2.4 Modules and submodules

A module is a vector space V over a ring R. The module V is called R-module. Let M and N be R-modules. A module homomorphism from M to N is a map f: M → N such that f(rx + sy) = rf(x) + sf(y) ∀ x,yϵM and r,sϵR. The kernel of a homomorphism f is ker f = {xϵM: f(x) = 0}, and the image of f is {f(x): xϵM}. It follows from the definition that the kernel of f is a submodule of M, and the image of f is a submodule of N. A module M is irreducible or simple if the only submodules are M and 0.

If not, M is reducible. M is decomposable if there exists nonzero submodules M_1 and M_2 such that $M = M_1 \oplus M_2$, otherwise it is indecomposable.

2.5 Codes

If F is a field, then F^n is a vector space (F^n is the set of all n-tuples or vectors with entries from F). A set C of these vectors is called a linear code if and only if it is a subspace of F^n.

Codes with 2- digits {0,1} are called binary codes. Those vectors which belong to the code are called codewords. A k x n matrix G whose rows form a basis of a linear (n,k,d) code is called a generator matrix of the code. A parity check matrix of a code C is an (n-k) x n matrix H such that ker H = C. i.e $C = \{ V \in F^n / Hv = 0\}$. For any code C, the dual code $C^{\perp}$ is the orthogonal subspace under the standard product. The hull of a code over some field is the intersection $C \cap C^{\perp}$. If a linear code over the finite field F of order q is of length n, dimension k, and minimum weight d, then we write $(n,k,d)_q$ to repsent this information. If C is a codeword then the support of C, S(C), is the set of non-zero coordinate positions of C. A constant word in the code is a codeword all of whose coordinate entries are either 0 or 1. Two linear codes of the same length and over the same field are equivalent if each can be obtained from the other by permuting the coordinate positions and multiplying each coordinate position by a non-zero field element. They are isomorphic if they can be obtained from one another by permuting the coordinate positions. An automorphism of a code is any permutation of the coordinate positions that maps codewords to codewords. An automorphism thus preserves each weight class of C. A binary code with all weights divisible by 4 is said to be a doubly – even binary code. The *Hamming weight* $w(c)$ of a codeword c is the number of nonzero components in the codeword. The *Hamming distance* between two codewords $d(x; y)$ is the number of places in which the codewords x and y differ. The *minimum (Hamming) distance* of a code C is the minimum distance between any two codewords in the code. In general, a code that has minimum distance d can be used to either detect up to $d - 1$ errors or correct up to $[(d - 1)/2]$ errors.

2.6 Designs

Let $S = \{1,2, - - -, v\}$. A collection D of distinct k-element subsets of S is called a $t - (v, k, \lambda)$design if $0 < t \leq k < v,\ \lambda > 0$ and every t- element subset of S is contained in exactly λ of the sets in D.

The sets of D are called blocks, and the number of blocks in D is denoted by b. the set S is called the base set.We say that the design is symmetric if it has the same number of points and blocks

2.7 Graphs

A graph G is an ordered pair (V,E), where V is a non-empty finite set of vertices and E is a set of pairs of distinct vertices in G, called edges. A loop is an edge from a vertex to itself. A multigraph is a graph with multiple edges but no loops. If e = {u,v} is an edge of a graph G, then u and v are the end vertices of e, and we say u and v are adjacent in G. The valency of a vertex is the number of edges containing the vertex. A graph is regular if all the vertices have the same valence. A regular graph is strongly regular of type (n, k, λ, μ) if it has n vertices, valence k, and if any two adjacent vertices are together adjacent to λ vertices, while any two non-adjacent vertices are together adjacent to μ vertices. Let G be transitive on X. Then G is primitive iff each suborbital graph Γ_i (i= 1,2,3,---,r-1) is connected.

2.8 Objectives

The objectives for this study are:

(i) Construct binary linear codes from the alternating group A_5 using modular representation method.
(ii) Determine the properties of these codes
(iii) Enumerate and classify the codes.
(iv) Determine any relationship between these codes and other mathematical objects like graphs, and designs.

3.0 Methodology

In this paper, we consider the primitive representations of A_5 as described in [11]. Using Meat Axe and Magma [10], we determine the irreducible constituents of the primitive 2- modular permutation representations and from these we determine the dimensions and constituents of all submodules of each of the subspaces. In addition, we use the Atlas of Brauer Characters [3] to determine the irreducibility of the codes.

4.0 Results and Discussion

4.1 The Primitive Permutation Representations of A_5

We consider G to be A_5, the alternating group on 5 letters, i.e, the subgroup consisting of all even permutations of the symmetric group S_5, which is of order 60 and its maximal subgroups and primitive permutation representations through the coset action on these subgroups [11]. There are 3 primitive permutation representations of degrees 5, 6 and 10 respectively (see [11]).
We summarize the information obtained from the group and find notations for the objects which are permuted in each of its primitive permutation representations. We will use names for all objects in terms of their alternating notation from [11].

No.	*Max. sub.*	*Deg.*
1	A_4	5
2	D_{10}	6
3	S_3	10

Table 4.1: Maximal subgroups of A_5

4.2 The 2- Modular Representations of A_5

Each conjugacy class of maximal submodules of A_5 generates a permutation module over F_2. We shall consider these F_2 - modules, and a chain of all their invariant maximal submodules under the action of A_5. Each maximal submodule constitutes in turn the binary code that is invariant under A_5. After eliminating isomorphic copies, we obtain a lattice of submodules. In this way, we classify and enumerate all submodules, hence codes invariant under A_5. Taking the submodules as the working modules, its corresponding maximal submodules are found recursively. The recursion terminates as soon as we reach an irreducible maximal submodule or a maximal submodule of dimension 1. In so doing, we determine all codes associated with the permutation module of a given dimension and invariant under the group. Our construction is based on a method outlined in [16]. The vectors in each submodule form a code over F_2, whose length is the dimension of the permutation module and whose dimension is the dimension of the submodule.

4.3 The 5- Dimensional Representation

Using the Atlas [11], we notice that the constituents being permuted by the group are the 5 symbols (points) of the set $\Omega = \{1,2,...,5\}$. The permutation module splits into two absolutely irreducible constituents of dimensions 1 and 4 with multiplicities 1 and 1 respectively. There are only two irreducible maximal submodules of dimensions 1 and 4. In this permutation, we obtain one non-trivial submodule invariant under A_5 of dimension 4.

From the submodule described above, we derive one non-trivial code $[5, 4, 2]_2$.

Theorem 4.1

The code $C_{5,1} = [5, 4, 2]_2$ is projective, even and its dual is a $[5, 1, 5]_2$ cyclic linear code. The hull of $C_{5,1}$ is a [5, 0, 5] cyclic linear code.

Proof

It is deduced by magma.

Remark 4.2 From the code $C_{5,1} = [5, 4, 2]_2$, we obtain a 1- (5, 2, 4) design with 10 blocks which is simple, uniform with block size 2. We determine from this design a point graph that is transitive and symmetric hence primitive. We also obtain a block graph that is transitive and symmetric and therefore primitive.

4.4 The 6-Dimensional Representation

The permutation module splits into two absolutely irreducible constituents of dimension 1 and 4. There is only one irreducible maximal submodule of dimension 1. By recursively determining a chain of maximal submodules of the permutation module (see [16]), we find that the permutation module has one maximal submodule of dimension 5. From the 5-dimensional module, we obtain 1 maximal submodule of dimension 1. The permutation module has therefore just one composition series.

It is evident that the codes of this representation are the trivial codes of length 6.

4.5 The 10-Dimensional Representation

The permutation module splits into three absolutely irreducible constituents of dimension 1, 4 and 4. There are only three irreducible maximal submodules of dimensions 5, 4 and 1. These submodules are absolutely irreducible. By recursively determining a chain of maximal submodules of the permutation module (see [16]), we find that the permutation module has two maximal submodules of dimensions 6 and 9. From the 6-dimensional module, we obtain only one maximal submodule of dimension 5 which is absolutely irreducible. From the 9-dimensional module we get two maximal submodules both of dimension 5. One of these maximal submodules is isomorphic to the submodule of dimension 5 obtained earlier from the 6-dimensional maximal submodule and contain a maximal submodule of dimension 1 which is irreducible. The other 5-dimensional submodule contains two irreducible maximal submodules of dimensions 4 and 1 respectively. In all, from this permutation module, we obtain three non-trivial submodules invariant under A_5 of dimensions 9, 5 and 4. From the submodules described above we derive three non-trivial codes namely:

$[10, 9, 2]_2$, $[10, 5, 4]_2$, and $[10, 4, 4]_2$

Theorem 4.3

(i) The code $C_{10,1}$= [10, 9, 2]$_2$ is projective, even and its dual is a [10, 1, 10]$_2$ code. The hull of $C_{10,1}$ is a [10, 1, 10]$_2$ cyclic code. The code $C_{10,1} \neq C_{10,1}^{\perp}$ and thus it is not self-orthogonal.

(ii) The code $C_{10,2} = [10,5,4]_2$ is projective, even and its dual is a $[10,5,4]_2$ linear code. The hull of $C_{10,2}$ is a $[10,1,10]_2$ cyclic code.

(iii) The code $C_{10,3} = [10,4,4]_2$ is projective, even and its dual is a $[10,6,3]_2$ linear code. The hull of $C_{10,3}$ is a $[10,0,10]_2$ cyclic linear code.

Proof

(i), (ii) and (iii) are deduced by magma

Remark 4.4 From the code $C_{10,1} = [10,9,2]_2$ we obtain a $1-(10,2,9)$ design with 45 blocks. The design is simple and uniform with block size 2. From the design we obtain a point graph that is transitive and symmetric hence primitive. We also obtain a block graph that is transitive and symmetric and therefore primitive. From codes $C_{10,2}$ and $C_{10,3}$ we obtain a $1-(10,4,2)$ design with 5 blocks which is simple. From this design we obtain a point graph and a block graph that are both transitive and symmetric and thus primitive.

Appendix

Magma version V2.22-2 (Student) was used .

```
a1,a2,a3:=CosetAction(G,G);
g1:=PermutationModule(G,GF(2) ); g1;
IsIrreducible(g1);
ConstituentsWithMultiplicities (g1);
m:=MaximalSubmodules(g1);m;
c:=LinearCode(Morphism(m[1],g1));
Dimension(c);
minwt:=MinimumWeight(c);
minwt;
WeightDistribution(c);
Dual(c);
c eq Dual(c);
A:=Dual(c1);
B:=Hull(c1);
D := Design< 1, Length(c1) | wds >;
K:=IncidenceGraph(D) ;
L:=PointGraph(D) ;
M:=BlockGraph(D) ;
GENERATORS
G<x,y>:=PermutationGroup<5|\[
2,1,4,3,5]
,\[
3,2,5,4,1]
>;
print "Group G is A5 < Sym(5)";

G<x,y>:=PermutationGroup<6|\[
1,4,3,2,6,5]
,\[
2,3,1,5,6,4]
>;
print "Group G is A5 < Sym(6)";

G<x,y>:=PermutationGroup<10|\[
1,4,5,2,3,8,10,6,9,7]
,\[
2,3,1,6,8,7,4,9,5,10]
>;
print "Group G is A5 < Sym(10)";
```

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The Binary Linear Codes of Mathieu Group M_{24}

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Abstract
We use coding theory to study the internal structure of simple groups. Coding theory deals with methods of constructing and analyzing error-correcting codes. In this paper, we construct all binary linear codes from M_{24} and determine their properties. We link these codes to designs and graphs.We develop the algorithm that determine these codes and add the algorithm to the Magma software.

Mathematics Subject Classification: 05B05, 20D45, 94B05

Key words: Binary codes, designs and Modules.

1.0 Introduction
Finite simple groups have been classified as cyclic groups with prime order, alternating groups of degree at least 5, a simple group of Lie type and ,the 26 sporadic simple groups based on external structures .This classification took many years and involved many researchers. The current research is about these classified groups and their internal structure. We use coding theory to study the internal structure of simple groups. Coding theory emerged following the publication of Shannon's seminal 1948 paper [1]. Coding theory deals with methods of constructing and analyzing error-correcting codes.

In a series of 3 lectures given at the NATO Advanced Study Institute "Information Security and Related Combinatorics" held in Croatia, the author discussed two methods for constructing codes and designs for finite groups (mostly simple finite groups) [3]. The first method dealt with construction of symmetric 1-designs and binary codes obtained from the action on the maximal subgroups, of a finite group G. The second method introduces a technique from which a large number of non-symmetric 1-designs could be constructed. Using these methods they constructed codes from Janko groups, J_1 and J_2 and from the sporadic group $CO_2$of Conway.
Three methods have been used for constructing codes and designs for finite groups [3]. The first method dealt with construction of symmetric 1-designs and binary codes obtained from the action on the maximal subgroups, of a finite group G. The second method introduces a technique from which a large number of non-symmetric 1-designs could be constructed. In the third method, each primitive representation of a given permutation group G, meat-axe and magma are used to construct the associated permutation modules and subsequently a chain of its maximal submodules.
In the 19th century E. Mathieu discovered and studied five multiply transitive permutation groups. The groups are called the Mathieu groups and it turned out that all five are simple. These remarkable groups are constructed in [2], with special focus on the small Mathieu groups M_{11} andM_{12}. All maximal subgroups of M_{11} and M_{12} are described and classified. It is also shown that the other Mathieu groups are subgroups of M_{24}. Finally the simplicity of the five Mathieu groups is proved.
Though codes have been constructed from M_{24}, only small degree of 24 was considered.In this paper we are interested in constructing codes of M_{24} group using large degrees. We examine the properties of these sub modules as codes and present their weight distributions. Using Assmus-

Mattson theorem and the transitivity of the groups, we shall determine some designs or graphs that are defined by code words of several weights in the codes and we use the properties of these designs or graphs and their geometry to gain some insight into the nature of some classes of codewords, mainly those of minimum weight.

2.0 Literature Review

2.1 Introduction

In this section we discuss some of the basic concepts that are used in this proposal.

2.2 Modular Representations

Let F be a field of characteristic p and let V be an F vector space. Let G be a finite group of order n. Then we define a linear representation V of G over F as a homomorphism $\emptyset: \mathrm{G} \rightarrow \mathrm{GL(V)}$. We say that the representation is faithful if $\emptyset$ is injective. Representations are similar or equivalent if they correspond to isomorphic FG-modules. A module M is irreducible or simple if the only submodules are M and 0. If not then M is reducible. M is decomposable if there exist nonzero submodules M_1 and M_2 such that $\mathrm{M} = \mathrm{M}_1 \oplus \mathrm{M}_2$. M is completely reducible if it can be written as the direct sum of irreducible submodules.[4]

2.3 Binary Linear Codes

A binary linear (n, k) code C is a k-dimensional subspace of the n-dimensional vector space over $\mathrm{GF}(2)$. A code C of length n, dimensionk, and minimum weight d, is denoted by $[\mathrm{n}, \mathrm{k}, \mathrm{d}]$. The Hamming weight w(c) of a codeword c is the number of nonzero components in the code word. The Hamming distance between two codewords d(x; y) is the number of places in which the codewords x and y differ. The minimum (Hamming) distance of a code $C$is the minimum distance between any two codewords in the code. In general, a code that has minimum distance d can be used to either detect up to $\mathrm{d} - 1$ errors or correct up to $[(\mathrm{d} - 1)/2]$ errors. [4]

A code is called self orthogonal if $c \sqsubseteq c^{\perp}$. All the weights in a binary self orthogonal code must be even since every vector must be orthogonal to itself. A code is doubly even if all the codewords have weights divisible by 4. A code is self-dual if$c = c^{\perp}$. If c is an [n, k] code, then $c^{\perp}$is an [n, n-k] code.

2.4 Designs

An incidence structure$\mathrm{D} = (\mathrm{P}, \mathrm{B}, \mathrm{I})$, with point setP, block set B and incidence I is a $t - (v, k, \lambda)$ design, if $|P| = v$, every block $\beta \in B$ is incident with precisely k points, and every t distinct points are together incident with precisely λ blocks. A design D is symmetric if it has the same number of points and blocks. A $\mathrm{t} - (\mathrm{v}, \mathrm{k}, 1)$ design is called a Steiner System. A $2 - (\mathrm{v}, 3, 1)$ Steiner system is called a Steiner Triple System. A $\mathrm{t} - (\mathrm{v}, 2, \lambda)$ design D can be regarded as a graph with ρ as points and β as edges.[4]

3.0 Methodology

In this paper, we use the following analytical methods:

2 Generate the permutation representations of M_{24} of degree 216 from the Atlas of finite groups.

3 Use Magma software to:

IV) Determine the permutation module of the permutation representation of degree 216

V) Use permutation modules to determine dimensions of all maximal submodules of the permutation module.

VI) List all the maximal submodules of the permutation modules.

VII) Sort out the maximal submodules by removing the Isomorphic copies.

VIII) Derive codes from the maximal submodules and then determine the properties of these codes

IX) Link these codes to some designs or graphs.

4.0 Results

4.1 The 24-Dimensional Representation

We generate the permutation group M_{24} from the atlas of finite groups using a permutation representation of degree 276.The permutation module of this group is a Gmodule of dimension 276. By recursively determining a chain of maximal submodules of the permutation module we find that the permutation module has three maximal submodules of dimension 23, 12 and 1 respectively. From the $12-$dimensional maximal module we derive a linear code $C_{24,1} = [24, 12, 8]_2$. $C_{24,1} = [24, 12, 8]_2$is a self dual, self orthogonal, doubly even and projective code. This code is an extended golay code which was originally constructed using design theory. The design held by this code is S(5,8,24).

4.2 The 276-Dimensional Representation

We generate the permutation group M_{24} from the atlas of finite groups using a permutation representation of degree 276.The permutation module of this group is a Gmodule of dimension 276. By recursively determining a chain of maximal submodules of the permutation module we find that the permutation module has 26 maximal submodules after eliminating the isomorphic copies. For any permutation representation of degree n we denote the determined codes by $C_{n,1}$,$C_{n,2}$…….. $C_{n,r}$, if r codes are obtained and by $C_{n,}$ if we only have one code upto isomorphism. The codes and their properties are shown in the table 1.

Table 1: Codes and their codes

Code $C_{n,r}$	Parameters	Dual()$C_{n,r}$	Hull($C_{n,r}$)	Self Dual	Self Orthogonal
$C_{26,1}$	[276,265,3]	[276,11,128]	[276,11,128]	False	False
$C_{26,2}$	[276,275,2]	[276,1,276]	[276,1,276]	False	False
$C_{26,3}$	[276,22,7]	[276,55]	[276,55]	False	False
$C_{26,4}$	[276,254,3]	[276,22,44]	[276,22,44]	False	False
$C_{26,5}$	[276,264,4]	[276,12,44]	[276,12,44]	False	False
$C_{26,6}$	[276,210]	[276,66]	[276,66]	False	False
$C_{26,7}$	[276,220]	[276,56]	[276,56]	False	False
$C_{26,8}$	[276,253,4]	[276,23,44]	[276,23,44]	False	False
$C_{26,9}$	[276,199]	[276,77]	[276,77]	False	False
$C_{26,10}$	[276,209]	[276,67]	[276,66]	False	False
$C_{26,11}$	[76,252,4]	[276,24,23]	[276,22]	False	False
$C_{26,12}$	[276,79]	[276,197]	[276,77]	False	False
$C_{26,13}$	[276,198]	[276,78]	[276,77]	False	False
$C_{26,14}$	[276,208]	[276,68]	[276,66]	False	False
$C_{26,15}$	[276,68,23]	[276,208]	[276,66]	False	False
$C_{26,16}$	[276,78]	[276,198]	[276,77]	False	False
$C_{26,17}$	[276,197]	[276,79]	[276,77]	False	false
$C_{26,18}$	[276,24,23]	[276,252]	[276,22]	False	False
$C_{26,19}$	[276,67]	[276,209]	[276,66]	False	False
$C_{26,20}$	[276,77]	[276,199]	[276,77]	False	True
$C_{26,21}$	[276,186]	[276,90]	[276,66]	False	False
$C_{26,22}$	[276,23,44]	[276,253]	[276,22]	False	False
$C_{26,23}$	[276,66]	[276,210]	[276,66]	False	True
$C_{26,24}$	[276,22,44]	[276,254]	[276,22,44]	false	True
$C_{26,25}$	[276,55]	[276,221]	[276,55]	False	True
$C_{26,26}$	[276,11,128]	[276,265]	[276,11,128]	False	True

Theorem 1

$C_{26,1}^{\perp} = C_{26,26}$

$C_{26,3}^{\perp} = C_{26,25}$

$C_{26,4}^{\perp} = C_{26,24}$

$C_{26,6}^{\perp} = C_{26,23}$

$C_{26,8}^{\perp} = C_{26,22}$

$C_{26,9}^{\perp} = C_{26,20}$

$C_{26,10}^{\perp} = C_{26,19}$

$C_{26,11}^{\perp} = C_{26,18}$

PROOF

As shown by magma

Designs Held by Codes

No	Design	Simple	Uniform	Balanced	Complete	Symmetric	Steiner
1	1-(276,3,22)	True	True	True	No	No	No
2	2-(276,2,1)	True	True	True	True	No	True
4	1-(276,3,22)	True	True	True	No	No	No
5	1-(276,4,1617)	True	True	True	No	No	No
8	1-(276,4,462)	True	True	True	No	No	No
11	1-(276,4,462)	True	True	True	No	No	No
18	1-(276,23,2)	True	True	True	No	No	No
22	1-(276,44,44)	True	True	True	No	No	No
24	1-(276,44,44)	True	True	True	No	No	No
26	1-(276,128,352)	True	True	True	No	No	No

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Sub-Theme 6:
Agricultural Productivity and Marketing Systems through Science, Technology and Innovation

Integrated Soil Fertility Management in Vegetable Production Systems: A Potential for Improved Food Security in Kenya

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Abstract
Many countries in the sub Saharan Africa are currently facing food security problems due to poor yields resulting from unavailability of nutrients for plants growth and development. This declining soil fertility has been accelerated by the increased population pressure on land leading to over cultivation, poor plant nutrition and inappropriate soil and water conservation measures among others. The major solution to reduced fertility is the application of integrated soil fertility management practices whereby soil improvement technologies are combined with Good Agricultural Practices (GAP) to avoid land degradation which is the major cause of reduced soil fertility. In Kenya, diversification of agricultural production is an important strategy used in ensuring food security. Unfortunately priority is given to staple and commercial foods in terms of resource allocation leaving vegetables to survive on traditional systems. Further more government projects aimed at improving food security mostly support cereal production. Nutritionally vegetables provide vitamins, proteins, carbohydrates and minerals which are responsible for good health thus enabling one to participate actively in agricultural production activities. High value vegetables provide income to small scale farmers improving accessibility to inputs for production of staple food crops. Vegetable production is advantaged by having several production systems in which integrated soil fertility management practices can easily be incorporated for increased yields. This paper describes the various vegetable production systems showing how integrated soil fertility management practices have been applied for maximum production. Proper implementation of the techniques will improve soil fertility accompanied by high yields thus improving food security in the country. Trainings through demonstrations will enhance the adoption of the technologies.

Key Words: *soil fertility management; Vegetable production systems; food security*

1.0 Introduction

In Sub Saharan Africa (SSA), soil fertility depletion in smallholder is the major cause of declining per capita food production (Verde and Matusso, 2014). Currently the major challenge facing these countries is ensuring food security (Kiaya, 2014). Food security according to FAO is a situation that exists when all people at all times have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preference for an active healthy life. Recent estimates indicate that by 2020 the SSA annual cereal import will rise to more than 30 million metric tons as per capita food production continue to decline against a rapidly growing population estimated at 3% per annum (Okuthe *et al*., 2013). Western Kenya which is a high potential area is characterized by widespread failure to make sufficient soil fertility investment in low agricultural production which is threatening food security in the region (Odera*et al.,* 2001). The yield of maize is very low in some of these areas averaging at less than 1 ton\ha against a potential of 4/ha (Kisinyo *et al.,* 2015) This failure to match the supply with demand is highly attributed to soil nutrient depletion following intensified land use with improper management practices (Sanchez *et al*., 2001). The declining soil fertility in Sub Saharan Africa is mainly due to depletion of nitrogen and phosphorus which are the most limiting nutrients (Warren, 1992). Phosphorus is important for root development and is an integral part of organic acids and is involved in energy transfer, The availability of phosphorus to plants involves complex chemical

and biological processes leading to fixation (sorption) and release (desorption). Acid soils are widespread occupying 13-29% of the total land area in sub Saharan Africa are associated with aluminum, iron and manganese toxicity corresponding to phosphorus fixation (Jama *et al*, 2000). Nitrogen supports vegetative growth forming the basis for reproductive growth and final yield. Poor agronomical and land management practices often lead to leaching of nitrates beyond the root zones thus causing deficiency (Fabia *et al*., 2014).

Kenya Government programmes aimed at increasing food security have given priority to cereal crops, National Accelerated Input Access programme (2008 – 2013) and now Kenya cereal enhancement programme (KCEP) all targeted cereal production. Vegetables are important components of a healthy diet as they contain antioxidants which neutralize radicals associated with lifestyle diseases (Devasagayam *et al*., 2004; Agudo, 2005). They play a major role in food security as they are alternative staple foods like irish potatoes and pumpkins fruits, nutritionally they provide energy, proteins, vitamins and minerals in various proportions and can be utilized in several different ways depending on consumer preference. Vegetables give higher returns per unit area as compared to cereal , cabbages yield up to 29 tons/ha while maize records an average of 1.6 tons/ha (GOK, 2015) . Rapid population growth which has resulted in reduced acreage per household calls for appropriate crop and soil fertility management practices for food sufficiency at farm level. Integrated soil fertility management refers to the application of soil fertility management practices and the knowledge to adapt them to local conditions which maximize fertilizer and organic management in combination with the utilization of improved germplasm (Sanginga and Woomer, 2009 ; TSBF – CIAT,). The selected technologies utilize the locally available materials while considering the cost and environmental impact. There several vegetable systems whereby soil fertility management practices can be incorporated for improved yields. This paper looks at these systems showing how the different soil fertility management practices have been used for increased yields.

2.0 Vegetable intercropping/mix Production systems

Intercropping involves the growing of two or more crops within a bed in alternating rows across the field. The common intercrops include , maize and cowpeas, low growing vegetables in banana plantation and other fruit trees, Quick growing green leafy vegetables(heavy feeders of N e.g. cabbages and kales) between widely spaced trellised rows of garden peas. The peas are able to fix their own nitrogen, Lettuce between tomatoes. The lettuce shades out early emerging weeds and it is harvested before it competes with tomatoes. The limited arable land is efficiently utilized and this key to sustainable development in SSA Africa. Traditionally, intercropping has been practiced in vegetables giving a higher yield and income per unit area. Nilanthi *et al.,*(2015) reported that okra intercropped with onions had all growth parameters and microbial activities increased. When vegetables are intercropped with legumes, soil nitrogen is replenished through symbiotic fixation. Planting of high nitrogen fixing legumes such as pigeon peas and ground nuts can fix up to 300kgN/Ha (Natasha, 2012). Gebru *et al.,*(2015) reported higher Land equivalent ratio (LER) values of 2.06 in maize tomatoes intercrop when compared to mono crop. Similarly, Rankat*et al.,*(2008) recorded a high LER in tomatoes/ kale; tomatoes/ onions intercrops. LER is mostly used to indicate the biological efficiency and yield per unit area when comparing mono crop and intercrops. A LER of less than one implies that the intercropping was less beneficial than sole crop (Gebru *et al.,*(2015). Intercropping ensures soil coverage thus reducing the weeds thereby reducing the cost of production and increasing the yields of the two crops. Brintha and Seran (2012) reported that weed population was reduced by 82% in an onion cowpeas intercrop while the plant weight and leaf area increased. Careful handling is necessary

while performing operations on one to avoid injuries and mechanization is not possible in most cases.

2.1 Cover crops vegetable production systems

In this system crops are closely grown with the aim of protecting the soil from adverse weather conditions. The growing of cover crops in vegetable fields minimize weeds, conserve moisture, modify soil temperatures, improve soil fertility thereby increasing production per unit area. The crops should be low growing and give coverage without competing for resources with the vegetables. Non legume cover crops including oats, wheat, barley, brassicas, sudan grass andsorghum provide large amounts of biomass and penetrate compact soil extracting moisture and nutrients. Legume cover crops beans (runner and common beans), cowpeas, clover and groundnuts are able to fix nitrogen hence assist in nitrogen replenishment for vegetative growth and at the same time provide enough coverage to suppress weeds and conserve soil moisture. Cover crops have been used in controlling and plant pests and diseases. Root rots in snap beans and dry beans were generally reduced after intercropping with barley or sudan grass and the population of nematodes reduced in plots containing ryegrass as a cover crop while certain varieties of brassica cover crops containing high concentration of glucosinalates may be useful in controlling soil borne pests (Stivers *et al.,* 1997).

2.2 Mulching vegetable production system

Covering the ground with plant materials or synthetic materials to eliminate weeds, protect soil against wind or water erosion, and reduce evapotranspiration to prevent water loss. Living mulch consists of one or lower growing ground cover crops eg beans, grapes and grasses. Just as cover crops they suppress weeds, conserve soil conserve and improve soil fertility. However proper selection is necessary as they can also reduce yields due to competition for available nutrients and wat**er.** Dead mulchis composed of various plant remains which decompose forming soil organic matter. It is important in preventing direct impact of rain on soil, prevents evapotranspiration and improves soil fertility. Synthetic mulch consists of polythene paper mainly black. It suppresses weeds and conserves soil moisture. However not commonly used by small scale farmers as it is expensive and Can also create conducive environment for pests and diseases especially during the rainy season when water collects on thesurface e.g. blight in tomatoes. Mulches of plant residues have been known to improve crop yields as soil bulk density is lowered andnitrate concentration is increased through mineralization of organic matter. Well decomposed manure of crop residues release necessary nutrients and improves soil structure (Oluyede *et al*. 2007). The use of mulch is very applicable in vegetable production due to the small sized plots as opposed to large cereal farms.

2.3 Crop rotation vegetable production systems

This is a planned sequence of crops grown in different areas to avoid the same crop continuously on the same place. Generally for vegetable crops a rotation of at least 4 years is recommended. In a typical rotation legumes are often used to enrich the soil with nutrients thereby improving fertility. Crops with different nutrient requirements are alternated to allow the soil to regain the lost nutrients. Accordingly shallow rooted crops like carrots are followed by deeper rooted crops like cabbages to extract the unused nutrients. Alternating high nitrogen users with legumes replenish nitrogen through symbiotic fixation, Legumes also increase soil organic as they feed the microbes which are responsible for nitrogen mineralization. Integrating cover crops at some point in a rotation as this enhances nutrient recycling and conservation, Accordingly, Rangarajan (2012) reported an increase in topsoil depth whengreen manure crops were incorporated in a rotation.

Sesame fits well into arotation as a fallow crop as it has deep tap roots which extract moisture and nutrients A properly designed rotation controls weeds(cover crops), pests and diseases. Vegetable diseases such bacterial wilt and blight in solanaceae are often controlled through crop rotation,

2.4 Vegetable production under controlled environment

This involves production of vegetables in well designed structures where abiotic and biotic factors are regulated to improve yields. There has been an increase in demand for this technique which has been triggered by several factors including: the need for a constant supply of vegetables throughout the year; mitigation measures against climate change; improved quality as vegetables are protected against pests and natural disastrous and decrease in land size due to population pressure whichcalls for intensive cultivation under small parcels for maximum yields (Ganesan, 2004). Greenhouses are commonly used for production of tomatoes and capsicum whereby the soil is enriched with organic manure and topsoil. A single tomato plant in a greenhouse has a potential of giving 15kgs in the first cycle and 60kgs in the final cycle (Makunike, 2007). Farmers can get 10 times more yield with greenhouse production thanopen field production (Seminis – Kenya, 2007). Ramesh and Arumungan (2010) observed an increase in all growth parameters in tomatoes, chillies andeggplants under polyhouse production. In shade net houses temperature is controlled thus creating a favourable microclimate for enhanced photosynthesis and respiration. Rajaseka *et al*., (2013) reported an increase in growth and yield parameters in vegetables under shade nets as compared to open field.

2.5 Modified environment systems in open field production

In commercial vegetable production, mini green houses, lath houses and growth chambers are used in propagation. In these structures relative humidity and temperatures are adjusted for specific vegetables while organic rich top soil is used as the propagating medium. This enhances germination producing vigorously growing transplants resulting in improved yields. In urban farming leafy vegetables including kales, spring onions, and cowpeas are produced in sacks containing rich organic materials with charcoal and stones used to provide drainage. This technology is referred to as multistorey and utilizes verandahs rooftops and balconies in formaximum production earning farmers an estimated monthly income of Kshs, 20,000 (Lwanga, 2015). A case study in Bologna Italy predicted that if all suitable rooftops space (estimate 0.83Km^2) was used for urban agriculture, rooftop gardens could supply about 12500 tones of vegetables in a year (Orsini *et al*. 2014). They can also reduce the environmental pollution by absorbing noise, carbon dioxide emissionand controlling temperature. Vertical farming (Aero farms) practiced in the US whereby leaves and any other growing materials arestacked ontop of the other up to 12 levels. Growing levels are positioned at every 90cm (McCarthy and Gunders, 2015). Mandala vegetable gardens are established in very unproductive land replenished with top soil and organic manure in open field vegetable production, different irrigation systems are used ranging from simple bucket to complex drip and sprinklers thus eliminating seasonality of vegetables.

2.6 Kitchen gardens

These are home gardens located near the homestead especially for vegetable production taking different sizes depending on available land. According to Ministry of Agriculture, a model kitchen garden contains vegetables, cereals, root crops and at least a fruit tree to ensure that the family gets a balanced diet (MOA, 2015). The gardens are intensively managed using organic manure produced within the farm and irrigated during the dry seasons. The excess produce is often sold

atthe local markets enabling the family to acquire other foods which are not available at farm level. Food security at household level is a positive towards attaining National food security.

3.0 Conclusions

The vegetable production systems described clearly show how soil improvement technologies have been applied making use of the available materials. The technologies not only increase yields by supplying the nutrients, but also improve soil conditions thus preventing degradation which has been a major cause of reduced yields.The adoption of integrated soil management practices accompanied with Good Agricultural Practices will in increase vegetable yields and this will trigger the demand for the technologies in other crops thus assuring food security.

4.0 Recommendations

Training on the technologies accompanied with appropriate implementation policies will enhance adoption.

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The Strategic Role of Marketing Information Systems on Agricultural Production: A Case of Selected Agricultural Saccos in Nairobi Kenya

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Abstract
Marketing information systems has revolutionized the old older of production and delivery of products and services to consumers. Traceability in agricultural food products has become an emerging issue in agribusiness where more consumers require knowledge of origin and components of food products in terms of quality, health hazards and nutrition. Developing countries among them Kenya have been a victim of contamination of fresh produce and animal products which has been catastrophic leading to casualty and deaths of unsuspecting consumers. Government on the other hand has taken active role of continuous monitoring with the most notable recent action of closure of slaughter houses suspected of trading intoxicated meat products. The specific objectives of the study sought to examine the strategic role of (a) value chain systems (b) supply chain systems and (c)quality assurance systems on the production sustainability of agricultural SACCOs in Nairobi county, Kenya. The study adopted descriptive research design and used both primary and secondary sources of data. Primary data collection instrument was structured questionnaire which was researcher-administered to respondents. Secondary data included past records of performance by selected SACCOs in Nairobi County. The choice of Nairobi County was based on the fact that Nairobi County has a representative sample of all the strata in line with agribusiness SACCOs. The study found out that there exists positive relationship between market information systems and agricultural production by agricultural SACCOs in Nairobi County, Kenya and concluded that there is need for development of market information systems, especially infrastructure and capacity building of system users to efficiently support traceability in agribusiness sector considering that with traceability systems more consumers will be knowledgeable of such health hazards as they seek to satisfy their needs and wants.

Key Words: *Strategic Role, Marketing Information System, Agricultural Production, SACCOs and Kenya*

1.0 Introduction

Food traceability refers to a process that includes tracing the origin, application and location of a component/entity in the food industry (Engelseth, 2009), where key element in information technology facilitating traceability data capture, which is also supported by use of audits and checklists in manual information systems (Deng *et al*.,2008).

Traceability in agricultural food products has become an emerging issue in agribusiness where more consumers demand the knowledge of origin and components of food products in terms of quality, health hazards and nutrition. Previous research indicates that this emerging area is important for policy makers, researchers and marketers as it would enable them customize tracing systems and therefore fulfil this increase in demand of product information (Opara, 2003).

Among other importance of using marketing information systems for tracing agricultural products is that it enables farmers acquire real time information about yields during harvesting and therefore are not required to be present to mitigate pilferage, it enables both suppliers and consumers predict pattern of availability of agricultural products across various seasons as well as provide monitoring of distribution channel of agricultural products from suppliers to consumers (Ko, Kwak, & Song, 2014). Engelseth (2013) also supports this technical view of traceability.

However, Engelseth, Wongthatsanekorn and Charoensiriwath (2014) agree that traceability has a wider scope than technical and cost focus as it is a value network construct. Traceability of food chain across distribution channel facilitates the organization of supply chain resources and information, considering that it facilitates collaboration of actors in goods transformation. According to Deng *et al*. (2008), in an area where product quality and safety are main customer concern, product traceability is increasingly being a resource in firms.

Deng *et al*. (2008) noted that electronic technique of food traceability becomes challenging in the international food supply chain. Further, Stickler and Nestle (2012) in their study indicate that due to open market systems such as foreign direct investment and mass marketing campaigns, developing countries have begun to experience a surge in highly processed food away from traditional simple diets. This, the study viewed was as a result of saturated markets in developed countries. Such products lead to increased consideration of information about quantities of genetically modified organisms in food component, quality of such foods and health impact of continued consumption.

1.1 Marketing Information System

According to **Invalid source specified** marketing information systems is characterized by alignment of people, procedures, and tools to collect, analyze, store and distribute needed information to marketing decision makers in a timely and accurate manner. (Strydom, 2007) further points out that recent developments in information has led to complexities that has made it diffucult to the stakeholders in marketing to distinguish relavant and irrelevant information. To gain competiitve advantage, this necessitates marketing information be useful i.e. of high quality, relevant, timely and complete so as to assist a marketing manager make the day to day decisions in the organization. Research done shows efficient provision of market information has positive benefits for the farmers, traders and the government.

MIS has four main constituent parts: the internal reporting systems, marketing research system, marketing intelligence system and marketing models. An efficient system is capable to collect, store and relay timely and accurate information. Cross functionally, data obtained from the various cost centers provide wealth of information for decision making. Marketing research systems: are systems that are proactive in identifying information in market place. In many cases, data collected is majorly to address a defined problem (Tsiakis, 2015)

Marketing intelligence systems are systems that involve set of procedures responsible of sorting information and information sources useful for marketing management decision making.Marketing intelligence is the information base of entrepreneurs and management within an organization. Marketing intelligence can be acquired primarily (first hand) or through secondary sources (second hand). This forms a large base and unlike market research which is conducted periodically, market intelligence is conducted regularly (Tsiakis, 2015).

1.2 Savings and Credit Cooperative Organization (SACCOS)

A Savings and Credit Cooperative, being an entity is owned and managed by the members, whose main objective is to pools funds and in turn facilitate credit facility for the members. Their main pupose is therefore to alleviate the economic status, social, cultural welfare of members through the entity (UN-HABITAT, 2010).

The modern history of cooperatives started with the Rochdale Society of Equitable Pioneers, an early consumer co-operative founded in 1844. The Rochdale Society of Equitable Pioneers was one of the first co-operatives to pay a patronage dividend, forming the basis for the modern cooperative movement. Although other co-operatives preceded them, the Rochdale Pioneers' co-operative became the prototype for societies in Great Britain, most famous for designing the Rochdale Principles. The Rochdale Principles are a set of principles of co-operation on which co-operatives around the globe use i.e. they include 1) voluntary and open membership; 2) democratic member control; 3) member economic participation; 4) autonomy and independence; 5) education, training ,and information; 6) co-operation among co-operatives; and 7) concern for community **Invalid source specified.**. In the 1860s, the second generation of modern cooperation emerged in certain European rural environments when models for agricultural cooperatives and savings and credit cooperatives were developed, this being inspired by the success of the consumer cooperatives and based on old traditions of rural solidarity aimed to meet the primary economic needs, which went unsatisfied.

In 1931, the first cooperatives most of which were companies were registered when the first cooperative ordinance was enacted so as to regulate the cooperative operations in the country. The Swynnerton Plan, implemented in 1953, initiated African farming cooperatives to be more involved in the economy some of the initial cooperatives included Kenya Co-operative Creameries (KCC-1925), Kenya Planters Co-operative Union (KPCU-1923) and Kenya Farmers Association (KFA-1923)**Invalid source specified.**.

In Kenya, the cooperative movement to date boosts of about 164 registered deposit taking cooperatives, 12 with restricted licenses while 1 being under statutory management. The SACCOs have twelve million members, more than 320,000 employees and an extra 1.5 million people involved in either the informal or small scale sector funded by cooperative loans. In addition SACCOs account to about 60% of economic revenue generated to the government. (SASRA, 2016); (Mwangi & Wanjau, 2012).

Many states including Kenya, have put in place regulatory systems in bid to safeguard citizens with SACCO activities. In Kenya, The Sacco Regulatory Authority (SASRA) regulates the activities of SACCOs. For SACCOs to fully operate, certain fulfillments e.g capital outlay and asset need to reach a specified minimum which poses as a criterion whether SACCO will be registered/ licensed or have its licensed revoked or put under statutory management (SASRA, 2016)**.**

1.3 Problem statement

Increased food scandals, provision of unfit food for human consumption in the market is an emerging issue that has affected both developed and developing states. In response to these concerns developed economic unions such as European Union developed the EU General Food Law of 2005 which aimed at mitigating the hazardous impact of uncensored food production. This over the years has facilitated implementation of food product traceability as well as assurance of secure production and supply of food for human consumption (Deng *et al*., 2008).

Developing countries among them Kenya has been a victim of non-traceability of supply food chain where consumers have previously been duped into purchase and consumption of unfit product such as donkey meat, bush meat products, maize products that has led to causalities and deaths of unsuspecting consumers. Government of Kenya on the other had has taken active role of continuous monitoring during such disasters e.g. flushing out of illegal brewing dens, closure of slaughter houses suspected of trading intoxicated meat products .

Sarpong (2014) study identifies that scandals emanating from consumption market concerning harmful /unhealthy products tend to reduce consumer confidence in ability to regulate its operations. This results from weak links such as failure to update audits on supplies by buyers (wholesale firms) as well as checklists. the study found out a positive relationship between regular tracing of the distribution channel and improvement of supply chain system. The study used horsemeat scandal in European Markets as a case study and concluded with the need for continuous policing of consumption products and however cautions on lack of visibility and ability to have a direct influence in distribution channel as some of impediments in food industry.
Studies e.g Engelseth (2013); Engelseth, Wongthatsanekorn and Charoensiriwath (2014); (Ko, Kwak, & Song, 2014); Hastings, Howieson and Lawley (2016); Fearne, Martinez and Dent (2012) view that increased visibility of the distribution channel by buyers, that is consumers and whole sale firms can be enhanced though development of a system of business to business relationships as well as traceability mechanisms that result to accountability of the marketing systems and quality food supplies.

Researchers e.g Stickler and Nestle (2012); (Fearne, Martinez, & Dent, 2012); (Deng, Lu, Zheng, Ren, & Chen, 2008); (Engelseth P. , 2013) recognize the emergence of these supply chain trend as well as scanty literature in the developing economies. It is against this background that the study intends to investigate the role of marketing information systems on agricultural production effectiveness: A case of agricultural SACCOs in Kenya.

1.4 Research objectives

The general objective of the study was to examine the strategic role of marketing information systems on the production sustainability of agricultural SACCOs in Nairobi County, Kenya.
The specific objectives of the study sought to examine the strategic role of: (a) value chain systems (b) supply chain systems and (c) quality assurance systems on the production sustainability of agricultural SACCOs in Nairobi County, Kenya.

1.5 Justification of the study

Among producers of agricultural products, SASRA (2016) estimates that agricultural SACCOs contribute up to 60% of supplies in the agricultural sector. Also, registered SACCOs are formalized economic entities as compared to SMEs where some may be or may not be registered. It is as a result of this condition that the researchers opted for agricultural SACCOs

1.6 Theoretical framework

1.6.1 Porters value chain model

According to porter, value chain activities can be broadly grouped in two i.e. secondary activities and primary activities. Primary activities consist of inbound logistics, operations, outbound logistics, marketing and sales and service. Secondary activities consist of firm infrastructure, human resource management, technology and procurement. In relation to the study, strategic marketing information systems involve all elements that facilitate agricultural production in firms. Such that inbound logistics, operations, firm infrastructure, human resource, marketing and sales facilitate that process.
However, the model does not capture the traceability aspect for consumers but only for in house, where the marketers are able to trace the movement of goods into and out of firm. This could be addressed by sales and marketing where packaging and labelling provides sufficient information that settles consumer curiosity or perceived risk. In addition, use of technology in line with traceability both locally and globally becomes an important aspect for competitive advantage.

Fearne, Martinez and Dent (2012**);** Howieson, Lawley and Hastings (2016) acknowledge that value chain analysis is critical as strategic process in any firm. Aside from discovering strategic and operational misalignments, value chain analysis facilitates a greater understanding of consumers aside from capturing commercial opportunities. Traceability systems in the case of the study is able to timely capture the gaps or errors in production and as a result ensure formalization of structures and relationship building of value chain members, therefore contributing to firm sustainability.

Crain and Abraham (2008) identified that internal and external value chains are important in identifying customer needs. Internal value chains have been thoroughly explored by authors, however external value chains have not been exhaustive even though they reveal areas of risk and opportunities. In relevance to the study, logistics i.e. the whole process facilitating provision of raw materials to finalizing of finished products is an important aspect that should be considered in ensuring product traceability and quality which leads to sustainability of firms, in this case agricultural SACCOs in Nairobi County.

1.6.2 Value Chain Systems

Mattevi and Jones (2016) sought to establish awareness of traceability concepts among SMEs in UK. The study employed survey research design where the unit of analysis were food and drink companies operating in food supply chain. The study found out that safety and quality was a stronger driver when compared to industry regulation and technology, where most companies had regulatory systems in place for traceability purposes and that the benefits of the traceability system outweighed the barriers towards organization crisis management. Salin(1998) study noted that high-tech information systems are a strong competitive advantages for agri-food firms particularly when the system adopted supports a supply chain strategy. However, adoption of such system by farmers were dependent on firm size, age of farmers and education level (Amponsah,2015).

Howieson *et al*. (2016); Fearne, Martinez and Dent (2012) studies found out that among other factors, establishment of early and pre-relationships among business to business firms facilitate successful creation of sustainable value chains and competitive advantage.

1.6.3 Supply chain management systems

Study sought to establish the factors that led firms to choose varying controlled standards within food supply chains, specifically, role of transaction risks, i.e. Internal and exogenous risks, in the implementation of diverse traceability schemes. Case study approach was adopted where unit of analysis was Italian food processing firms. The study found out that there existed positive relationship between internal risks and implementation of complex traceability schemes which led to closer supply chain relationships. Exogenous risks however had a negative relationship with implementation of traceability schemes and lacked strong coordination.

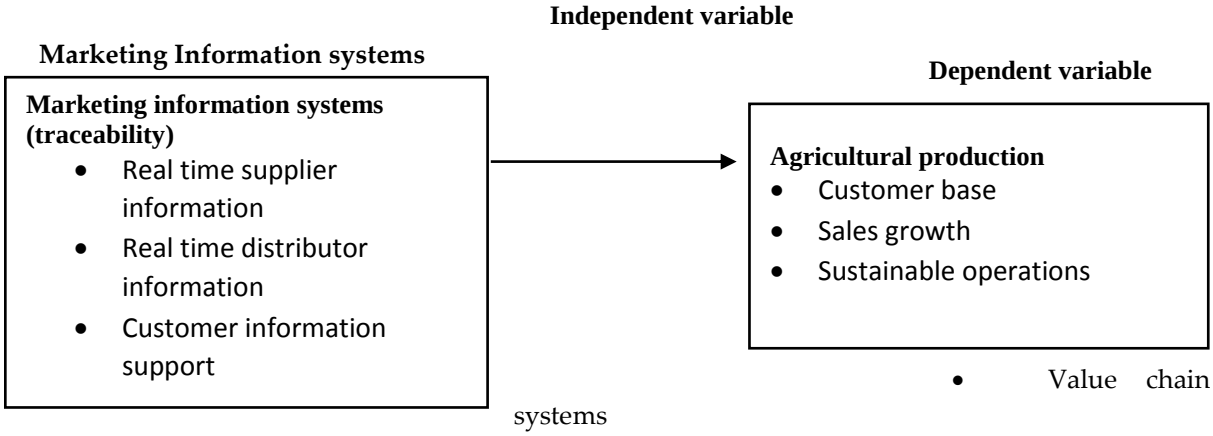
Study by (Hinkka, Främling, & Tätilä, 2013) sought to establish improvement of supply chain tracking through alignment of different incentives by buyers and suppliers. Case study research design was used and targeted respondents was a network of suppliers and wholesaler companies. The study found out a positive relationship between implementation of IOS systems and improvement of alignment in supply chain, between suppliers and buyers. The study concluded that tracking improved supply chain collaboration and long run firm operation. (Goswami, Engel, & Krcmar, 2013) study further supported the findings by noting that even though supply chain information systems differed among firms due to firm characteristics and specification of supply chain needs, there existed a positive relationship between information sharing and collaboration among firms in a supply chain.

Simangunsong, Hendry and Stevenson (2016) sought to establish effective management strategies in supply chain uncertainity. The study had adopted case study where data was collected from various companies in Indonesian food industry. The study identified main empirical issues in supply chain uncertainity as : power abuse by large retailers disvadantaged smaller competitors in the distribution channel; collusion by suppilers to limit supplies in the market and unethical govermental influence by suppliers. The study concluded collaborative strategies such as joint purchasing as one of main strategies towards supply chain uncertainity.

1.6.4 Quality assurance systems

In agricultural marketing especially in specialty production, there has evolved new technologies which aim at not to increase production efficiency but rather to increase costs of production. Such technologies are used for source verification, and for quality to be a brand for an organization's product, it has to be consistent which is enabled through controls of quality assurance systems. This system provides same information both to regulatory bodies and consumers and in a position to verify the merit (Hueth, Ibarburu, & Kliebenstein, 2007). Niadoo, Singh and Lange (2007) reiterate that for quality to be distinctly defined by stakeholders, three elements i.e. fitness for purpose, value for money and transformation should be considered as well as linearity with regulatory systems used to measure quality products.

Conceptual Framework



Source: Author (2017)

1.7 Research Gap

Most of the studies e.g Engelseth, *et al*. (2014); Hinkka *et al*. (2013); Hastings, *et al*. (2016); Mattevi and Jones (2016); Salin (1998) recognize the marketing information systems i.e supply chain systems, value chain systems and quality assurance systems by noting that they facilitate transmission of real time information, boost consumer confidence on product due to information accessibility and also enables tracing of suppliers and distributors. The studied however have focused on agri-firms, developed nations and scanty information exist of the developing countries context, especially on agricultural based SACCOs. This study therefore intended to bridge the gap by investigating the strategic role of marketing information systems on agricultural production.

2.0 Materials and methods

The study adopted descriptive research design and used both primary and secondary sources of data. According to SASRA (2016), there exist about 164 registered SACCOs in Kenya where out of this, 10 SACCOs in Nairobi City are agricultural based (See Appendix).

Primary data collection instrument was structured questionnaire which was researcher-administered to respondents. Respondents were basically staff working at the top and operational level management of this SACCOs. Top level management were in a position to discuss the strategic position of firm in regards to traceability whereas the operational level management were more conversant with logistics form suppliers and to the market/distribution channels, i.e. inbound and outbound logistics.

Secondary data included past records of performance by selected SACCOs in Nairobi County. The choice of Nairobi County is based on the fact that Nairobi County has a representative sample of all the strata in line with agribusiness SACCOs.

3.0 Results and Discussion

The reliability coefficient 0.637, indicating that 63.7% of the items used were relevant constructs in the study. From the demographic information, the respondents were 30

Table 1: Respondents Biodata

Demographic characteristics		
	Frequency	Percentage (%)
Gender		
Male	17	56.7
Female	13	43.3
Total	**30**	**100.0**
Age		
21-30 years	2	6.7
31-40	10	33.3
41-50	18	60.0
Total	**30**	100.0
Level of education		
KCPE	8	26.7
O level	6	20.0
Tertiary	7	23.3
University	9	30.0
Total	**30**	**100.0**
Years of experience		
Less than 1 year	6	20.0
Between 1 and 5years	9	30.0
Above 5 years	15	50.0
Total	**30**	100.0
Job Position		
Strategic management level	3	10.0
Business level management	9	30.0
Operational level management	18	60.0
Total	**30**	100.0

Source: Survey data (2017)

Most frequent respondents :were male (56.7%) i.e. based on gender, were aged between 41 and 50 years(60.0%) i.e. based on age, most frequent respondents had attained university education, in addition, all the respondents had attained some level of education. The respondents had some

level of experience with most having above 5 years experience (50.0%). The most frequent respondents were situated at the operational level of management (60.0%).

From the descriptive findings shown in the table below, the respondents were averaged at n=28. The responses in this section were ranked on a five point Likert scale where 1=Not at all; 2=Slightly; 3=Moderated Extent; 4=High extent; 5=Very high extent

Table 2: Descriptive statistics

	N	Min	Max	Mean	SD
Value chain systems	30	1.00	4.00	4.0396	0.95666
Supply chain management systems	28	1.00	5.00	4.2277	0.78588
Quality assurance systems	30	2.00	4.00	3.1881	1.41218
Aggregate score	28			3.8185	1.05157

Source: Survey data (2017)

For the findings most of the respondents agreed that the statements on value chain systems (mean=4.0396), and supply chain management systems (mean=4.2277)were to a high exxtent. Researchers e.g. Goswami *et al*.,(2013); Fearne *et al*.,(2012); Hinkka *et al*.,(2013); Mattevi & Jones, (2016) identify with alignment of incentives, information sharing, quality, safety and industry relationships as key determinannts of effctive supply chain management and value chain systems. However, most of the respondents thought that statements on quality assurance systems were to a moderate extent. Hueth *et al*. (2007) and Niadoo *et al.* (2007) support this finding in that technology, brand quality; regulatory bodies are all determinants of an effective quality assurance system.

The inferential statistics sought to investigate the strength of the relationship between the marketing information systems and traceability. The findings are as shown below:

Table 3: Inferential Analysis

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.680[a]	.462	.454	.24604

ANOVA[b]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	22.245	3	7.415	123.58	.000[a]
	Residual	5.812	97	.060		
	Total	28.057	100			

Coefficients[a]

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	.691	.181		3.821	.000
	Value chain systems	.222	.042	.287	5.341	.000
	Supply chain mangement systems	.270	.031	.514	8.783	.000
	Management support system	.152	.058	.186	2.605	.011

Source: Survey data (2017)

The established regression equation was

$$Y=0.691+ 0.287X_1 + 0.514 X_2 + 0.186 X_3 + e$$

Y= the value of the dependent variable

$B_{0=}$ Constant

{Xi,i=1,2,3,4,5} = values of the various independent (covariates) variable

Y= Agricultural production

X_{1-3}= value chain systems, supply chain systems; Quality assurance systems respectively

e = Error term

From the findings 45.4% of the variation in production was as a result of market information systems. The remaining 54.6% was a result of factors not included in the study. The ANOVA findings indicated that the model used in the study was significant at p=0.00.

The constant of the study was 0.691 indicating that when all factors are held constant, one unit change in marketing information systems would result to 0.691 unit change in agricultural production. The equation shows a strong positive relationship between marketing information systems and agricultural production by agricultural SACCOs in Nairobi County, Kenya. Where all the variables (i.e. value chain systems, supply chain systems and quality assurance systems) were significant at p<.0.05.

These findings concur with the descriptive findings where on average most frequent respondents agreed that the marketing information systems facilitated agricultural production to a moderate extent. This could apply given that the inferential findings also identified an averagely low strength (45.4%) between the dependent and independent variables.

Previous studies e.g Ko *et al*. (2014); Engelseth (2013) also argue that MIS plays an important role in the overall firm productivity.

4.0 Conclusions

The study concludes that there is need for development of market information systems, especially infrastructure and capacity building of system users to efficiently support traceability in agribusiness sector considering that with traceability systems more consumers will be knowledgeable of such health hazards as they seek to satisfy their needs and wants.

5.0 Recommendations

To policy development, the government should consider further implementation of information systems policies by agricultural SACCOs that would facilitate information provision that improves welfare of both consumers and market players. The study also recommends that future researchers should consider replicating the model on a wider scope i.e. inclusion of other sectors and counties to test whether the relationship strengthens.

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The Role Played By Mobile Phone Communication in Diffusion of Dairy Goats Rearing In Kitui County, Kenya

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Abstract
The study investigated how dairy goat farmers used mobile phones communication in dairy goat rearing to improve their livelihoods. Farmers targeted were widows, Caregivers and Orphans in Kitui County Kenya. Two types of goat reared were Toggenburg and Galla. Sampling was done in two stages proportional to get five clusters and random within a cluster to get 100 respondents. Women consisted 71% of the sampled farmers. Forty two percent of farmers use their dairy milk for home consumption and cited it as a strategy to improve family nutrition.Average goat milk production was 2.6 litres and retailed at KES70.00 per litre. Eight six percent of farmers have owned their mobile phone for more than one year. Farmers (69%) called Livestock extension officer and Veterinary officer, both of whom are instrumental in the general management and disease control of the dairy goats. 99% of farmers interviewed own or have access to mobile phones. Ninety six percent of goat farmer have used Mpeas services (money transfer service) at least once in a month. The top challenges was high cost of airtime at 32%. The high farmer mobile phones ownership or having access to use of mobile phones have increased communication contacts amongst farmers, sellers, buyers and extension agents. Challenges notwithstanding, the technology has shaped the dairy goat keeping technolgy to a great extent in Kitui County.The result is improved family nutrition and household income to local residents. The role played by mobile in agricultural production can not be underarated. The aspect of mobile phone communication must be embedded in the programming of the projects by poilcy makers.

Keywords: *Galla, Livelihood Milk, Mpesa, Toggenburg*

1.0 Introduction

The rapid spread of information and Communication Technologies (ICT) in developing countries over the past decade offers a unique opportunity to transfer knowledge via private and public information systems. Over the past decade, mobile phone coverage has spread rapidly in Africa, Asia and Latin America. As of 2009, over half of thepopulations in sub-Saharan Africa, Asia and Latin America had access to mobile phone coverage, representing 60, 67 and 77 percent, respectively (Aker,2010). Mobile phone coverage has greatly exceeded investments in other infrastructures in these countries, namely,electricity, roads and landlines. Coinciding with this increase in mobile phone coverage has been an increase in mobile phone adoption, even in some of the world's poorest countries. As of 2008, there were about 4 billion mobile phone subscribers worldwide, with 374 million subscriptions in Africa, 1,791 in Asia and 460 million in Latin America. While initial adoption was primarily by the wealthy, urban and educated residents, mobile phones are currently being adopted by the rural poor in some of the world's poorest countries *(Mbiti ,2010).*

The diffusion of mobile phones into rural areas represents one of the most profound changes in rural Kenya and many other developing countries in the past decade. Farmers, agricultural processors, and marketers have transitioned from a culture in which there was virtually no telephone service of any kind to one in which mobile phones are now widely utilized by farmers in

the rural areas and markets. Rearing of dairy goats was introduced to Kitui County in the year 2007. Toggenburg and Galla were the selected breeds due to their improved milk and meat yields.

1.1 Problem Statement

Farmers require information on a variety of topics at each stage of the agricultural production process. In many developing countries, such information has traditionally been provided via personal exchanges, radio and perhaps landlines and newspapers. Landlines are not readily available in most regions of the county, and radio only provides price information for specific products and markets on a weekly basis. Mobile phone communication could be the solution to improved access to and use of information about agricultural technologies.

The broad objective was to assess the role played by mobile phone communication in the diffusion of dairy goat rearing in Kitui County, Kenya

1.2 The specific objectives were

1. Determine proportion of farmers who own/have access to mobile phones
2. Establish mobile phone applications (products) used by most dairy goat farmers in the course of dairy goat keeping
3. Identify constraints faced by dairy goat farmers as they used mobile phone communication in dairy goat rearing.

1.3 Conceptual frame work

The roles of Mobile phone communication in diffusion of rearing of dairy goats.

1.4 Theoretical framework

According to Rogers (2003), there are four main elements that influence the spread of a new idea**:** These are**;** the innovation itself, communication channels, time, and a social system. That is, diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system. Individuals progress through 5 stages: knowledge, persuasion, decision, implementation, and confirmation. If the innovation is adopted, it spreads via various communication channels. During communication, the idea is rarely evaluated from a scientific standpoint; rather, subjective perceptions of the innovation influence diffusion. The process occurs over time. Finally, social systems determine diffusion, norms on diffusion, roles of opinion leaders and change agents, types of innovation decisions, and innovation consequences. . In rearing of dairy goats, diffusion is about how, why and at what rate the technology of rearing of dairy goats has spread through the community of Kitui County from the first beneficiaries of the dairy goats to those farmers who acquired their own stock after understanding the benefits of the enterprise.

Adoption as a process starts with innovators, people who are ready to take risks and try their hands on new technologies. Mobile owners are people who spared part of their resources to keep up with the technology. They are likely to be ahead of others and even influence them. Innovators are known for their willingness to share information and influence innovations. Rogers defines an innovation as "an idea, practice, or object that is perceived as new by an individual or other unit of adoption"

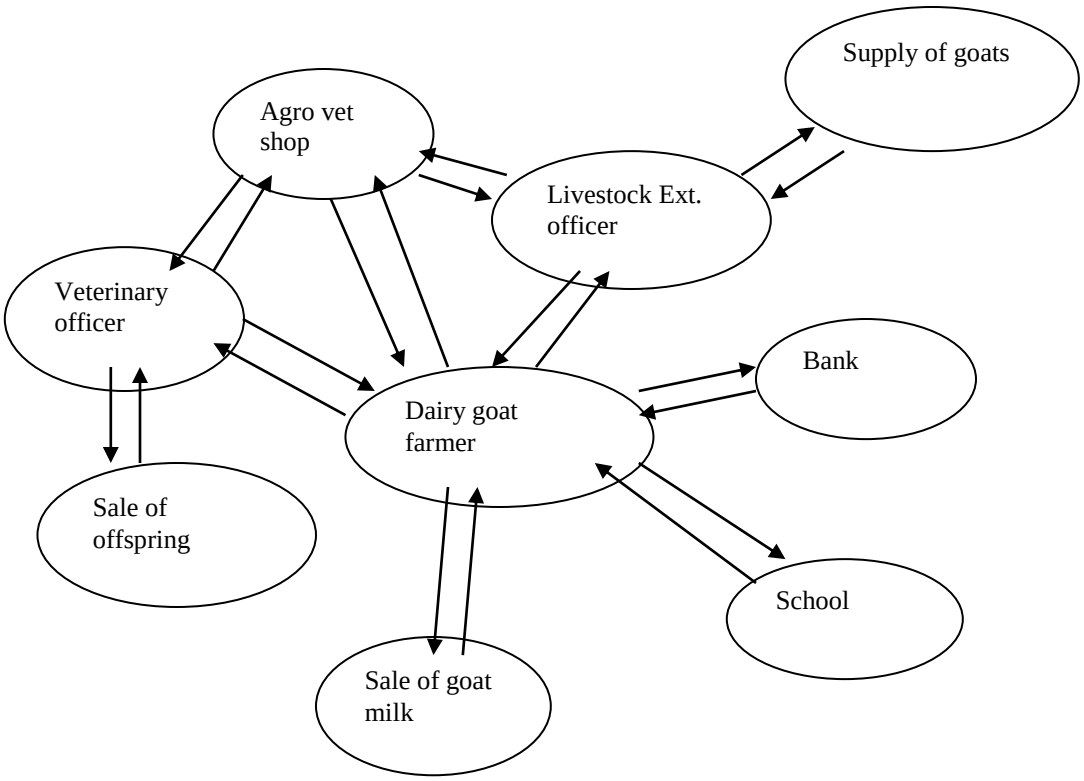

Figure 1: Conceptual framework (Source; authors)

The dairy goat farmer is at the Centre of the framework. The Livestock extension officer uses mobile phone to scout for the breeding stock and only take off with a sure destination in mind. This saves time and money and lowers the cost of scouting, thus saving the money for other uses. He uses mobile phone to mobilize dairy goat keepers to attend meetings, trainings and to prepare to receive their stock of goats. The feedback is instant as the farmers confirm that they have got the communication. He also gets reports on progress of the group and can make decisions without delay.

The farmers communicate to veterinary officer about sick animals and get assistance immediately. The time and money saved on transport to Veterinary office is spent somewhere else. Few animals die of disease attack. Buyers of milk and offspring easily contact the farmers for the commodities and get terms of sale at a much faster rate than through physical contact.

Farmers do mobile banking of their earnings through mobile phone money transfer services and pay for veterinary services and school levies. There is reduced risk of losing the money to thieves and robbers. Mobile phone communication between farmers and other stakeholders has facilitated a lot of information sharing which has enabled the group to move on as a team.

2.0 Materials and Methods

2.1 Study area

The study area was Kitui County in the Eastern region of Kenya.

2.2 Sampling Framework

Key Informants Interviews (KIIs) were purposively sampled from people expected to have knowledge on the project or had perceived level of influence. Key Informants Interviews were conducted to World Vision Livestock Extension Officer, District Livestock Production Officer and District Veterinary Officer.

Sample size was calculated using the formulae:

$$n = \frac{z^2 p.q.N}{e^2 (N-1) + z^2 p.q}$$

Where z (confidence interval) is at 90%

e (acceptable error) is + (-)10

$$= \frac{1{,}96^2 (0.5) (0.5) (300)}{(0.1)^2 (299) + (1.96)^2 (0.5) (0.5)}$$

$= 72.9$

This was revised to 100 for ease of distribution in the clusters and work of enumerators to collect a sizeable data in view of the fact that the data being collected is largely heterogeneous

Sampling was then done in two stages i.e. proportional and random sampling within a cluster.

In proportional sampling, each administrative location was allocated a number according to that of its surviving farmers of dairy goats. Survey clusters were however formed depending on the proximity of the areas from one another and did not necessarily follow the administrative boundaries. A cluster consisted of an area to be visited by one enumerator who was expected to interview a total of 20 farmers.

2.3 Data collection

This exercise was conducted using household questionnaire by five enumerators, Key informant interviews (KII) and Focus Group Discussions (FGD) integrated with relevant data collection approaches such as literature review and observation among other methods. A questionnaire was administered to 100 farmers sampled from a frame of 300 farmers who benefited from dairy goats supplied by Mutonguni Poverty Reduction Project (MPRP) in the year 2007. Two focused group discussions were held at two different clusters. One FGD was attended by 12 women in Kaimu cluster and the other one was attended by 13 men in Kakeani cluster. Both discussions were facilitated by the researcher with help of a recorder and an observer. The survey clusters are equivalent of administrative locations. Three KIIs were held with Livestock Officer of Mutonguni IPA, District Veterinary Officer, District Livestock Officer and Chairman of Kitui West Dairy Goat Association who provided very key information to corroborate what was gathered through other methods of data collection. Training content included objective of the survey, sampling methodologies employed and discussion of the questionnaire to be used during the exercise. The enumerators translated the questions in their mother tongue, (Kikamba) so that they had a common understanding of the questions. Every enumerator was assigned 20 farmers to interview. Focused Group Discussions (FGDs) was to help identify positive deviants and support the questionnaire responses by providing the qualitative data, as well as a means of triangulation. In special cases, when dealing with sensitive areas, a combination of approaches was applied to help get the response to sensitive questions, and strengthened the research ethics of the evaluation process.

2.4 Data Analysis

This was both descriptive and inferential. Descriptive analysis provided profiles of dairy goat farmers on their ownership or access to mobile phones, frequency of use of those mobile phones to

communicate to their customers, fellow group members and with the service providers. It also portrayed the rating of usefulness of mobile phone by different farmers and various challenges they face as they go about making calls and receiving and sending money through the mobile phone service.

3.0 Results

Most of the farmers under the project are women at 71% against men who form 29% of the farmers as shown in Table 1.

Table 1: Goat farmers by gender

Gender	Frequency	Percentage(%)
Male	29	29
Female	71	71
Total	100	100

A good percentage of farmers 35 % have not received formal education. 65% of farmers received have either primary or secondary education as in Table 2, an improvement from the situation in 2009 when the indiactor was 53% (MPRP mid-term evaluation report, 2009). Non of the farmers interviewed went beyond seconadry school. The high illiteracy level (35%) has however not prevented the farmers from acquiring own mobile phone handsets (70%), and even those who do not have their own usually rely on their family members or neighbors to communicate with fellow farmers and other stakeholders.

Table 2: Level of education of goat farmers

Level of education of goat farmers	Frequency	Percentage (%)
Never gone to school	35	35
Primary Education	47	47
Secondary Education	18	18
Post Secondary Education	0	0
Total	100	100

Table 3 shows that 47% of farmers who have 3 goats and below report that they usually dispose of male offsprings to earn income and also to avoid in breeding. Disposal of animals and rotation of the breeding buck and arranging for buyers is done by use of mobile phone. A typical group breeding buck is shown in Figure 2

Table 3: Number of Dairy goats per Farmer

Number of Dairy goats per Farmer	Frequency	Percentage (%)
Famers having 1 – 3 goats	47	47
Farmers having 4 goats and above	53	53
Total	100	100

Plate 1: Group breeding buck

The few farmers who have not been able to milk their goats lost the original stock to diseases and had to look for replacement on their own. They are also to be found in the less potential part of the catchment. Almost half the farmers (42%) use milk from their dairy goats for home consumption to improve family nutrition.

Table 4: Use of goat milk by farmers

Use of Goat Milk	Frequency	Percentage (%)
Never milked	4	4
Family Consumption only	42	42
Sale only	0	0
Family Consumption and sale	54	54
Total	100	100

The farmers who do not offer any milk for sale (46%) are the same ones who consume all their milk in the family see Table 5. While 96% of farmers use milk in their families and sell to their neighbours. The demand of goat milk within the farm and its neighbourhood is so high that nothing is sold to institutions, even though, Muthale Hospital, among other institutions, offers ready market for goat milk. Goat milk is popular for boosting immunity of people living with HIV and AIDS. Esteemed buyers place their orders of milk by use of their mobile phones. According to mid-term evaluation of the project in the year 2009, milk was sold to neighbours at an average price of KES0.60 per litre. The average litre per household was 0.62, while that sold to neighbours was 0.12. Average price or mean per litre per household was 8.97. Income from the sale of goat milk was 151.80 per household. 36 % of the 133 households indicated that they consume 1 litre of milk per day while 10.5% consumed 2 litres. Those who mentioned 3 litres were 1.5 %. The nearest market to sell the milk produced was Kabati about 2-7 km from the member groups. This trend of selling milk to neighbours as a preferred outlet has persisted.

Table 5: Milk for sale outlets

Sale out let/market of milk	Frequency	Percent
Dont sell milk	46	46.0
Sell milk to neighbours	50	50.0
Sell goat milk in trading center	4	4.0
Sell goat milk in institution	00	00
Total	100	100.0

Table 6 shows that 99% of farmers interviewed either own mobile phones or have access to one whenever they need to communicate. This high percenatge shows the extent to which mobile phone technology has infiltrated the rearing of dairy goats in Kitui.

Table 6: Mobile phone ownership or access

Mobile phone ownership or access	Frequency	Percentage (%)
Own no mobile phone	1	1
Own mobile phone	70	70
Have access to mobile phone	29	29
Total	100	100

In Table 7, eighty six percent of farmers have had their mobile phones long enough to influence their communication in the business of dairy goat rearing, Those who have used mobile phones for between 1-2 years disclose that they were being left whenever information was circulated by short message service (sms).

Table 7: Duration of mobile phone use

Duration of mobile phone use	Frequency	Percentage (%)
Has never used mobile phone	1	1
Used mobile phone for 3 years and above	51	51
Has used mobile phone for between 1-2 years	35	35
Has used mobile phone less than 1 year	13	13
Total	100	100

Sixty nine percent of farmers mostly called Livestock extension officer and Veterinary officer (Table 8), both of whom are instrumental in the general management and disease control of the dairy goats. Twenty five percent of farmers called agrovet stores to inquire on drugs for controlling intestinal parasites and also to place orders for feed supplements for lactating goats.

Table 8: People called by mobile phone

People called by mobile phone	Frequency	Percentage (%)
Has never called any one	1	1
Called extension officer	26	26
Called veterinary officer	43	43
Called agrovet stores	25	25
Called customers of milk or goat	5	5
Total	100	100

The District Veterinary Officer reported that on several occasions he was informed of goats that were sick through mobile phone and he responded promptly. In unfortunate situations when he received the information late, the animal succumbed but he still had to arrive and diagnose what

caused death of the animal. The post mortem reports generated helped to develop mitigation measures against the diseases

Plate 2: A well-managed dairy goat in Kitui

A well managed dairy goat is shown in Figure 3. Fifty seven percent of farmers communicate at least once every week over mobile phone, to members of dairy goat keeping group.(Table 9). This is beside the communication that they make to other targets in respect to keeping of dairy goats.The high monthly communication 42%, (Table 9) is when members are invited to monthly group meetings or when they inquire about the meetings.

Table 9: Frequency of mobile phone communication

Freq. of mobile phone communication	Frequency	Percentage (%)
No communication	1	1
Communicates daily	0	0
Communicates twice a week	11	11
Communicates weekly	46	46
Communicates monthly	42	42
Total	100	100

Almost all the farmers, (96%), Table 10, in the dairy goat project are aware of mobile phone money transfer. Only 4% respond that they have not heard of the service. This level of awareness has enhanced the transfer of money between farmers as well as with those outside the project.

Upto 95% (Table 10) of these farmers use mobile phone money transfer service at least once in a month, to send or receive money from members of the family, members of dairy goat association or from other sources. They reveal that delivery from agrovets that demand payment before delivery of drugs has been instant once they receive their payment through Mpesa service.. Misappropriation of group funds is reduced since the money is sent directly from a member to the treasurer without passing through other hands.

Table10: Frequency of Mobile phone money transfer

Frequency of Mobile phone money transfer	Frequency	Percentage (%)
Never sent or recieved	5	5
Sent or recieved money daily	1	1
Sent or recieved money weekly	29	29
Sent or recieve money monthly	65	65
Total	100	100

The most popular use of mobile money transfer service, 65% is when members make payments of the monies they owe to the group in terms of dues. This has greatly reduced defaulting by members and improved the groups monthly collection of money. The financial strength of the group is tranlated into proper management of group activitie like periodic meetings and organized capacity building sessions on the identified gaps.

The second popular use of mobile money tranfer is to receive payment for goat milk that has been supplied. Payment at the end of the month is preferred by the milk suppliers as the money received is substantial and can be spent on a much worthy cause. 'Little money received every day immediately disappears into the kitchen', laments one farmer.

In a focused group discussion with KitheoNzao of Kakeani, It was pointed out that on several occasions members paid their dues to the respective groups through Mpesa service. Some secondary schools accepted payment through mobile money transfer which allowed the farmer to pay school fees without leaving his farm. While in the farm he continues to attend to the goats by fetching more feeds for the coming days. This arrangement has since been discontinued when some conman circulated fake mobile numbers purporting them to have originated from the school heads and coned many unsuspecting parents of lots of money, before the principals warned against sending money to such numbers.

Sixty nine percent of farmers agreed that mobile phone is a very useful gadget and they have seen its fruits in their lives as keepers of dairy goats. 30% described the technology as either useful or fairly useful whereas one percent had no idea as to the usefulness of mobile phone technology.Those who find it very useful have used it to communicate to members through voice call or by way of sms service and also to send and receive money to various destinations.

No innovation comes without its challenges. 99% of farmers were able to cite one or a combination of challenges that they face as they use mobile phone in carrying out their business of keeping of dairy goats. Top on the list is high cost of airtime* at 32%. This is followed closely by inadequate knowledge on use of mobile phones, which limits the number of features that a farmer can put to use on his/her mobile phone. Those who cite high cost of airtime, inadequate knowledge on use of mobile phone or both form 79% of the farmers, confirming that there is a burning dsire among the farmers to exploit the technology for increased dairy goat production.

Note * Airtime is currently priced friendly due to the intense competition among the mobile providers.

4.0 Discussion

By understanding and documenting the contribution of mobile phones to rate of diffusion of rearing of dairy goats in Kitui County, the study offers significant contribution to the development of dairy goat rearing in Eastern province and the adjoining areas. This will also be useful in the design of monitoring and evaluation frameworks that take into account the contribution of mobile phones to success of the project.

The dairy goat farmers of Kitui were selected on the basis of need. Rich farmers were left out and they are now the ones who have come up to acquire the goat breeds through their own efforts, having gauged the advantages of the project. They also do so with intention of supplying the Nairobi market where a litre of goat milk goes for about Ksh 300. Sharing of information among fellow goat keepers is much easier and encourages triability. When a farmer sees it being done by a neighbor he gets challenged. This fits very well with Rodger's principle of homophily. Rogers defines homophily as "the degree to which pairs of individuals who interact are similar in certain attributes, such as beliefs, education, social status, and the like". When given the choice, individuals usually choose to interact with someone similar to him or herself. Furthermore, homophilous individuals engage in more effective communication because their similarities lead to greater knowledge gain as well as attitude or behavior change.

The situation in Kitui presents similarities as well as differences witnessed in Uganda. Kitui dairy goat farmers consulted with experts on livestock management practices more than the proportion of Ugandan farmers who consult the experts. Unlike Kitui farmers Uganda farmers were able to undertake such specialized tasks like, taking photos of agricultural demonstrations, using the loudspeaker function to permit a group of farmers to consult with an expert, recording group members pledging when they will repay loans, and storing data such as the date hens should start laying eggs. The low numerical literacy level among Uganda women that affected their use of calculator features of the mobile phone is not a serious problem in Kitui. Martin and Abott (2008) conducted research in Uganda to evaluate the relationship between level of education completed and length of time owning the mobile phone under the assumption that those who are higher in education level would have adopted the mobile phone earlier. This was also noted with Kitui farmers about their educational levels.

In Nigeria, studies done by Bolarinwa et al, 2011 showed that extension agencies can adequately serve the farmers withneeded agricultural information in case ICT component such as mobile phone are employed alongside television and radio. The report concluded that there will be quick exchange of agricultural information between the extension agents and farmers if ICT components are integrated in delivery of agricultural information to farmers in Nigeria. In the same vein, extension agents will relay farmers' information needs to researchers and rapidly access large amount of information from the researchers through mobile phone for onward dissemination to farmers.

This position has been corroboarted by the high proportion of Kitui dairy goat farmers who engage the experts to exchange agricultuarl information on management of dairy goats and control of diseases. Farmers communicate with agrovet stores to procure feede supplements and to negotiate for market for their products. In the same breathe the importance of mobile phone among partners of the farmer cannot be overemphasized.

It was deduced from this finding that income status of the households, affected the attainment of food and nutrition security. Hence living standard of the cell phone users cannot be compared with non phone users..

5.0 Conclusion

The role played by mobile in agricultural production can no longer be ignored. The aspect of mobile phone communication must be embedded in the programming of the projects. Challenges notwithstanding, the technology has shaped the dairy goat keeping technolgy to a great extent in Kitui County.The result is improved family nutrition and household income. The higher percetage of farmers who offer part of their milk for sale confirms that the amount of goat milk produced often surpass the family milk demand.

6.0 Recommendation

The County Ministry of Agriculture Livestock and Fisheries should embrace technology and give mobile phones to their extension staff to reach the farmers. Development agents who design agricultural projects should include aspect of mobile phone communication; gadgets and capacity building to enhance farmer communications with other stakeholders.

Acknowledgement

We thank all the respondents and all stakeholders in Kitui County for their participation in this study.

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Factors Contributing To Low Productivity and Food Insecurity in Bungoma County, Kenya

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Abstract
Food is a basic necessity of life. Food insecurity within households is a risk to people's livelihoods. Households in Bungoma county of Kenya were noted to be food insecure due to low productivity and this state threatened peoples' livelihoods. The objective of this study was to examine the physical, economic, environmental and social factors that led to low food production in Bungoma County, Kenya. A cross-sectional survey design was used in the study and a cluster (multi-stage random) sample size of 400 households were selected. Tools used for data collection were questionnaires, interview guides, focus group discussions and observation checklists. Data was analyzed using descriptive and inferential statistics. The study found that land size was small, road network was poor and market systems were disorganized. The cost of farm inputs was high as well as high poverty levels. Climatic variability affected crops and animal production. Social support, traditional beliefs and culture which discriminated against women were key risk factors that contributed to low farm production, making households food insecurity. Based on the findings, the study concluded that low farm productions were attributed to physical (Poor road networks and small land size), economic (poverty and high cost of farm inputs), environmental (climate variability and pests) and Social (cultural belief and negative attitude) factors. The study recommended that costs of farm inputs should be subsidized, improve road network system and sensitize people on positive cultural practices and attitude change to allow both gender participation on issues of food security. The outcome of the study will guide decision-makers at all levels in formulating food policies. Reliable and timely information on the incidence and causes of low productivity and food insecurity will be documented. Recommendations from the study will assist households understand factors affecting production and be able to appropriately plan their farming schedules.

***Key Words**: Farm Productivity, Household Food Insecurity, Bungoma County, Kenya*

1.0 Introduction

Food is a basic necessity of life. It is a basic means of sustenance and key for healthy and productive life (FAO, 2010). If Kenya is to continue to cut down on health costs and compete in a global economy, it should ensure adequate food security and nutrition within households. Food insecurity within households is a risk to people's livelihoods. If not addressed in good time it could result into a disaster that will require foreign intervention for that affected community (UNISDR, 2004). The economic development of any nation is dependent on the productive capacity of human resources which is however a function of how well fed they are.

Poor farmers have little or no access to credit, particularly short-term seasonal credit for farming (Audsley, *et al* 2010). Under such circumstances, farmers plant uncertified seeds without fertilizer and the result is low production (GOK, 2011). Other studies showed that households that lack economic capacity are at a risk of being vulnerable to food insecurity (KARI, 2013). Crucial information on the type of interventions that can be most effective in increasing productivity, reducing hunger, targeting the most needy, informing preparedness and developing contingencies is lacking in most communities in Kenya (Lautze *et al* 2003).

Available literature indicates that Bungoma County is food insecure and also records a poverty index of 52.9% compared to the National index of 46%, while the food poverty stands at 43% (KNBS 2010). There is documentary evidence that Bungoma County has many stakeholders dealing with food security issues being led by the County Government (GOK 2013). This scenario would give an impression of high production and food sufficiency at household level but it is not the case. Food situation reports dating way back to 2011, show insufficient food stocks among households in Kenya (GOK 2011a). Records of studies done in Bungoma county revealed household food insecurity (NALEP 2012, Muyesu 2013, KARI 2013 and Ndienya *et al* 2013). Many families in Bungoma county take one meal a day, in contrast to the recommended three meals per day (UNICEF, 2009). Due to this controversy, the study was set up with the objective to examine factors that led to low farm productivity, making households vulnerable to food insecurity despite the County's interventions (GOK, 2015).

The study has immense contribution to the field because it will give recommendations to guide policy makers on issues of food security. Reliable and timely information on the incidence and causes of low productivity, food insecurity and malnutrition will be documented. The paper contributes to the knowledge bank important for scholars. It is arguable that findings of this study with a focus on Bungoma County will inform similar studies in other counties in the entire country.

2.0 Research Methods and Design

The study targeted household heads whose food security depended on farming. Community groups (women groups, men groups, youth groups and self-help groups) were targeted for focus group discussions. Opinion leaders, Non-Governmental Organizations, Community Based Organizations/Non-State actors, Faith Based Organizations and Government officials were selected as key informants.

This study was done in four sub-counties of Bungoma County; they included Bumula, Bungoma West, Mt. Elgon and Bungoma North (Figure 1). The County is located on the Southern slopes of Mt. Elgon, and lies between latitude 0^0 28^1 and latitude 1^0 30^1 North of the equator, and longitude 34^0 20^1 East and 35^0 15^1 East of the Greenwich Meridian.

The research work adopted a cross-sectional survey research design and the variables examined were physical, environmental, social and economic factors. The population for the study was household heads, key informants and formal organized groups. A cluster (multi-stage random) sample size of 384 households- calculated using a formula from the book of Mugenda (2008) was selected from households' population of 1,553,655 (KNBS 2009). This study utilized both primary data collected from the field and secondary data from archival sources. Data was collected using semi-structured questionnaires administered to the selected household heads. Four (4) Focus Group Discussions were held and each group was composed of eight to twelve (8-12) members of mixed gender. Twenty (20) key informants purposely chosen from opinion leaders, Government departments, Faith based organizations, Non-governmental organizations were interviewed. More information was obtained from observation checklists.

The quantitative data were organized, coded and edited by a process called data cleaning (Punch, 2003). The statistical package for social sciences (SPSS) was used to analyze data. Two analyses were made. Descriptive analyses were done by use of means, modes, standard deviations, variance, percentages, and frequencies) while inferential analyses done by use of chi-square test and Spearman rank order correlation.

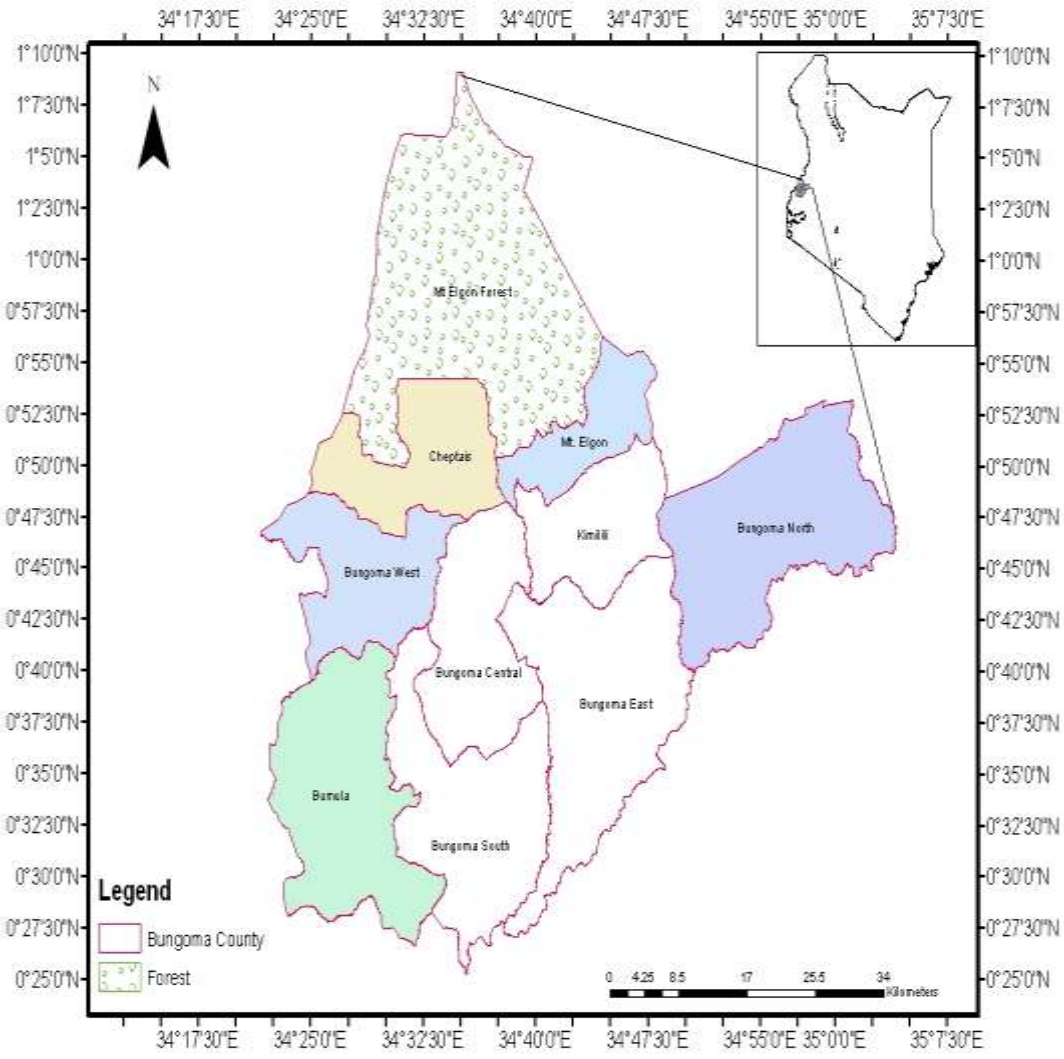

Figure 1: Map of Bungoma County, Kenya, showing demographic boundaries of Sub counties

3.0 Results and Discussions

1. Physical factors

Various physical factors were identified as contributors to low productivity. These included small land size for farming, poor road transport network due flooded roads (Figure 2)and inadequate storage facility for farm produce. Lack of cold rooms for perishables and small volumes. The soil was infertile and this led to low yields and disorganized marketing system. Chi-square tests revealed a significant relationship between physical factors and production levels in the county (*p*-value = 0.035; < 0.05).

It was also established that markets were few and far apart from farmers. The distribution of farm produce outlet included; farm gate level, neighbors, local or open markets and others (Figure 2). International markets fetches better prizes but unfortunately, all households interviewed had no idea of existence of export market.

Very little produce was sold to supermarkets, meaning low incomes that could not enable farmers to purchase certified seeds or other food items not produced on the farm. The seasonal roads as well as lack of means of transport made farmers to sell their produce at low prices on the farm. Besides this, farmers did not have government permits and certificates of operation to enable them penetrate the supermarkets in the country.

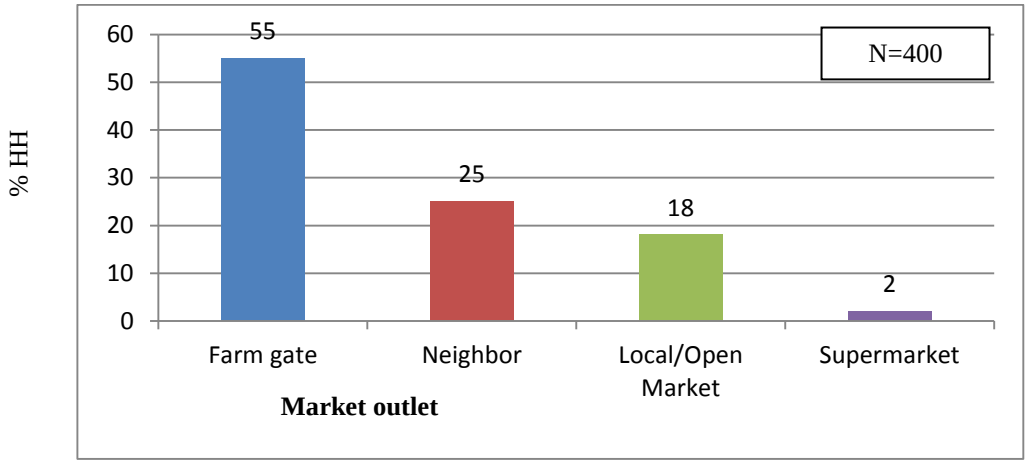

Figure 2: Market outlet for households' farm produce in Bungoma,Kenya

2. Economic factors

In order to earn a living and be food secure households engaged in the following activities: Dairy production, maize farming, horticulture, banana farming and petty trade. Most of the households depended on farming with some shifting from subsistence to business farming to raise income. Similar views were found by Makhanu *et al*. 2012 working in the same region; this shift in attitude to do farming as a business reflects current trends of blending specialization and diversification to reap optimal benefits by smallholder farmers. This was also observed by similar studies as captured by government policy initiatives in Agriculture (GOK 2007).

The economic factors that contributed to low productivity and food insecurity were listed as high levels of poverty and high cost of farm inputs. Due to high cost of farm inputs like fertilizers and certified seeds, majority of the farmers planted uncertified maize seeds (*number nane)* and without fertilizer. As a result of planting uncertified seeds, the cereal yields were so low that it hardly sustained a household for three months after harvest. Horticulture farming was affected due to non-use of chemicals to control pests and disease.

3. Environmental factors

Environmental factors contributing to food insecurity were found to be natural calamities like drought, floods, hailstones and inadequate / unreliable rainfall. Crops on farms were at the risk of natural calamities like hailstones (Figure 3). Too much rainfall led to floods which damaged both properties and livelihoods. Human activities like cutting of trees led to deforestation and this resulted into soil erosion. Erosion made soil unproductive as the soil nutrients are washed downstream, hence food insecurity for such households. Other factors established were pests and disease outbreaks which were a risk to both crops and animals. This finding is comparable to a study done by Ahmed *et al* (2010), which revealed that increasing vulnerable environmental conditions such as diminished biodiversity, soil degradation or growing water scarcity can easily

threaten food security for people dependent on the products of the land, forests, pastures, and marine environments for their livelihoods. These findings also support Kenya Government recommendations for adapting to climate change like; conservation farming, right land use practices that reduce emissions of greenhouse gases (GOK 2011).

Figure 3: Mama Nekesa's maize crop damaged by hailstones in Bungoma County, Kenya

3. Social factors

A key social factor contributing to vulnerability was the gender of the household head. The study established that 80% households were headed by men while 20% were women. All decisions in the household were made by men. In many cases men were found to be the cause of food disasters in their own homes. Women had no say in decision making concerning food issues where men were heads. Men made final decisions in relation to land allocation for different crops, when to market farm produce and the use of cash from sale of farm produce (Figure 4). The study further revealed that women were in the same category with children, so they could not be allowed to make final decisions in the households. One Man, during focus group discussion quoted the Holy Bible (Genesis 2:18 where he said 'women were made to assist men), therefore they should always be subordinates to us'. This notion made households vulnerable to food insecurity as productive ideas from women may not be adopted. The findings were similar to the study done by Lautze *et al.* (2003) who found out that positive traditional value, customs and ideological beliefs contributed to social vulnerability of any given household.

Focus group discussions recorded that culture prohibited working on the farm during bereavement and this contributed to low productivity incase funeral occurred during planting season. Farming activities may be stopped for periods exceeding three weeks. This can be crucial as even a small period of time lost affects agricultural production (Africa Progress Report, 2015,). Laziness, idleness among the youth and theft of farm produce while in the farm and store were mentioned as contributing factors to food insecurity.

Key informants quoted lack of knowledge on production and storage as factors leading to low productivity and household food insecurity. This was also revealed by household interview results, where 61% of the household heads only attained primary level of education, meaning they were limited in knowledge and the level of understanding of new farming technologies.

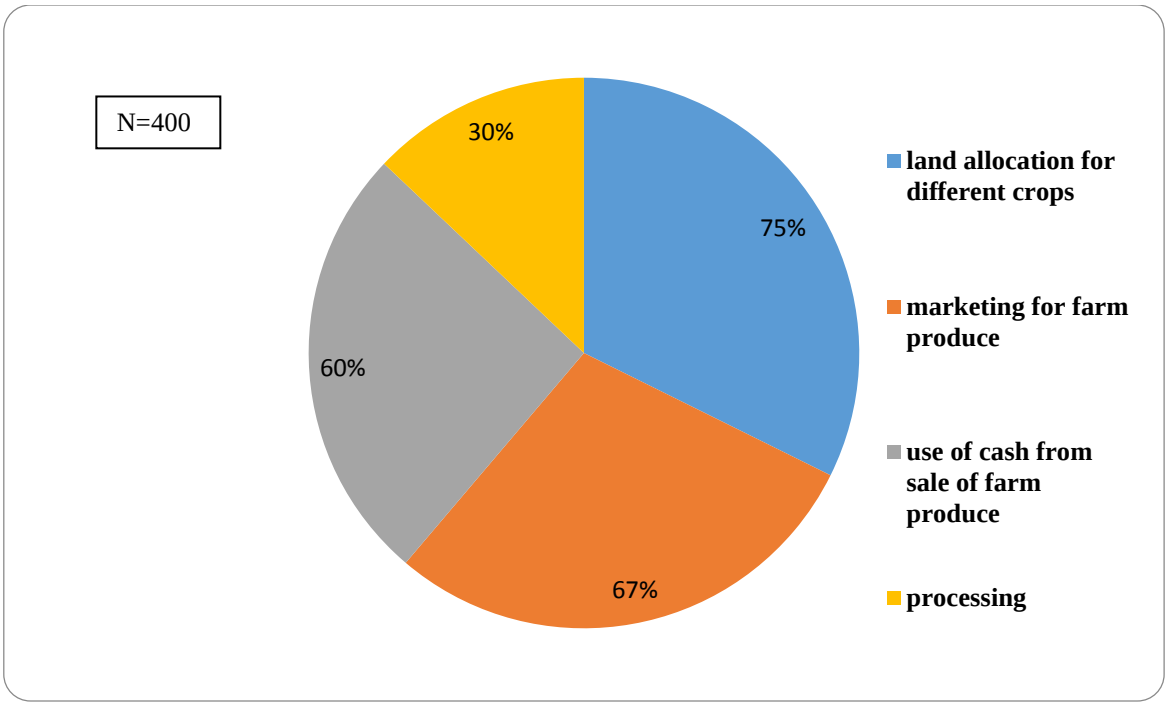

Figure 4: Decision making in relation to food security within households, Bungoma County, Kenya

4.0 Conclusion and Recommendations

Farm production by Households in Bungoma County were found to be low and hence making them vulnerable to food insecurity because of the following factors; physical (Poor road networks and markets), economic (poverty and high cost of farm inputs), environmental (climate variability and pests) and Social (cultural belief and negative attitude).

The study recommended that the County Government of Bungoma should subsidize costs of farm inputs and make it accessible to farmers, the road network system should be improved to ease transportation to access markets for farm produce, people should be sensitized on positive culture practices and attitude change to allow both gender participation on issues of food security. Farmers to embrace climate smart agriculture.

Acknowledgement

The success of this research paper is bestowed upon the parties acknowledged herein. The farmers of Bungoma County for giving information about their households, food security stakeholders working in the county for their collaboration, and the National council of Science and Technology (Nacosti) for funding the project. I am also grateful to my colleagues, fellow students and family

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God bless all.

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Factors Influencing Green Maize Harvesting Towards Innovative Research and Knowledge for Global Copmetitveness and Sustainable Development: Case Study of South Nandi District

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Abstract
The purpose of this study was to assess the challenges facing the society specifically the farmers and the country on the growing popularity of the green maize harvesting within the growing areas. The study was geared towards finding out the role of policy makers in understanding the reasons why farmers were opting to sale green maize rather than wait to dry up. The study investigated the role played by the provincial administration and the Ministry of Agriculture in either promoting or discouraging green maize harvesting towards achieving a knowledge economy through research and innovations. The research also investigated the effects of green maize harvesting on farmers food security, National food security policy in Kenya. The study was guided by motivational theories. The study aimed at achieving the following objectives; to establish the factors that influence green maize harvest in South Nandi district; to evaluate pros and cons to which commercialization of green maize harvesting affects the socio-economic status of farmers; to examine the consequences of green maize harvesting. The study utilized purposive and simple random sampling technique. The study employed descriptive survey design with questionnaires and interview schedules as data of collection instruments. Both qualitative and quantitative methods were used to analyze data. Based on the findings, recommendations were made to capture all that benefits the farmer, the consumer and the state as the regulator towards being food secure.

Key Words*: Green Maize, Food Security, Challenges*

1.0 Introduction

In recent years, Kenya's cereal (maize) farming has over time become more commercialized. The yields realized from farming however depend, on rainfall patterns. This questions the country's' position towards fighting food and crisis for use of alternatives means of maize production that would involve irrigation of arable areas. Maize is a popular cereal and is considered a stable food *(ugali)* in Kenya. Reports within Africa indicate that, farmers and consumers in Kenya, Malawi, Zambia and Zimbabwe are the greatest beneficiaries of maize farming. It is noted that maize consumption with vegetables (especially the traditional vegetables) improves local diets and live hoods. Like in many parts of the world, farmers locally in Kenya have suffered the consequence of dependency on rainfall maize production over time with the worst year being the 1984 drought, which saw them lose all their valuable crops (Daily Nation Feb 2010). This resulted in farmers failing to service the loans they had borrowed from AFC (Agricultural Finance Corporation) and as such, it became evident that the agricultural institution was no longer in good terms with commercial farmers. This has however changed in recent years thanks to AFC's ability to adopt policies that will help the farmers mitigate economic hardship that are as a result of drought. In North America, maize was and is grown to supplement human food and fodder for animals in the dairy sector. Maize cereals also provides for the extraction of products that are used in many industries as a source of energy and alcoholic beverages i.e. beer and local brews. In Asia, this crop has rapidly become a stable food in addition to the many uses in both the dairy and industrial sectors. It as also been used as an alternative source of energy in countries like the USA who consider hydro energy as a more expensive source of energy

When the maize crop is harvested, it is dried and shelled. From this the maize cereals attained and can be put to different usages' such as *posho* flour for making *ugali.* In most households in the developing world, dried maize cobs from the maize has been shelled serve as alternative source of energy which is used for cooking. Secondly most countries are advancing their dairy sector and maize cereals are providing materials to make the dairy meal for dairy usage. (McCann, 2000), pointed out that, by 1920s maize cereals had become a dominant cereal crop both to African & European farmers in Kenya.

Currently green maize is becoming popular with the urbanite populations who use the maize to make *githeri* (local meal of mixed beans and maize). Green maize harvesting has constantly been influenced by price in relation to resource allocation in both production and consumption and this is an agreement with what Timer (1995:293) says in another context on price policy that 'on markets trace the effect of changed price levels, especially of food grains, on consumers, producers and the government budget as a result of food shortage.

The unfavorable climatic conditions have over the period changed and have given the researchers, governments, lead companies and farmers to ensure that maize production does not collapse.Ngethe and Owino, (1990: 34) asserts that, "Policies on food security and self sufficiency span all the major policies for increasing agricultural productivity, such as marketing and pricing, research and extension, infrastructure, credit and major input policies".
Evidence suggests that green maize sale is affecting food security and exercabating household poverty.

2.0 Materials and Methods

The study adopted the descriptive and exploratory research design, this being a case study. According to Kothari (1990), descriptive research studies are concerned with the description of characteristics of an individual or a group of people. Exploratory studies on one hand are concerned with the formulation of problems which generates facts leading to more investigations. Another scholar Mugenda (2003), the design in uniqueness involves and offers an in-depth study of a social unit. From descriptive survey, the research design in the study was able to offer information with more emphasis on variables related to the green maize business in the design location. The aim of the study was to investigate the relationship between genders, age, respondents' class, respondents' type on the factors influencing the green maize harvesting. The questionnaire was used to obtain data for the study. Data obtained was analyzed using both descriptive and inferential statistics. This method employed offered a successful investigation into the relationship between variables towards a successful study.

The target population for the study was the farmers, middlemen and the businessmen in areas of Kesegon, Kaptumo, Kibwareng and Nandi Hills locations was 4000. The said population excluded the children, even those going to school. Purposive and random sampling was used to select the farmers who have participated in one way or another to the success of the green maize of the business. As from what the study opted, this basically was to help reduce the margin errors at the end. The participants were owners of the green maize, being middlemen or the business men and women. The study included other stake holders the public officers; Public Administration, Ministry of Agriculture in the district. Purposive and random sampling was used to identify the sampled group of 626 individuals. The researcher obtained 188 as the representative sample for the study.

3.0 Discussions

The sampled study comprised of 188 farmers who were both men and women. The study wholly comprised of the farm owners, businessmen, middlemen, Ministry of Agriculture and the public administration. The study indicated that from the four areas showed the distribution based on gender on total participation towards the growth of green maize sale.

Table 1: Study Sample

	M	F	A/M	MOH	TL	%
Kibwareng	22	30	1	-	53	100%
Kaptumo	30	22	2	2	56	96.7%
Kobujoi	12	22	4	4	42	96.7%
Nandi Hills	11	10	4	3	28	86.7%
	82	84	11	9	179	100%

Source: Field data 2012

The study was carried out in four locations of Kibwareng, Kaptumo, Nandi Hills, and Kobujoi of South Nandi district. A total of 188 questionnaires had been distributed with each location with 47 questionnaires.

In Kibwareng location, the response showed 100% participation where live experience was shaped by the daily operations. The study therefore attributed this response to some factors like farmers' awareness and the general knowhow concerning farming as business enterprise. In the assessment it showed that Kaptumo and Nandi Hills locations performed equally well on business related activity. Kobujoi, as indicated in the table showed that male and female doing farming as a business adopted the willing buyer.

3.1 Gender Distribution

From the questionnaires the researcher found out that both male and female participated in the sale of green maize. It also shows that the number of male respondents was low in nearly all the locations, other than in Kobujoi where they nearly equaled women participants.

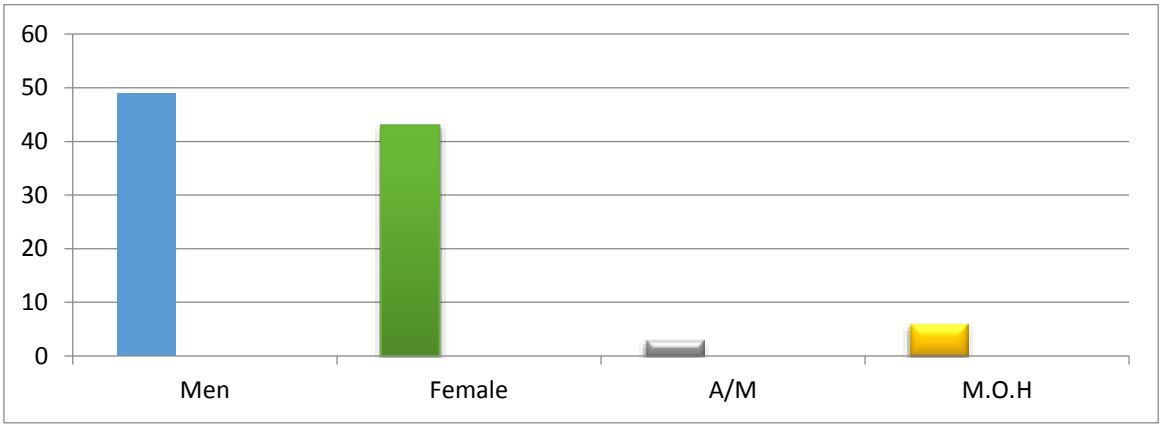

Figure 1: Gender Distribution

Figure shows the distribution of men and women in the sale of green maize. From the study it shows that women in the business are forming 43% whereas male 49%, while those in administration 3% and the ministry officials 6%. Generally women were active players in most areas (location) where G.M.S is taking place.

Table 2: The Gender Distribution

Responses	Participant	%	M.o.H	%	A/M	%
Male	82	49	5	31.25	7	66.7
Female	80	43	11	68.75	3	33.3

Source: Author, 2012

The table shows the role played by men in the green maize harvest and sale shows that they control the entire process. Among the government officials (participants) men dominated the work force in enforcing departmental policies. The table further elaborates the role played by female in the expansion of the same. It explains the expectation and the rewards which have assumed their duties and their environmental demands.

The clip shows a ready maize farm, which according to the farmer is like cash at hand depending on the arising needs. The owner of the ten acre farm believes that it is upon the government to protect the farmers from constant exploitation from the middlemen. This farmer openly expressed fear of dry maize prices and that is why he was preparing to sell green maize.

Plate 1: Green maize truck lorry at several stop over between while on the business.
Source: Field Photo 2012

The plate shows a busy transporter, dealing with green maize at one of the destination (Moi University) where the number of consumers of the same has been attracting many consumers.

Table 3: Age distribution of respondents

Response Age bracket	Male	%	Female	%
18-24	24	25.4	6	6.4
25-31	28	29.8	16	17.0

32-38	22	23.4	32	34.2
39-45	15	16.0	16	17.0
46 above	6	6.4	24	25.4
Total	**94**	**100**	**94**	**100**

Table indicates that male participants were active in GMS between the age bracket of 18- 24 standing at 25.4 %, 25-31 at 29.8 % and 32-38 at 23.4%. In this age bracket, the youthful men are attracted to trade and in the company of successful middle men, transporters and farmers who are selling off their maize. But as men advance in age they become more conserve and are interest in pure farming but not in the green maize sale. They are not ready to sale their maize.

Table 4: Occupation of the Respondents in the Area of the Research

	M-youth	**F-youth**	**M =%**	**F=%**
Farmer	10-18	4-0	72.5	27.5
Businessman	4-30	2-5	66.5	33.5
Middlemen	2-17	0-4	100	0
Ministry officials	2-3	2-2	50	50
Public administration	2-2	2-3	50	50
Other	22-15	18-15	20	80
Total	**42-85**	**28-29**	**55**	**45**

Source: Field Data; 2011

Table illustrates the daily entry of individuals in the designated duties, and where farmers are participating; the results attained showed that the male farmers do participate most in the exercise. Nonetheless this may not be a true picture among the Nandi community where men held a lot of authority. The scenario here is direct roles played by men, towards the creation of self made complaints are raised by their spouses or female partners are taking of their family needs. The response provided information that 72.5% against 27.5% men and women respectively, were highly involved in maize business at whatever dealings.

Farmers have played a positive role in and are those with primary education; forming 14.9%. The 24% recorded in the study showed that the elderly members of the society put emphasis on good farming and in them; they accommodate the green maize sale. They still believed that all farmers are supposed to have storage facilities so as to be able fight hunger. Their responses were guided or demand driven. From the study farmers saw it wise for the government to support the farmer to reclaim his lost glory of being a commercialized farmer. Failure to this has led to the growth of green maize.

3.2 Marital status

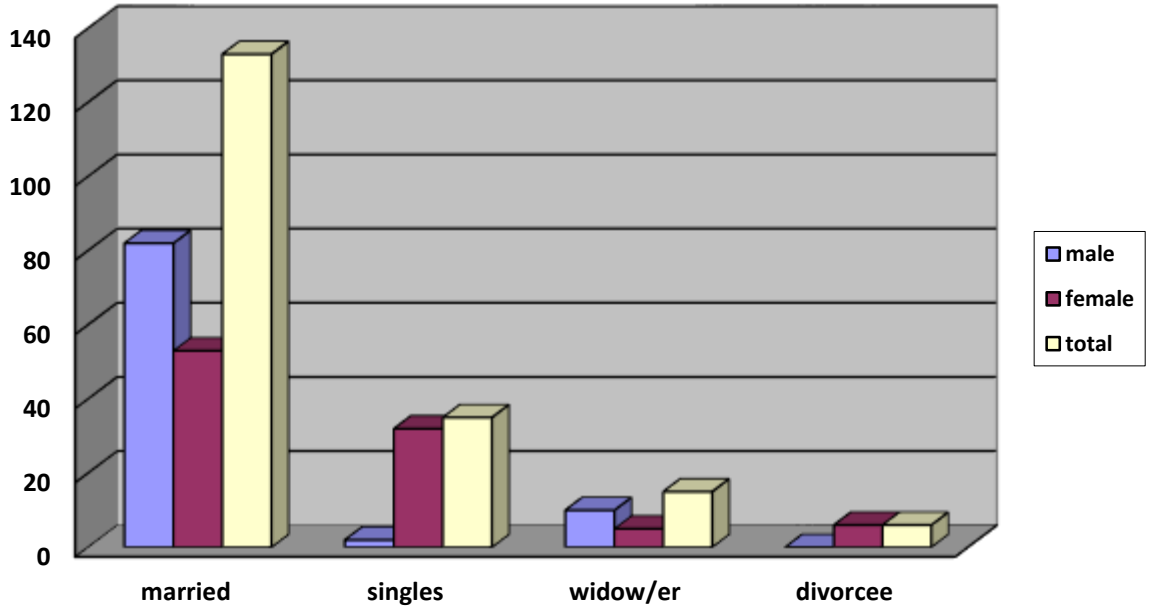

Table 5: Summary of activities taking place in the farm

Response	Popularity	Solution	Is it a sol	Rewarding	Sustainable	Affective	Family decision
Yes-	140	Poverty .68	93	137	50	170	120
No	48	Money. 85	95	51	138	18	68
		Unemployment .35					
Total	**188**	**188**	**188**	**188**	**188**	**188**	**188**

Source: Field Data 2011

The respondents from the table showed that the green maize harvest and sale was truly on the rise. It was from this believe that will make the government have a second thought and think other wise on the issue of food security in the country. The second column analyzes critically on the causes and its popularity. On the same, it became a reality that, money paid for the green maize is higher than the benefits from the dry maize. Those who thought that money is factor or played a role were 85. Some thought that poverty is making people to sale their crops, and others on the same approach still see it as an eye opener to the locals. Had it not been for poverty farmers would not sale their crops anyhow. And they are about 68. Then another group, who are associated to the green maize, believes that it is a factor of unemployment. Majority of those found to trade on green maize claimed that they cannot fend for their families not unless they get any substitute, as a source of finance.

The study showed that about 40% did support the liberalized market, where each person can do what ever he or she thinks best suits his/her farm. The study raised questions about the authenticity of the government policy on the Green maize sale. Issues on the root cause of Green maize sale arose and more so factors that were disregarded by the elderly farmers. The respondents (old) people saw it as a scheme to wipe out their economic strength and open a Pandora box which leads to hunger and deaths in case of emergency.

4.0 Conclusion and Recommendation

The study attempted to evaluate the role played by farmers, businessmen, middlemen and the government agency in establishing a food secure and a stable region as matter of security. The report in the study by the respondents' revealed that green maize businesses have existed ever since but from 2004; but each year it is doubling and is greatly affecting food security. The point of poor planning may arise at some time but not because of maize as the source of income to most peasant farmers. Though to some extent have improved farming by having diversity among farmers in the region.

Farmers were dissatisfied by the way the Ministry of Agriculture has performing their task. They are actively working with them on the technologies and as a result they are harvesting poor yields. The Green maize business has no standardization during or at green maize trading. The buyer has the sole monopoly over the farmers. And yet the farmers has invested heavily, this impedes the farmer development and thus affects his years long investment.

Another finding is that, Government does have misplaced priorities though she has the best policies. Farmers put it clearly that those in power are not working for the government but to satisfy their own ego. According to their understanding down from the Minister of Agriculture, Livestock, Fisheries and others, they are there to serve their political masters.

Political patronage, ethnicity and pride over the agricultural farming communities have made the ordinary Kenyans being subjects of continued poverty. Most farms end up being left fallow. And from them, most of the youths are moving to urban centers, towns and cities as a resort to growing poverty. Another problem is coming

The government commits more towards her policy statements. This will encourage and enable farmers to be access to affordable farming. Provide with subsidized or loan facilities with the low interest-rates (recent) activities to enhance credit facilities by the financial institutions. There is need for civic education and be conducted among farming communities. This would enable the farmers make a wise decision on the green maize and the future implications.

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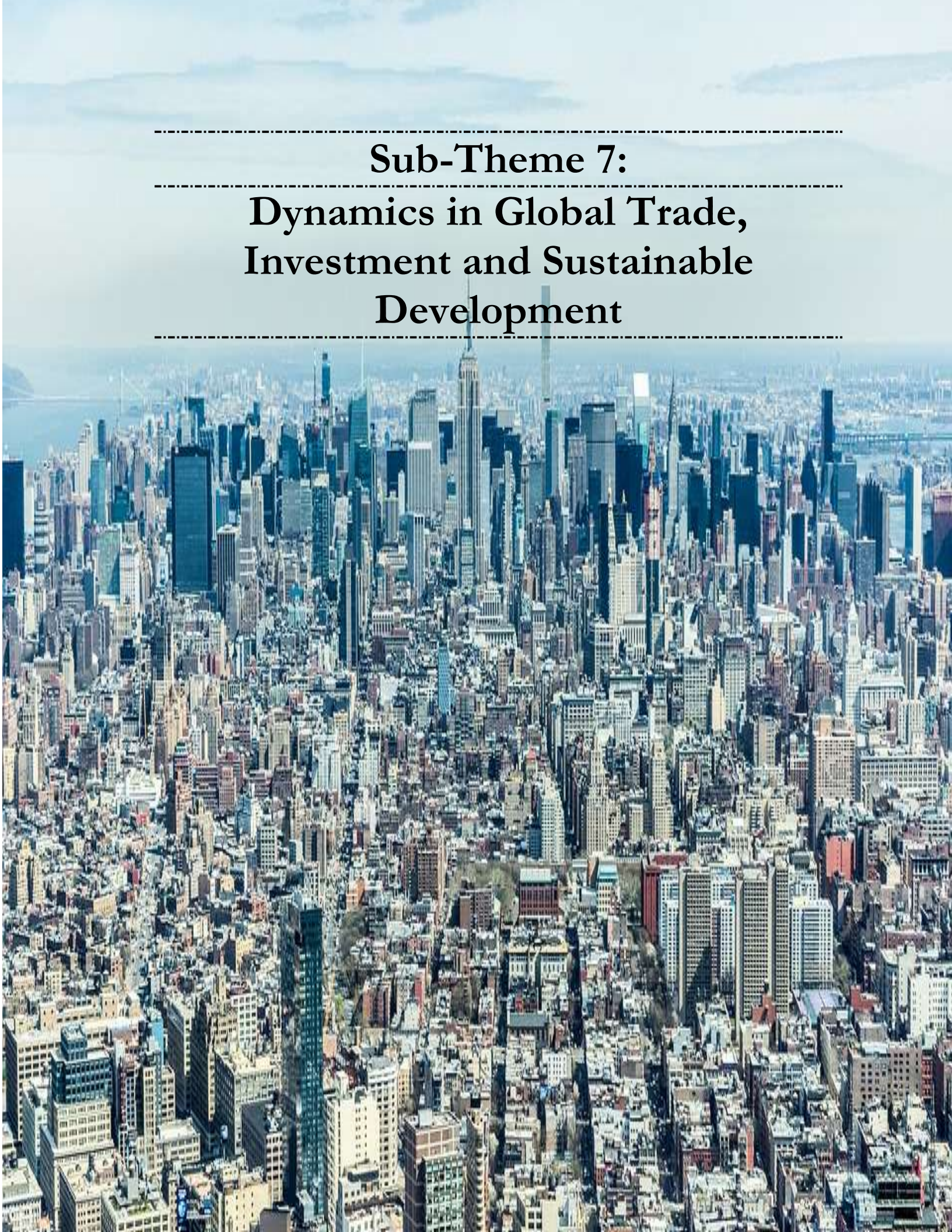
Sub-Theme 7:

Dynamics in Global Trade, Investment and Sustainable Development



Assessing Accounts Payables Management as a Determinant of Profitability on Agro-Firms in Eldoret Business Centre

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Abstract

Most agro-firms in Eldoret business Centre have been operating without accounts payables management as a component of working capital meaning it has been difficult to manage their working capital. Businesses are expected to manage their working capital, and its components to enable them generate profitability in their businesses. The purpose of the study was to assess Accounts payables management as a determinant of profitability. The main objective of the study was to assess the effect of management of accounts payables on firm's profitability. The study was guided by Baumol, Miller-Orr, and Stone models. The study adopted a descriptive survey design with a target population of 510 respondents. Purposive sampling technique was used to sample 51 managers, while simple random was used to sample 214 other employees and data collected using questionnaire. Validity of the instruments was determined by the experts and reliability determined using Cronbach Alpha. The findings revealed a cronbach's alpha coefficient of 0.716 and 0.781for Management of Accounts Payables and profitability, respectively. The data was analysed using both descriptive and inferential statistics. The study established that, management of accounts payables (p=0.001), is a predictor variable for profitability of agro firms. This study recommends that there is need for managers to create value for their shareholders by ensuring effective and efficient management of creditors. Owing to the limitations of the study, it is suggested that same study be done but in other sectors to allow generalizations of the study findings. Besides, apart from Accounts Payables, other determinants of profitability need to be further studied.

Key Words *Agro-Firms, Accounts Payables, Profitability, Eldoret Business Centre*

1.0 Introduction and Background

Accounts payables is referred as the spark of life and nerve centre of any business Deloof, (2003). Within the existing industrial world, Accounts payables refers to a components of short term funds essential for supporting the entire duration of the operating cycle of a business known as Accounting period. Therefore, it's a transaction capital that is not maintained in the business in an exceedingly explicit type for over a year (Gill *et al.*, 2010).

Maintenance of accounts payables as component of working Capital is said to be adequate once the working Capital is adequate as it'll result in business protection from adverse effects of shrinkage in the value of current assets (Kaur 2010). Adequate capital permits carrying of inventories at a level that will allow a business to serve reasonably to customer requirement, enables a company to offer favourable credit terms, to operate its business more efficiently (Pandey, 2006).

Profitability of the firm is additionally affected by excessive capital referred to as a scenario of idle funds that earn no profits for the firm. The evils of excessive capital are and it should be tempted to over trade and loose heavily, needless accumulation of materials, imbalance between liquidity and profit, high liquidity can involve a corporation to undertake larger production that will have an identical demand. It'll realize itself in an exceedingly embarrassing position; its marketing policies

aren't properly adjusted to enhance the marketplace for its product (Bhattacharya 2009). Most studies with reference to asset management support the actual fact that aggressive working capital policies enhance a firm's profitability. Previous studies worldwide like Jose *et al*. (1996), Shin and Soenen (1998), Wang (2002) and Deloof (2003) supported the fact that reducing the net credit amount might enhance a firms profitability, permitting managers to make value for the shareholders by reducing the investment in current assets.

Padachi (2006), management of payables is vital for the monetary health of all businesses, no matter kind and size. It's necessary that inefficient working capital Management might not solely scale up profit. Sound payables management ensures that organizations have the power to fulfil their short-run liabilities adequately and on time. Where-ever companies have accumulated idle resources which cannot generate any financial gain or as indicated forestall inaccessibility of enough monetary resources required for meeting short-run monetary obligations. Thus, this explains why it's usually argued that efficient payables management is incredibly vital in achieving the main objective of the organization, which may be a firm's profitability.

1.2 Statement of the problem

The most significant issue in Accounts payables management is maintaining of liquidity within the daily operations of a firm, since it helps in preventing creditors and suppliers whose claims are due within the short term from exerting unwarranted pressure on management. This means that, the objective of Accounts payables management is to ensure maintenance of satisfactory level of working capital to prevent excessive or inadequate availability of assets (Filbeck and Krueger, 2005).Working capital management efficiency is essential particularly for agro firms; wherein the main part of assets is composed of current asset (Horne & Wachowitz, 2000). It directly impacts the profitability and liquidity of organizations (Raheman & Nasr, 2007). Accounts payable is the most important factor for keeping liquidity and profitability of commercial firms (Mukhopadhyay, 2004).

The statement by Filbeck and Krueger is supported by Bhattacharya (2009) who stated that inadequate working capital ends up in the subsequent dangers; the firm might not be able to profit from discount facilities, credit worthiness of the company will be jeopardized due to lack of liquidity, may not take advantage of business opportunities that are profitable, they won't be able to pay dividends because of non-availability of funds, they might borrow funds at unconscionable low liquidity and interest rates can result in low gain, loses its reputation on account of not conformity to its short term obligations.'

In Eldoret Business Centre, businesses register for operation, majority of the businesses operate for a year or two then closes, several scholars would really like to understand the explanations behind the unexpected closures. From numerous feedbacks, it's noted that stock wasn't properly managed; debtors weren't paying their debts, and this suggests that firms aren't generating profits. However, the question that is still unanswered, based on Bhattacharya's findings is how effective is the management of payables on profitability, hence the study Accounts payables management as a determinant on profitability.

Objectives

The study's main objective was to determine the assessment of Accounts payables management as a determinant of profitability

Specific objectives were:

(i) To determine the assessment of payment period on agro-firm's profitability
(ii) To determine the assessment of creditors on agro-firm's profitability

Hypothesis

H_{01}: There is no significant relationship between management of accounts payables and profitability.

2.0 Literature Review

2.1 Management of accounts payables and profitability

Accounts payables, which arise directly from the business's operations, represent a valuable source of internal spontaneous short term financing that is unsecured and flow of cash (Maness, 1994, Scherr, 1989). Accounts payable is the largest for cash outflow in many firms (Gallinger and Healey, 1987). They are also a notable source of interest free financing (Fraser, 1996). Accounts payable comes in due to the unsynchronized timing of allocation of goods and the services, to the extent that payment occurs after receiving goods and services, credit, which is a source of funds, has been created Asch and Kaye, 1989, Van Home, et al. (1985). Accounts payable is likely to fluctuate with changes in operating activities (Hill and Sartoris, 1992, Ross, et al. 1990, Richards and Laughlin, 1980).

Accounts payables are suppliers whose invoices for services or goods have been processed but not yet settled. Alternatively, trade credit denies the organization discount paid which can be considered as an implied cost. To add on that, trade credit may ruin the reputation of the company if supplier is not paid. Petersen and Rajan, (1997), say, delaying payments to suppliers makes a company to evaluate the quality of the goods bought and a low-fee and flexible supply of investment for the company then again, credit in change is a herbal supply of investment that lowers the amount needed in financing the sums secured up in the inventory and accounts of clients. (Wilner, 2000)

Dolfe & Koritz (1999) say a company's short-term debt is very much determined by the money paid and the main part of this cash flow consists of accounts payables. Changing the routines which can give the company great savings, usually in the form of interest and a reduction on penalty interest and step to better the payment process is to retain firm funds in a safe account for long until payment to get interest is possible. The cash flow of accounts receivables gives rise to short-term reserved earnings and at times short-term shortages in companies' liquidity, coming up with a need for short-term financing, and it is hence important to have a well-functioning payment routine. (Larsson & Hammarlund, 2007)

It's far taken into consideration to be suitable phrases to apply powerful credit that is given to the company. Paying earlier than the due date incurs loss in shape of non-interest for the company and if price is paid now not on time penalties are paid in terms of interests on expense incurred. (Karlsson, 1997) Nevertheless, one should keep in mind that firms with severe liquidity problems can also deliberately delay payments to suppliers while waiting for cash flows from clients. This exact becomes adjustment between the price of short-term financing and the cost of penalty interest. As the financial turbulence and the decrease in economic growth can have a negative impact on firms.

3.0 Research Methodology

A descriptive survey design was adopted where an investigation of variables that constitute what is happening or what has happened and of which the researcher has no control over (Greener, 2008). Kothari, (2012) it includes surveys and fact finding enquiries of different kinds. According to Kerlinger (2000) it allows you to employ both quantitative and qualitative approaches.

Target population is the entire group of people, events, or things of interests that the researcher wishes to investigate (Mugenda and Mugenda, (2003), the universe may be finite or infinite where finite population is one which has a definite number of items. When the number of items is infinite the population is said to be infinite universe or infinite population (Mbwesa 2006).
Fifty one (51) agro-firms were targeted with 510 employees as revealed in table 1.

Table 1: Target Population

Employees Categories	Population
Managers	51
Veterinary officers	80
Supervisors	51
Accountants	51
Sales Assistants	277
Totals	510

Source: County Government of Uasin Gishu (2016)

3.1 Sample Size and sampling technique
Kothari (2012) defines sample as a sub-group of a population or universe; sampling is the process used in selection. (Baker, Gandhi, 2007) argues out that a sample should be picked in such a way that it represents the entire population to be investigated. Kothari (2012) explains that the size sample should neither be excessively large or small. Table 2 shows the sample size:

Table 2: Sample Size

Employees category	Population	Sample size
Managers	51	51
Veterinary Officers	80	37
Supervisors	51	24
Accountants	51	24
Sales Assistants	277	129
Totals	510	214

Source (Author, 2016).

3.1.1 Sampling technique
Trochim, (2005) sampling is the process of selecting a representative sample of elements from the population. To get a representative sample, the researcher used purposive sampling method to sample top managers of Agro- firms, the selection of a study is sample based on experience or knowledge of the group to be sampled. For the case of selecting other employees the researcher used simple random sampling technique as shown by the formula in the next paragraph.
In order to determine the sample of other employees the researcher used Yamane's (1967) formulae which are as follows;

$$n = \frac{N}{1 + N(e)2}$$

Where;
n is sample size,
N is population size, (459)
e is level of precision (0.05).

Therefore n=

$$\frac{459}{1+ 459\ (0.05)2}$$

n= 214

Therefore, 51 managers were sampled using purposive, 214 respondents were sampled using simple random sampling, making a total of 265 respondents.
The data collection instruments used was developed by the researcher, a questionnaire. The designed questions or items in word format are distributed to the respondents. This method collects a lot of information over a short period of time. Five point Likert scale structural questionnaire was useful in analysing data in questions that directly involves the attitudes of the respondents.

3.2 Validity of research instrument

Creswell, (2011) supports that validity is the extent to which research instruments measure what they are intended to measure. To validate the questionnaire, a pilot study was used to the selected separate respondents, but a similar sample to the one in the study. The results of the questionnaires piloted enabled the researcher to determine the consistency of responses which were made by respondents and adjusts the items accordingly by revising the document.

3.3 Reliability of the research instrument

According to Mugenda & Mugenda, (2003) reliability is a measure of the degree to which a research instrument produces reliable results after several repeated trials. Reliability followed the following steps: the developed questionnaires were given to a few identical respondents subjects not included in the main study, the answered questionnaire was manually answered. After two weeks the same questionnaire was administered to the same group of subjects, meaning that the instrument used in test-retest method. The constructs testing for reliability was achieved by calculating the Cronbach's alpha.

Table 3: Reliability Test of Constructs

Variables	Reliability Cronbach's alpha	Comment
Accounts payables management	.797	Reliable
Profitability	.781	Reliable

Cronbach Alpha was used to test the reliability of the proposed constructs. The findings indicated that Management of accounts payables had a coefficient of 0.797, and profitability had a coefficient of 0.781, hence the values of Cronbach's Alpha are above the suggested value of 0.7 thus the study was reliable (Nunnally & Bernstein, 1994). Sekaran and Bougie, (2010) states that the closer the cronbach's alpha is to 1, the higher the internal consistency of reliability. The measure ranges from 0 to 1, where a value of 1 indicates perfect reliability.
The Regression Model:

$$\mathbf{Y = \beta_0 + \beta_1 X_1 + \varepsilon}$$

Where:
Y = Profitability
X_1 = Management of accounts payables
β = Constant
ε = Error term. (Random variation due to unmeasured factors)

4.0 Findings and Discussions

4.1 Descriptive statistics

4.1.1 Response Rate

214 respondents were sampled for the study hence the same number of questionnaires was issued. However, 205 questionnaires were received and 8 were poorly filled and were not used in the analysis. Total number of 197 questionnaires was used for analysis and this represents 92.1% response. This was supported by Survey Monkey. (2009) which stated that the widely acceptable minimum response rate for Face-to-face: studies is at 80-85% is rated good

Table 4: Response Rate

Questionnaires	Actual Response	Response Percentage
Not returned questionnaires	9	4.2%
Poor filled questionnaires	8	3.7%
fully filled returned questionnaires	197	92.1%
Total	**214**	**100%**

Source: Field data

4.2 Background Information

Descriptive statistics relating to the socio-demographic characteristics of respondents are presented in table 5;

Table 5: Demographic Characteristics of the Respondents

Variables		Frequency	Percentage
Gender status	Male	120	60.9
	Female	77	39.1
	Total	**197**	**100.0**
Age of respondents	20-30	95	48.2
	31-40	66	33.5
	41-50	22	11.2
	Over 50	14	7.1
	Total	**197**	**100.0**
Level of education	Certificate	26	13.3
	Diploma	109	55.3
	Undergraduate	59	29.9
	Post graduate	3	1.5
	Total	**197**	**100.0**

Source: Field data (2016)

4.3 Gender of the Respondents

Regarding the gender of respondents, majority of the respondents 120(60.9%) were male, while female were 77(39.1%).

4.4 Age of respondents

95(48.2%) were in the economically active age group of (20-30) this is followed by the ages between 31-40 with 66(33.5%), 22(11.2%) and lastly 14(7.1%) were 50 years

4.5 Level of education

26(13.3%) had certificate, 109(55.3%) had diploma, 59(29.9%) had undergraduate and 3(1.5%) had post graduate. It can therefore be inferred that majority have minimum qualifications due to the fact that respondents were sales officers. It also indicates that the respondents are knowledgeable on the study.

4.6 Management of Accounts Payables

This section presents information pertaining to management of accounts payables, as shown in the table 6:

Table 6: Management of Account Payables

According to Maness, (1994) and Scherr, (1989)Accounts payables, arise directly from the business's operations and represent a valuable source of internal spontaneous short term financing that is unsecured and flow of cash. Gallinger and Healey, (1987) indicates that accounts payable is the largest for cash outflow in many firms.

Management of Payables	N	M	SD
Our creditors use cash on delivery method in supplying products	197	3.84	1.398
It is beneficial if we purchase our products on credit because it increases our profitability	197	4.04	1.190
We strictly follow the trade credit policy when making payment to our suppliers	197	4.33	0.962
It takes us one month to pay our suppliers	197	4.12	1.062
It takes us more than 3 months to pay our suppliers	197	3.78	1.278
Ẍ		4.08	.731

Most respondents were in agreement with most of the statements regarding the effect of management of accounts payable on profitability as depicted in table 6. These findings were supported by an overall mean of 4.08 indicating that the respondents agreed with the information on the effect of management of payables on profitability at a standard deviation of .731 indicating that there was slight variation on the effect of management of accounts payables on agro-firm's profitability.

Findings are in line with Dolfe & Koritz (1999) states that a company's short-term debt is very much determined by the money paid and the main part of this cash flow consists of accounts payables.

4.7 Management of Profitability

Table 7 below presents information pertaining to the management of profitability.

Table 7: Management of Profitability

Management of Profitability	N	M	SD
We realize profitability when debtors settle their debts	197	3.85	1.171
Management of inventory has helped us improve on our profitability	197	4.22	.975
Management of Cash help the firm to generate and increase its profits	197	4.07	1.033
After paying all our expenses, we don't get any profits	197	3.84	1.242
After paying all our expenses, we still have profits	197	3.74	1.305

According to Gitman, (1997) organizations management considers profitability as an important input when planning the organizational operations, whereas creditors and shareholders look at profitability to determine the returns on their investment in the business and assess the risks of their investments, which may be affected by the industry structure and the nature of the competitive environment. From the results in table 7 it can be revealed that, agro firms in Eldoret business centre realize profitability. The overall average mean was 3.966 meaning that most of the respondents agreed on the management of profitability at a standard deviation of 1.118 suggesting

that the standard deviation was lower indicating that the data tends to be closer to the mean, hence there was slight variation in the agreement on the management of profitability.

These results are supported by Ehrhardt & Brigham, (2004) who stated that when firms are in financial difficulties their value and profitability fall because the fear of bankruptcy and the costs that go with it move the shareholders to dispose of their shares quickly even at the lowest price possible. This results in the reduction of the firm's value and profitability during the period of financial distress.

4.8 Inferential Statistics

The study employed regression to examine the change of dependent variable explained by the effect of independent variable. Analysis of Variance (ANOVA) was used to test the statistical significance of the regression model

4.9 Tests for Regression Analysis Assumptions

4.9.1 Normality

Normality assumption states that all the study variables have normal distributions. Non-normally distributed variables can distort relationships and significance tests. Kolmogorov-Smirnov tests was used to test normality of data with a prediction value of 0.05 such that the **Significant** value of the Shapiro-Wilk Test is less than 0.05 and this indicates the normality of data, when it is greater than 0.05, the data significantly deviate from a normal distribution.

Table 8: One-Sample Kolmogorov-Smirnov Test

		Account payable	profitability
N		197	197
Normal Parameters[a,b]	Mean	4.08	4.0888
	Std. Deviation	.731	.72208
Most Extreme Differences	Absolute	.181	.187
	Positive	.109	.114
	Negative	-.181	-.187
Kolmogorov-Smirnov Z		2.540	2.629
Asymp. Sig. (2-tailed)		.000	.000

a. Test distribution is Normal. b. Calculated from data.

From the table 8, the Kolmogorov-Smirnov Test revealed that the data used was normally distributed and hence can be subjected to other statistical tests of significance used to test the relationship between dependent and independent variables.

4.9.2 Multicollinearity Test

Before the analysis, a multicollinearity diagnostic test was conducted to ensure that data was suitable for logistic regression analysis. Multicollinearity assumption explains the state in which the study explanatory variables are linearly related.

Tolerance is an indication of the percent of variance in the predictor variables that cannot be accounted for, subsequently very small values suggest that a predictor is redundant, and values which might be less than 0.10 may merit further investigation. VIF, variance inflation factor, is (1 / tolerance) and on the whole of thumb a variable whose VIF values are greater than 10 may merit further investigation. The table reveals that VIF values were equal to or less than 10 rendering the variables suitable for regression analysis.

Table 9: Multicollinearity Test

Model	Collinearity Statistics	
	Tolerance	VIF
(Constant)		
Our creditors use cash on delivery method in supplying products	0.438	2.283
It is beneficial if we purchase our products on credit because it increases our profitability	0.813	1.230
We strictly follow the trade credit policy when making payment to our suppliers	0.902	1.109
It takes us one month to pay our suppliers	0.934	1.071
It takes us more than 3 months to pay our suppliers	0.480	2.084

4.9.3 Homoscedasticity Test

Homoscedasticity assumes that dependent variable show an equivalent level of variance across the range of predictor variable. Homoscedasticity is one of the assumptions required for multivariate analysis to test homoscedasticity. If there is no autocorrelation, the Durbin-Watson statistic should be between 1.5 and 2.5. Durbin-Watson statistic was employed to assess the equality of the variances for accounts payables. From the table 10 that follows, the resulting the Durbin-Watson statistic is 1.648 which is between 1.5 and 2.5 and therefore there is an equivalent level of variance across the range of predictor variable.

Table 10: Homoscedasticity Test

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.870[a]	.758	.756	.35638	1.648

a. Predictors: (Constant), account payable
b. Dependent Variable: profitability

4.10 Test of Hypothesis

4.10.1 Linear regression model of accounts payables and profitability

Linear regression analysis was used to test for relationship between the profitability and accounts payables. The coefficient of determination (R^2) and correlation coefficient (R) shows the degree of association between profitability and accounts payables. The R^2 indicates that explanatory power of the independent variables is 0.758. This means that about 75.8% of the variation in profitability is explained by the unit change in accounts payables

Table 11: Linear regression model

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.870[a]	.758	.756	.35638

a. Predictors: (Constant), account payable

ANOVA test reveal that accounts payables has significant effect on profitability. Since the P value is 0.000 which is less than 5% level of significance. It implies that the model was significant; hence the study rejected the null hypothesis.

Table 12: ANOVA

ANOVA[a]

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	77.430	1	77.430	609.663	.000[b]
Residual	24.766	195	.127		
Total	102.195	196			

a. Dependent Variable: profitability

b. Predictors: (Constant), account payable

Table 13 indicates there was significant relationship between management of payables and profitability, this was supported by p-values of 0.000, and this indicated that a unit increase in management of payables leads to increased profitability. This is supported by Grzergorz, (2008) who says that payables are directly affected by the credit collection policy of the firm and the frequency of changing the payables into cash in management of working capital. By granting the customers more liberal credit terms, profitability will be high but at the same time liquidity will be sacrificed.

Table 13: Coefficients

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.576	.145		3.988	.000
	Account payable	.860	.035	.870	24.691	.000

a. Dependent Variable: profitability

4.12 Summary, Conclusion and Recommendations

4.12.1 Management of Accounts Payables

The findings on the effect of management of payables shows, there is a strong association between management of payables and profitability. According to Grzergorz, (2008) these are creditors who have not yet been paid for goods and services supplied to the company, the payables are a vital factor of current liabilities.

This concurs with the findings by Maness & Zietlow, 2005). Who stated that being active the collection process of accounts payables should be among other things that help shorten down cash flow timeline minimizing the risk for liquidity problems. Karlsson (1996) indicated that loans granted to firms by the creditors and the liabilities of the firm are called accounts payables. When there is a build-up of payables, resources are scarce that will in other words be put into more efficient use within the company and earn a return.

4.12.2 Management of Profitability

Regarding management of profitability, it was revealed that, agro firms realize profitability when debtors settle their debts, Management of inventory has helped the firms improve on our profitability was supported, also management of Cash help the firm to generate and increase its profits.

These results concur with Ehrhardt & Brigham, (2004) who stated that when firms are in financial difficulties their value and profitability fall because the fear of bankruptcy and the costs that go with it move the shareholders to dispose of their shares quickly even at the lowest price possible. This results in the reduction of the firm's value and profitability during the period of financial distress.

4.13 Conclusions

Accounts payables, arise directly from the business's operations and represent a valuable source of internal spontaneous short term financing that is unsecured and flow of cash. This was supported by the Conservative Policy which states that the firm finances its permanent assets and additionally a part of temporary current assets with long-term financing

4.14 Study recommendation with policy and practice

Managers of agro firms in Eldoret should create value for their shareholders by ensuring effective and efficient management of debtors, this ensures reduction of time between sales and receipt of payment and this will determine the capability of finance of the firm.

4.15 Suggestion for further research

Owing to the limitations of the study it is suggested that same study be done but in other sectors to allow generalizations of the study findings. Also working capital is not only a factor that ensures profitability of agro firms, There is need for a study on the determinants of profitability in agro firms.

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Influence of Business Demand on the Performance of Post Retirement Business Enterprises in Ugunja Sub County, Siaya County

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Abstract

The study sought to assess the influence of business demand on the performance of post retirement businesses in Ugunja Sub-county, Siaya County. It adopted a descriptive survey research design and inferential statistics. The target population for the study was 80 retirees. The researcher used census and collected data using questionnaires. The instrument was validated by the supervisors. Reliability of the instrument was determined through a pilot study where a Cronbach alpha coefficient of 0.708 was obtained from the instrument. This indicated that the instrument was reliable. Quantitative data was analyzed using descriptive statistics and inferential statistics and presented in tables. The study established that business demand with p-values (p= 0.000) significantly affect performance of post retirement business enterprises. It was concluded that for enhanced performance of post retirement business enterprises adequate business demand should be adhered to by post retirement entrepreneurs. The study also recommended to retirees to ensure that they adhere to business demands for their business enterprises to enable them grows to corporate business entity.

Keywords: *Business Demand, Influence, Post Retirement*

1.0 Background

Retirement can and should be an exciting time. It provides the retiree with the time and freedom to do other things including travelling freely for the first time. However it also comes with challenges. When such individuals do not find activities that are meaningful to replace work, they risk feeling purposeless and this could lead to boredom and depression. According to Moser (2012), retirement is withdrawing from business or public life in order to live leisurely at one's savings or pension. He further states that for a successful retirement, prime ingredients must be present: robust health, financial security, and a balance of intellectual, physical, cultural and social activities. Retirement is understood and perceived differently by different retirees. According to Bur (2011), retirement is seen as an act of leaving the service either on a compulsory basis or voluntarily whenever an employee has completed a specific duration of service years or is forced to exit as a result of compulsory retirement or by being laid- off or even through dismissal from service (for acts of insubordination or misconduct), death, illness or disability.

It is pertinent to argue that employees need to plan, adopt and implement strategies to ease the pain and problems associated with retirement. Since retirement is not what one could avoid except death, it is advisable and appropriate to start preparation immediately one gets employment. Scholars have suggested various strategies that employees can adopt to ease the pain of retirement. One of such strategies has seen many retired employees in Kenya start businesses after retirement, although majority of them are facing challenges either in managing, obtaining the capital and ensuring the business grows. Going into business is thought to play an important role in transforming one's life. This is thought so because some of the members in the society who have ventured into

Such businesses apart from providing revenue to the government also become major sources of self- employment. It is in this background that the retirees opt to venture into business projects with the aim of earning extra income and to help them get busy. In the recent past, many retirees in

Kenya have ventured in business (RBA survey, 2006). Although efforts have been made by various stakeholders to support and enhance the success of such businesses that have been put up by the retirees, they are still performing poorly. According to the Retirement Benefits Authority survey of 2006, most business projects started by retirees collapse within the first three years but it still remains the most alluring preference for retirees. This implies that a circumstantial variability is inexistence despite the same external environment and majority of the internal factors; still retirees who start same businesses on the same financial footing end up not achieving the same results (Karingiti, 1999). It is as a result of this variation in business returns and business sustainability that this study intends to find out. Therefore this study seeks to find out the influence of demand on performance of post retirement business enterprises in Ugunja Sub County, Siaya County.

2.0 Literature Review

Researchers have conjectured that the increasing relative absence of business demand by such young, high-growth firms is a cause of worsening aggregate labor market outcomes: declining employment rates, earnings (for most of the earnings distribution), and so on. That idea has sparked a search for reasons why would-be transformational entrepreneurs are somehow prevented from carrying out their plans successfully, possibly due to excessive regulation or expensive housing in locations where such start-ups are likely to be successful. But the results of those investigations have so far been weak to nonexistent (Goldschlagg and Tabarokk, 2015 & Furman and Orszag, 2015). Instead, declining start-up rates and growth rates for the subset of high-growth startups is in part a manifestation of the labor market's larger problem of declining mobility and job ladder deterioration, with would-be entrepreneurs and their employees reluctant to leave positions to which they may not be able to return, and in part the result of rising concentration and market power of incumbents, holding down growth potential for new entrants.

This means that companies can rather take up innovations if they assess that selling potential is high enough. The most important characteristics of the demand that a company should consider are: the sales potential, demand growth, demand length, demand indefiniteness and demand elasticity. In the few last decades, customer needs and demands have been discovered to be connected closely and the needs of customers have been the subject of many researchers. However, it is not only the needs of a customer that should serve as the single predictor of innovation; demand should be examined, too. If accompany estimates that sale potential is small and that a considerable growth cannot be expected, it can influence a great deal on innovation decision.

In a recent Canadian study, Astebro and Dahlin (2005) introduced and empirically proved three important hypotheses: a) The higher the needs of the clients and recognition of invention, the higher and bigger the possibility of its commercialization (i.e. realization of innovation); b) The bigger the expectation for an invention, the bigger possibility of commercialization and c) the effects of needs and users' preferences are in compliance with the effects of expected demand for probability of invention commercialization.

Through the analysis of the market he argued that companies find profitability in investing in process innovation in mass markets in question. These markets can be mass markets for consumer goods, but they can also present markets for standardized products such as personal computers. Due to a low-level of sophistication it is more profitable for companies to implement process innovations and use the market size than to follow the strategies of differentiation. Process innovations investment is not possible in such small markets as the number of output units is not enough to overcome the high fixed costs. Besides, the users being aware of their needs help the producers in designing and in giving feedback and even suggesting on possible innovative

solutions. That is why the possibility to realize incremental product innovations, specified for a market niche, is high.

3.0 Methodology

This study employed descriptive survey design. Oliver (2006) defines research design as to all pragmatic aspects of the way the research should be carried out. According to Kothari (2008) the research design is the conceptual structure within which research is conducted, it constitutes blue prints for data collection from retirees, measurement and analysis of collected data.

A number of 80 retirees were used for the study. Retiree of both genders male and female was considered. The source of information was from Siaya Retirees Entrepreneurs association registered under the ministry of social services.

The study made use of Census method which is a study of every unit, everyone or everything in a population hence all the 80 retirees participated in the study. The study employed census method because the entire population is very small.

3.1 Data Analysis

Descriptive statistics such as frequency counts of the retirees was done using statistical records. Closed-ended questions were coded before being keyed into a computer using the Statistical Package for Social Sciences (SPSS). The study also made use of chi-square test where the p- value was used to determine whether observed sample frequencies differ significantly from expected frequencies specified.

4.0 Results and Discussion

For analysis, frequency, percentages and mean ratings of response for each item were assessed and summarized in Table 4.1.

Table 1: Descriptive statistics for effects of business demand on performance of post retirement business enterprise

Statement on business demand		SA	A	U	D	SD	MEAN
As you select the business one should look as	F	53	24	0	0	0	**4.69**
the demand	**%**	**68.8**	**31.2**	**0**	**0**	**0**	
As your business grows to meets the customers'	F	56	20	0	0	1	
							4.69
	%	**72.7**	**26.0**	**0**	**0**	**1.3**	
Preference of the customers in the area affects	F	52	23	1	0	1	
the business							**4.62**
	%	**67.5**	**29.9**	**1.3**	**0**	**1.3**	
Commodity price affects customer loyalty to	F	52	25	0	0	0	
the business	**%**	**67.5**	**32.5**	**0**	**0**	**0**	**4.68**
Supply of product /services affects customer	F	59	17	0	0	1	
base	**%**	**76.6**	**22.1**	**0**	**0**	**1.3**	**4.73**

Table 4.1 shows that 53(68.8%) respondents strongly agreed with the statement that as you select the business one should look as the demand, 24(31.2%) respondents agreed, while non 0(0.0%) respondents was undecided, disagreed and strongly disagreed with the statement. The study findings suggested that the respondents tended to strongly agree (Mean=4.81) that as you select the business one should look at the demand.

In addition, 56(72.7%) respondents strongly agreed with the statement that your business grew to meets the customers', 20(26.0%) respondents agreed, 1(1.3%) strongly disagreed while none 0(0.0%) of the respondents was undecided and disagreed with the statement. It emerged from the study that the respondents tended to strongly agree (Mean=4.69) that your business grew to meets the customers'.

Similarly, 52(67.5%) respondents strongly agreed with the statement that preference of the customers in the area affected the business, 23(29.9%) respondents agreed, 1(1.3%) was undecided and another 1(1.3%) strongly disagreed while none 0(0.0%) of the respondents disagreed with the statement. The study findings suggested that the respondents tended to strongly disagree (Mean=4.62) that preference of the customers in the area affected the business.

Further, 52(67.5%) respondents strongly agreed with the statement that commodity price affected customer loyalty to the business, 25(32.5%) respondents agreed while none 0(0.0%) of the respondents was undecided, disagreed and strongly disagreed with the statement. The study findings suggested that the respondents tended to strongly agree (Mean=4.68) that commodity price affected customer loyalty to the business.

Finally, 59(76.6%) respondents strongly agreed with the statement that supply of product /services affected customer base, 17(22.1%) respondents agreed, 1(1.3%) strongly disagreed while none 0(0.0%) of the respondents was undecided and disagreed with the statement. It emerged from the study that the respondents tended to strongly agree (Mean=4.73) that supply of product /services affected customer base. This is in line with the findings of Astebro and Dahlin (2005) and Armstrong (2005) that a good business marketing analysis should include demographic information and psychographic factors such as perception, motives, attitude that customers may want to satisfy. This implies that for enhanced performance of the customer loyalty and continuous supply of products demand should be ensured as this likely to affect performance of business.

This implies that business demand influences performance of post retirement business enterprises and therefore should be considered before the business starts.

Chi-square test for relationship between business demand and performance of post retirement business enterprises

The Chi-square test at $p \leq 0.05$ significance level illustrating statistically significant relationship between business demand and the performance of post retirement business enterprises are as summarized in Table 4.16. Therefore, Table 4.2 presents the Chi-square test that was conducted to find out the influence of the business demand on the performance of post retirement business enterprises in Ugunja Sub, County Siaya County.

Table 2: Chi-square test for relationship between business demand and performance of post retirement business enterprise

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	109.532[a]	48	.000
Likelihood Ratio	37.437	48	.864
Linear-by-Linear Association	12.568	1	.000
N of Valid Cases	77		

a. 59 cells (93.7%) have expected count less than 5. The minimum expected count is .01.

From the results in Table 4.2, the P-value for the Pearson Chi-Square test for relationship between business demand and the performance of post retirement business enterprises is 0.000. The p-value (p=0.000) is less than 0.05, therefore, showing a statistically significant relationship between business demand and the performance of post retirement business enterprises. Since the p-value is less than 0.05, it means that there is a significant relationship between business demand and performance of post retirement business enterprises. The study is supported by a research conducted in 2007 about the determinants of small business growth in Nigeria (Okpara, Wynn and Pamela, 2007). Their study indicated a significant relationship between demand for services and products and business performance. They stated that businesses with high demand are more likely to grow faster than those without.

5.0 Conclusion and Recommendation

The study concluded that there was a significant relationship between demand and performance of post retirement business enterprises. It implies that business should meet customers' expectations, preferences of customers, price of commodity and supply of products/customers affects demand and therefore should be considered. This conclusion tallies with contingency theory that there is no best way to organize a corporation, to lead a company, or to make decisions instead, the optimal course of action is contingent (depended) upon the internal and external factors.

Based on the findings, the study recommended that retirees should ensure that they adhere to the demands for their business.

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Re-Designing National Planning Methods For Africa's Develoment

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Abstract
Kenya wage a daily struggle against abject poverty as the gap between rich and poor widens whose source is pessimistic planning that fails to address and actualize developmental parameters. Devolve system is Kenyan led renaissance project of industrialization to re-benchmark the country plundered for decades to take its rightful place in the world economy which requires an action plan to realize change fostering; influence, nationalism, fraternity and reconstruction.This will redefine country's priorities, opportunities, rethink way to plan, manage, and improve county/national planning which vests on reconstruction and industrialization. As Kenya reaps from its Lion Economy, the innovative ideal Action Plan is "Economic Planning Optimistic Model" (EPOM). The objectiveis to enhance innovative planning mechanisms to integrate the country for global competitiveness, trade, investment and sustainable development. To provide solutions to identified problems/challenges in the statistical data outlined policy documents.The methodology to base on; research approach, research design (design used/study location/target population); sampling techniques (sample size/process and sampling procedure); research instruments / data collection (instruments/tools used); data analysis; report writing/compiling, recommendations on findings; and submit for adoption. Key resultsinclude scaling-up investments, rural development, industrialization, poverty reduction and re-benchmark the nation capturing "Kenya Vision 2030". This model be adopted as industrialization platform; impetus to reduce number of citizens dependent on social welfare and graduate Kenya from HIPC to Newly Industrializing Nations.EPOM' is the only devolution action plan and Kenya's best proactive approach to jump-start industrialization, integrate local market economies to global market economies, settle debt predicament and shape its future.

Key Words: *Influence; Nationalism; Fraternity; & Reconstruction*

1.0 Introduction

The positive nod on decentralization is for Kenya to claim the 21st century through EPOM plan of action as regionalism and devolution strategy that vests on reconstruction and development initiative.As Kenyans we are convinced that this new start will enhance economic recovery facility into industrialization and economic growth facility. By this, our mode of living will be re-evaluated, once we become masters of our own destiny.Decentralization is Kenya's renaissance project of industrialization which shall allow our country plundered for decades to take its rightful place in the world economy and it depends on building a strong and competitive economy as the world moves towards greater liberalization and competition.

6.1 Kenya's strategy in the 21st century

Devolution is Kenyan owned and Kenyan-led strategic development plan, which focus to develop the institutional capacity to sustain growth at levels required to achieve poverty reduction and sustainable development. This in-turn depends on the other factors like; infrastructure, capital assets (natural capital, social capital, human capital, physical capital and financial capital), institutional set-up, structural diversification, competitiveness, education, health and stewardship of the environment.

The initiative requires massive and heavy investment to bridge existing gaps and the other challenge ahead for Kenya is to be able to raise the required funding under the best conditions

possible, for funds shall provide an impetus to Kenya's development by bridging existing gaps in priority sectors per region to enable the country catch up with developed parts of the world.

6.2 Approaches to reduce poverty and leapfrog the country for investment, global trade and competitiveness

(i) Innovative approaches and solutions to achieve maximum results and sustainability to enable the country join other global actors in global trade, investment and competitiveness.

(ii) Ensure maximum impact of available resources and secure long term sustainability which focuses the many dimensions of sustainability namely; institutional, financial, social, and environmental.

(iii) Projects should target the poor and their particular needs, priorities and involve community

6.3 Agenda

To aggregate investment deliverables in the sectoral instruments like; agriculture, health, commerce & industry, transport, communication and tourism among others that sets the benchmarks for development.

Therefore, Kenyan people needs to understand that, development is a process of empowerment and self reliance. Kenya cannot make a new start unless there are far-reaching changes in the making that characterizes; human resource development; development, institutionalization and identification of Regional Economic Blocks through devolution known as Empowered Special Economic Zones (ESEZ).

6.4 Scope

As the gap between the rich and the poor widens whose source is pessimistic planning, that failed to address and actualize the developmental parameters of the nation. Our concern as a nation is to impress the devolved system for industrialization as we put in place an optimistic and innovative planning mechanism to spearhead strategic planning change that focused on influence, nationalism, fraternity, reconstruction and adoption. This planning mechanism is a benchmark to redefine the country's priorities, opportunities, rethink the way to manage, plan, introduce creativity also improve in county and national planning and development which vests on reconstruction and industrialization. As Kenya reaps from its LION ECONOMY, the identified ideal pragmatic planning approach is known as "ECONOMIC PLANNING OPTIMISTIC MODEL" (EPOM), as the yard-stick under which the success of the project shall ultimately be judged.

To institutionalize (EPOM) by setting up identifiable projects covering fiscal financial interests basing on a conducive ecological and economic culture as an equity dispensable work plan. For the Greek Origin of the two words indicates that both disciplines have their base in the home (ECOs) of human being. Thus, the proposed planning model is to conserve and re-integrate the two.

The researcher to articulate the methodological mechanisms that will be utilized for analysis – that shall be outlined in the following sequence systematically; research approach, research design – that will explain and justify the design used; location of the study; target population by giving a table of those in population; sampling techniques that shall characterize – sample size, process and sampling procedure; research instruments / data collection that will include – instruments and tools used; data analysis that will explain how data was analyzed and report writing and compiling, making recommendations on findings; host stakeholders forum and submit to government and other stakeholders for adoption.

To retain investors' confidence in the region, expand investments in agriculture and rural development, industrialization, reduction in extreme poverty and re-benchmark the new decentralized action plan to attain the set objectives and goals in "KENYA VISION 2030". This model to be adopted as strategic plan by governments for industrialization platform blue print, also as impetus to reduce rich-poor gap, graduate the country from HIPC to Newly Industrializing Nations and reduction in the number of citizens dependent on social welfare. This optimistic planning is the only devolution action plan and Kenya's best proactive approach to jump-start industrialization, integrate its local market economies to global market economies, settle debt predicament and shape its future.

6.5 Broad Objectives

(i) To enhance innovative planning mechanisms to integrate the country for global competitiveness, trade, investment and sustainable development.

(ii) To provide lasting solutions to the earlier identified problems and challenges in the statistical data outlined in national and supra-national policy documents.

(iii) To investigate the national strategic planning methods, determine causes of poverty and barriers for development and industrialization and institutionalize innovative objective EPOM for adoption.

(iv) To obtain lessons as the basis for the development of a wider program of poverty reduction through community involvements by focusing to reduce the number of families in scarcely populated areas.

(v) To curtail ecological and economic reconstruction and reconciliation under the innovative integrity of "Economic Planning Optimistic Model" (EPOM) as National Industrial Development Objective Order (NIDO), by setting up identifiable projects for implementation.

Main Aim: Is to focus on food security, energy, health, water and sanitation, infrastructure, human resource development, anti-desertification and job creation, by this it shall strengthen our productive capacities and competitiveness at the global level.

Interest: To curtail economic reconstruction and development

The Purpose: Integration of Kenya into the global market economies through the application of ecology and economy merger, focusing industrialization and utilization untapped resources.

N/B: For sure, under-development is still being evidenced in our continued focus on identifying problems, challenges also the government hires expatriates to serve as consultants who are un-familiar with the country, and this makes them study the country prior to embarking on their respective assignments, which delays most projects. Thus the government needs to utilize local human resources, prioritize identification of solutions and setting way-forward to the very problems/challenges.

2.0 Material and Methods

At the time of independence in 1963, the Government of Kenya identified illiteracy, disease, ignorance and poverty as the main problems to be addressed in the post independence era in order to achieve sustainable national development. Policy on poverty reduction was stated in Session Paper No. 10 of 1965. The GoK noted there were regional and gender dimensions to the problem and that certain groups had been excluded and needed to be brought into the mainstream of development. In respect to the above statement, it is evident that what I term as pessimistic planning which has failed to articulate, actualize and implement developmental parameters so as to bring solution to the aforementioned problems. The reason was that the ancient planners and strategists decided to identify the problems and consider the very problems as hurtles for development instead of them seeking solutions or way-out for the problems. This is the cornerstone for the widening gap between the rich and the poor in third world nations.

In line with the above policy, the GoK through the various development plans, has attempted to address the concerns of the poor. Poverty alleviation and unemployment have been the subject of subsequent National Development Plans, Sessional Papers, Presidential Commissions, Task forces and other studies in Kenya. This range of contributions reflects the determination of Government to find solutions to the persistence of poverty in Kenyan society. The National Poverty Eradication Plan is the culmination of all these efforts and provides a real opportunity to reduce poverty in Kenya effectively and sustainably. In regards to this paragraph, we identify two key words that are (reflects & opportunity) to mean that the efforts by the Government will be achieved at a slow base or never in its lifetime bring a lasting solution to problems affecting its citizens unless there are far reaching changes in the planning mechanisms that focus on solving problems facing Kenya and third world nations, which we believe will leapfrog the dynamics in the global trade, investment and sustain global development whose key developmental cluster is industrialization, as in reference to the Republic Of Kenya Sessional Paper No. 2 Of 1996 On Industrialization to the Year 2020 November, 1996 on the Title: 1.2 Why Kenya Must Industrialize.

In reference to the District Focus for Rural Development (DFRD), we find that in March 1983, the DFRD was a strategy to decentralize development administration and planning functions, strengthen local institutions to facilitate more effective participation. A key objective was the allocation of resources on a geographically more equitable basis. Funds were to be allocated to the less developed regions, which were then encouraged to submit projects proposals for funding. The target beneficiaries, the poor and vulnerable, were even in this decentralized system, excluded from direct involvement in the process of project design and implementation. The projects were therefore seen as Government, not community projects and were not so much supported as raided for benefits when there were any, even though these structures were closer to the people because most projects were set by senior government officials, politicians without broad based consultations. Finally, however, it is the strong impression of some of the stake-holders interviewed that the DFRD has provided a useful framework for expedited and well-informed planning and administration of development activities at district level for projects planning activities.

In summary, if Kenyans had considered this policy article on time before 2010 when we had in place the promulgation of New Constitution, the set benchmarks of March 1983 on devolution would have accelerated Kenyans to a higher trajectory of development and leapfrogged it to 'NIC' countries of the world.

2.1 Hypothesis

The EPOM program focuses on the population that lives below a dollar per day and transformation of individual poverty indicators. This is to increase household survival and provide adequate nutrition, education among others. In addition EPOM strives to deliver transparency and accountability results in all stages of projects research and commissioning.

2.3 Research Questions

(1) How shall we realize this 'EPOM' objective model to enable the country join the other countries of the world in global trade, investment and competitiveness?
(2) What are the ways to provide a lasting solution to the statistically identified problems and challenges as outlined in the national and supra-national policy documents?

2.4 Institutional mechanism

This is the preparation of the EPOM implementation units basing on its own capacity under unique monitoring and evaluation frameworks with state of governance and administration. For the link between environment and development is the value of human resource. Economists have long emphasized that the wealth of nations is determined by hard-work, creative thinking and initiative. Thus, human resources are crucial for economic development. Development is not just development for the people, but also of the people and by the people. Development implies participation of the people themselves. In this regard, people should be considered as managers, as inventive individuals willing and capable of contributing not only to the growth of wealth, but also to the shaping of their societies.

Poverty is the great stone in the path of development and social justice and no developing country can roll this stone out of the way by itself. "As applauded by Professor Ayensu; To solve Africa's problems it requires extra-ordinary initiatives and these must come from the African countries themselves and from the continent's own institutions and Africa's friends". Poverty is both a cause and an effect of environmental degradation also environment's worst enemy and the real disease for Africa. Let us not forget that; South Africa's former President Thabo Mbeki's contention that "Poverty is a major factor in the prevalence of AIDS in Africa since impoverishment is not medical but a socio-economic condition". The poorer the community, the more future is discounted in decision making and hence the less attractive are investments in resource conservation. As the needs of today and tomorrow become urgent, the concerns of next year, next decade and next century recede. The poorer resource users are, the less likely they are to be able to afford technological solutions to sustainable practices.

3.0 Methods and Instruments

The researcher shall articulate in preference to the methodological mechanisms that will be utilized for analysis – that shall be outlined in the following sequence systematically; research approach, research design – that will explain and justify the design used; location of the study; target population by giving a table of those in population; sampling techniques that shall characterize – sample size, process and sampling procedure; research instruments / data collection that will include – instruments and tools used; data analysis that will explain how data was analyzed and report writing and compiling, making recommendations on findings; host stakeholders forum and submit to government and other stakeholders for adoption.

3.1 Targeted Population

The targeted 9 districts based on geographical areas with the largest number of poor people living below the poverty line taking into account the level of income and other poverty indicators such as enrolment in education, access to safe water and sanitation, nutrition level and infant mortality. The nine selected districts represent 31.5% of the 11,540,090 persons living below the poverty line in Kenya.

The following districts with high concentration of people living below poverty line were identified;

District	Province	Population Below Poverty Line	Main Poverty Characteristics
Makueni	Eastern	545,794	Arid, semi-arid, subsistence farming
Kilifi	Coast	430,192	Arid, semi-arid, subsistence farming
Kisii	Nyanza	306,509	Shortage of land, subsistence farming
Kakamega	Western	537,141	Shortage of land, subsistence farming
Kericho	Rift Valley	394,206	Landless rural poor, plantation workers
Murang'a	Central	346,223	Subsistence farming & plantation workers
Nairobi	Nairobi	477,025	Urban squatters & street dwellers
Mombasa	Coast	329,753	Urban squatters & street dwellers
Kisumu	Nyanza	267,511	Urban squatters & street dwellers
TOTAL SELECTED		**3,634,354**	

3.2 Capital Assets

Phase A: Human Capital; representative of the skills of knowledge (including education), ability to labour and good health that together enable people to pursue different livelihood strategies and achieve livelihoods for sustainable growth.

Phase B: Social Capital; is the social resources upon which Kenyans draw in pursuit of their livelihood objectives, through networks and connectedness, membership of moral formalized groups and relationships of trust, and exchanges, political inclusion and voice

Phase C: Natural Capital; is the natural resource stocks of Kenyans from which they drive their livelihood resources, eg, rangelands, soil fertility, trees, fishing grounds etc.

Phase D: Physical Capital; is the basic infrastructure in the country and producer goods needed to support livelihoods such as bridges, roads, markets and communications.

Phase E: Financial Capital; is the financial resources of Kenyans which include flows, stocks and contributes to both consumption and production.

4.0 Results and Discussion

To realize 'EPOM' objective model to enable the country join the other countries of the world in global trade, investment and competitiveness

To utilize identified ways to provide a lasting solution to the statistically identified problems and challenges as outlined in the national and supra-national policy documents.

The country's economic growth rate stands at 6.1% but for it to achieve tangible development, it needs to grow at the rate of 7% which is envisaged target growth by 2010 and 10% GDP for the next 25% years and this shall be realized by 'EPOM' strategy.

By 2030, Kenya's GDP is expected to rise to Kshs 12 trillion a year from the current 1.1 trillion.
The goal of reducing poverty is not impossible at all. Kenya is not doomed by its poverty or its poor development record. In the 1960s and early 1970s, many prominent economics considered Asian countries, with their vast, poverty-stricken populations and limited resources, to be caught in a low level development trap. It was inconceivable in the early 1960s that the republic of Korea would emerge as an industrial power. The passing of time has shown wrong such views were. The performance of other regions, the findings of cross-region studies and the achievements of a number of Kenyan people suggest that industrialization is attainable.

4.1 Challenges

The overriding challenge if the country has to move to a higher trajectory of development is employment creation, poverty reduction and reduction in the number of citizens dependent on social welfare.
Other challenges are;- promotion of sustainable economic development through preservation of environment and culture; increasing domestic investment and savings to levels sufficient to support the desired rate of growth; restoration and improvement of infrastructure based on the critical needs of the people and improving the management of public finance and deepening Kenya's economic base through an increased rate of industrialization

5.0 Conclusion and Recommendations

5.1 Interest

Lesson I: EPOM in Kenya is the best proactive approach in aggregation of wealth to 80% of Kenyans especially youth and women, for it shall lay down the benchmark and scale-up investments, rural development, industrialization, poverty reduction and re-benchmark the nation capturing "KENYA VISION 2030". This model be adopted as industrialization platform; impetus to reduce number of citizens dependent on social welfare and graduate Kenya from HIPC to Newly Industrializing Nations.

Lesson II: Lessons learned are to improve the self dependence caliber in order to sustain Kenya's debt predicament through home grown investment scenarios under EPOM.

5.2 Adoption of best practices

- To utilize identified ways to provide lasting solutions to the statistically identified problems and challenges as outlined in the national and supra-national policy documents.
- The United States of America is a Superpower. The Americans were propelled to the technological, economic, political and intellectual superpower status by their deeply held values of hard work, industry, respect for individual freedom, respect for achievement, thrift and a spirit of enterprise, among others.
- The Japanese economic miracle was also anchored in their highly disciplined work culture inspired by a mixture of their Budhist tradition and modern management thinking.
- The Malaysian transformation under "Excellent Work Culture Movement" (EWCM), spearheaded by the leaders, preached a wide range of values at both individual and

organization levels, such as self-respect and respect for others, work ethic and industry, courtesy, manners and etiquette, and habitual excellence. The promoters of the movement believed that individuals must be developed before organization and the nation can be developed, that indeed the country will be as good as the quality of individuals.

5.3 Appeal

- Cultural is a critical factor in the development of any society and a strong cultural framework is a necessary prerequisite to institutional, economic, industrial and social development. Culture gives the people an anchoring point, an identity and it instills a sense of belonging, direction and purpose for the nation. My concern is not the material culture, which comprises art, music, literature, arte-facts, dress and food, although these are also important. My focus is on values internalized by the critical mass of the people in Kenya, and which form the philosophical basis of the nation. Thus the sitting government should inculcate in the minds of Kenyans the state of mind that is the nation. This state of mind should be the embodiment of values that hold the society together, and propels it to greatness. The economic miracle envisaged in Kenya Vision 2030 will be a lot easier to achieve if the masses are prepared to change for optimistic planning methods.

5.4 Impact

- Traditional economic theories have not given us a framework sufficiently broad enough to deal with the socio-economic implications in Kenya, (poverty, nutrition, education etc), and this has widen the gap between the poor and the rich thus leaving the poor more vulnerable in the society with lack to access their basic needs.

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The Enemy within Interceptions of Fruits and Vegetables from Kenya for Export Market

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Abstract
The Horticulture sector in Kenya is among the leading foreign exchange earners and contributes enormously to food security and household incomes but products destined for export market especially the EU have to undergo stringent/extensive checks and analysis to ensure it complies with several set standards of both the exporting and importing country. This has led to several produce being intercepted to guard against introduction and spread of organisms harmful to plants and plant products from other member states or third countries. This situation has significantly affected local production and depressed prices of certain commodities thus negatively affecting the livelihood of many Kenyans who depend on this industry. This review paper has the following objectives, to understand a) the various causes of interceptions of horticulture produce destined for export, b) the reasons for these interceptions and c) the mitigation measures undertaken to minimize these interceptions. Export produce is intercepted mainly due to presence of live pests and documentation errors. HCD has put down some guidelines which the exporters must meet for the produce comply. A system is also available that ensures traceability to the place of origin and legal amendments to Kenya gazette for the restriction to using banned chemicals. Products which do not meet the set standards are destroyed to guard both the consumer and producer. Other punitive measures include a suspension of authorization to export, the destruction of infested plants and the application of plant protection products or an appropriate biological control agent.

Key Words: Interceptions, Harmful Organisms

1.0 Introduction

Kenya exports 95% of horticultural produce mainly to the EU (MoA Report, 2014); and other destinations such as USA, Middle East, Japan, Russia, and South Africa. Competition in these markets is stiff due to a large number of suppliers such as Colombia, Ecuador, Ethiopia, Spain, Morocco, Israel, Egypt, India, and China. The UK and France are the primary markets for pre-packed high quality fresh vegetable produce from Kenya, with a share of over 30% by volume.These include snow peas, sugar snaps, baby vegetables, runner beans, French beans (Haricot Verts) and avocadoes(.Kephis newsletter ,February 2015). Germany is an emerging market for vegetables and fruits, especially with its good connections and central location in Europe and now that it is centered on Frankfurt it's a focal position across the European continent. Sales are high mainly in January to March and in October to December. Other exports include small amounts of pineapples, avocadoes and beans. Horticulture production for export is completely market driven and sensitive to factors that facilitate market access such as global trade agreements and compliance to standards

1.1 Overall objective

To determine the various interceptions of Kenyan horticultural products to the export market and measures undertaken to remedy the situation

1.2 Specific Objectives

1) To highlight the various causes of interceptions of horticulture produce for export
2) Determine the reasons for interceptions of horticulture produce
3) Highlight the mitigation measures undertaken to minimize these interceptions

1.3 Problem statement

Developed countries have increased their demand for fresh produce from the developing world. Whereas this can help dramatically increase incomes for poor farmers but this is not always the case in practice. Increased demands have led to the heavy use of pesticides which are expensive and can harm the health of agricultural workers and communities when water courses are polluted. Child labour may supplement income in the short term, but in long-term it reinforces poverty as the lack of education and training that results means that mobility is absent.Traders and brokers tend to be opportunistic and there is prevalence of produce of substandard hygiene and quality arising from lack of enforcement of standards. There is also inappropriate pre- and post-harvest handling practices and packaging of horticultural produce

1.4 Justification

The fresh produce business is considered high risk and volatile with post-harvest losses being high, especially during transport and off-loading. The horticulture industry employs over six million Kenyans directly and indirectly. Of the total horticultural production, about 95 percent is consumed or utilized locally, while the remaining 5 percent is exported; yet in terms of incomes, the export segment earns the country huge amounts of foreign exchange. For example, in 2011, the industry earned the country KES 91.2 billion from exports (RSA Ltd, 2015). Over the years, Kenya has endeavored to nurture and protect this market through implementation of measures for effective traceability in order to comply with international standards and market requirements.This calls for need to identify the causes of interceptions, and ways of minimizing their occurrence to increase acceptance of Kenyan produce in EU market.

1.5 Horticulture Crop Interceptions

In 2015 there were 194 interceptions due to documentation errors (52%) and presence of live pests (48%); KEPHIS annual report 2015. Any produce that does not meet the specifications and does not have the required documents is barred from proceeding to the intended export market. The main aim of these interceptions is to protect EU member states against introduction and spread of organisms harmful to plants and plant products from other member states or third countries.
Regulations in the individual countries may differ slightly from EU regulations, although generally market access requirements are very similar.

Inappropriate use of pesticides which lead to high higher levels of residues on the produce, presence of harmful organisms and collection of products from unknown sources has led to products being non-compliant. In order to enforce compliance the government has prepared legal amendments to gazette for the restriction to using banned chemicals (dimethoate and chloropyriphos) and destruction of non-compliant produce to guard both the consumer and producer.

Tracking and tracing is also important, as well as certification schemes such as Global G.A.P and British Retail Consortium (BRC) global standards. Growers and exporters also have to pay specific attention to cleaning and decontaminating equipment, containers and transport vehicles. Produce of substandard hygiene and quality arising from lack of enforcement of standards, and poor

consumer awareness is intercepted. Genetically modified fruit and vegetables are currently not permitted to enter the market

1.5.1 Export requirements for horticulture crops

The Ministry of Agriculture, livestock and fisheries, state department of Agriculture and the Horticulture Competent Authority structure (HCAS) comprising of KEPHIS, PCPB, HCD, and KARLO have implemented strategies to ensure compliance with market requirements. More emphasis is placed on the growing and exporting of fruits and vegetable to enhance food safety.

1.5.2 Compliance regulations-Legal Documentation and Licensing Requirements

To export horticultural products the following legal/licenses are mandatory;

1. A Certificate of Business Incorporation/Registration from the Registrar of Companies
2. An Export Permit from Agriculture, Fisheries & Food Authority (AFFA)

1.5.3 Produce quality considerations

Depending on the type of produce, specific requirements in terms of size, number per box and skin color are mandatory.

Post-harvest handling of same product different countries; Kenya and Japan

Fruits and vegetables on Kenyan market

Tomatoes packed ready for shipping in Japan

1.6 Presence of harmful organisms (quarantine pests) in consignment

Consignments can be intercepted due to presence of harmful organisms. Harmful organisms can be defined in Article 2 (e) of Council Directive 2000/29/EC as any species, strain or biotype of plant, animal or pathogenic agent injurious to plants or plant products on fruits and vegetables and include insects and mites, bacteria, fungi, viruses and parasite plants. In 2014-2015, there were 70

notifications due to interceptions, KEPHIS report 2015. The most commonly intercepted harmful organisms include *Lyriomiza* spp. (leaf miners) and non-European Tephritidae ("fruit flies"), and *Bemisia* spp. (white flies). Fruit flies are found mainly on *Momordica* sp (bitter gourd, or Karella) Diptera, which includes fruit flies, of non-European Tephritidae on *Mangifera* sp. (Mango – mainly pickling mangoes).
After inspection, a phytosanitary certificate is issued to certify consignments for export.


Adult fruit fly ***Dacus bivittatus***


Damage on karella


Damage on mango

1.7 Presence of pesticide residues above the acceptable limits in and/or on produce
Strict compliance with Maximum Residue Levels (MRLs) and prevention of microbiological contamination are also precondition when entering the EU market. A maximum residue level (MRL) is the highest level of a pesticide residue that is legally tolerated in or on food or feed.

The amounts of residues found in food must be safe for consumersand must be as low as possible. To ensure that MRLs are as low as possible, applicants seeking approval of a pesticide must submit scientific information about the minimum amounts of pesticide necessary to protect a crop and the residue level remaining on the crop after such treatment. The European Food Safety Authority (EFSA) then verifies that this residue is safe for all European consumer groups, including vulnerable groups such as babies, children and vegetarians. When there is a risk established for any consumer group, the MRL application will be rejected and the pesticide may not be used on that crop. Food safety thus has priority over plant protection. In many cases the amount of pesticide needed is much lower than the highest level that is still considered safe. In such cases the MRL is set at the lower level, thus ensuring that only the necessary (minimum) amount of pesticide is used. How and when the pesticide may be used is defined by the relevant national authority and can be found on the label of the pesticide. Examples of these banned chemicals include (dimethoate and chloropyriphos)

1.8 Appropriate Export Documents, Source Export promotion council

Every consignment of horticultural products requires the following documents that are mandatory: -

1. Phytosanitary Certificate which is issued by Kenya Plant Health Inspectorate Services is isssued at the ports of exit after inspection. If it is absent, or a regulated plant is not included or there is incomplete additional declaration, the consignment is rejected.In 2014-2015 KEPHIS issued 331,322 phytosanitary certificates as compared to 223,427 and 199168 certificates issued in 2013/2014 and 2012/2013 respectively(KEPHIS Annual report 2015).
2. Certificate of Origin (depending on the destination market);
3. Commercial Invoice
4.
5. Bill of lading (sea freight), Airway bill (for air freight)
6. Packing List

If applications are incomplete either due to missing supportive documents that must accompany the application or non-payment of the application fee by the applicant the produce is rejected.

1.9 Mitigation Measures

The Kenyan industry has recognized the need to comply with the numerous regulations on standards set up by destination markets and has embraced these requirements which have now become a "license to trade". Working with the private sector, the Kenya Plant Health Inspectorate Service (KEPHIS) has worked hard to comply with EU regulations in terms of inspections and achieved status under EU regulation 1148 as an `"approved nation" which ensured that Kenyan produce would be fast tracked on arrival in the European Market. This is a significant competitiveness advantage for Kenyan exporters

1) Manipulation of Environment

This is done by maintenance of host resistance to infection through manipulation of the postharvest environment. This is done in order to delay senescence by delaying ripening and hence disease development. It is achieved the following ways

a) Temperature

Low temperature storage of fruit and vegetables is used extensively used to delay ripening and the development of disease, although the temperatures commonly used for storage are not lethal to the pathogen. Temperatures used to store produce depend largely on the chilling sensitivity of the produce in question. For example, many temperate fruit and vegetables (e.g. apples, peaches and broccoli) can be stored at $0^{o}C$, whereas many tropical fruits cannot be stored below $l0^{o}C$ without developing symptoms of chilling injury. Modifying the storage atmosphere is sometimes used to delay produce senescence. The rate of fruit respiration can be reduced by increasing CO_2 and decreasing O_2 levels in the storage environment. Storage atmosphere can also have a direct effect on pathogen growth, although levels of CO_2, or O_2 required to achieve this are often damaging to the produce if applied for extended periods. A notable exception to this is strawberry, which for extended storage periods can tolerate the high levels of CO_2 (20-30^{o}) required to inhibit the development of grey mould (caused by *Botrytis cinerea*). Short-term exposure to very high levels of CO_2has shown some potential for delaying the onset of anthracnose (caused by *Colletotrichum toeosportotdes*) symptoms in avocado.

b) Relative humidity

The relative humidity of the storage environment can have a major influence on the development of postharvest disease. High humidities are often used to minimise water loss of produce. This

however can increase disease levels particularly if free moisture accumulates in storage containers. The humidity chosen for storing produce is frequently a 'trade-off between minimizing water loss and minimizing disease.

2) Hygiene

Maintenance of hygiene at all stages during production and postharvest handling is critical in minimizing sources of inoculum for postharvest diseases. To most effectively reduce inoculum, a good knowledge of the life cycle of the pathogen is essential. Sources of inoculum for postharvest diseases depend largely on the pathogen and when infection occurs. In the case of postharvest diseases which arise from pre-harvest infections, practices which make the crop environment less favourable to pathogens will help reduce the amount of infection which occurs during the growing season. As many pathogens are soil-borne, minimizing contact of leaves and fruit with the soil is desirable. Inoculum for infections occurring after harvest commonly originates from the packing shed and storage environments.

3) Water

Water used for washing or cooling produce can become contaminated with pathogen propagules if not changed on a regular basis and if a disinfectant such as chlorine is not incorporated. Water temperature can also be an important factor in the transfer of inoculum in some situations. For example, tomatoes harvested during hot weather may have a higher temperature than the water used to wash them. In this scenario, inoculum present in the washing water can be taken in by the fruit tissue, causing higher levels of diseases such as bacterial soft rot. Reject produce which has not been discarded from the packing shed or storage environment provides an ideal substrate for postharvest pathogens.

4) Specializing role for importers

They become more specialized and are looking to establish a unique market position.

Wholesalers that supply large retail formulas now prefer to work with a lean and mean middle man, who works with large producers and in large quantities. They handle the European logistics without having their own facilities. If plant space is needed they will hire it temporarily. As a result, smaller importers search more and more for niche channels, for example by specializing only in exotics or a specific product type.

5) Vertical integration

Supply lines are becoming shorter and more efficient. Contact between farmers, traders and retailers are becoming closer. Control throughout the entire value chain is essential in order to build expertise in specific products and to comply with the strict delivery terms of large retailers (Michel Peperkamp, 2016).

6) Support services

Government intervention in the Kenyan horticulture sub-sector has been minimal, mainly facilitating sectoral growth through infrastructure development, incentives and support services (HCDA strategic plan 2009 – 2013) and letting the private sector steer the industry. The result has been unprecedented growth in the sector which has been the envy of many competitors and indeed the model has been utilized as a template for many emerging economies.

Scaling up the capacity of the cargo terminal at the airport as well as adequate and efficient cold storage systems on site have also contributed significantly to efficiency in export horticulture. Availability of cold storage depots for hire near production zones was facilitated by HCD through

construction of cold stores in various regions bringing chill chain services closer to the produce source.

2.0 Conclusions and Recommendations

Kenya can be amongst the leading exporters of flowers and fresh vegetables to the EU market and has a good reputation. Maintaining this reputation is key to continued growth and for diversification into new markets in the future. The following measures can help maintain this good reputation

(a) Government investment

Government investmentsin education, infrastructure and communications have supported the sector and encouraged more private investment. This has included the introduction of dedicated airfreight airlines, new airports, introduction of cold chains; packaging and label suppliers setting up locally, greenhouse suppliers, irrigation suppliers, chemical and fertilizer companies looking at the markets with a view to expand regionally into the East African Community. There is need for lobbying for government intervention to reduce all forms of taxation thatimpact negatively on exports.

(b) Looking beyond EU

Kenya should now look beyond the EU market where competition is high and consumer spending power is reducing, the emerging markets of Asia may have more potential.

(c) Labour costs

Labour costs are highin Kenya and the costs continue to rise, mostly attributed to an educated workforce and inflation. Kenya has a comparative advantage in the availability of well-trained supervisors and technicians but unskilled labour is expensive.

Research should now focus research on developing labour-saving production and post-harvest techniques such as robots.

(d) Compliance with MRLs

Compliance with MRLs is crucial to continued growth of the industry and there is need to enforce regulatory systems on chemical use in horticulture.Harmonize standards and send the same messages to all farmers. Introduce guiding food safety policies on produce destined for the domestic market.

(e) Supplementing Water

Irrigation is essentialfor maintaining continued future production. Much of horticultural production is rainfed leading to erratic production and insecure income for farmers. There is need to upgrade and invest in irrigation systems and promote sustainable natural resource management e.g. water and soil conservation, use of irrigation systems etc.

(f) Post harvest handling

A wide variety of fungal and bacterial pathogens cause postharvest disease in fruit and vegetables. Some of these infect produce before harvest and then remain quiescent until conditions are more favourable for disease development after harvest. Other pathogens infect produce during and after harvest through surface injuries. In the development of strategies for postharvest disease control, it is imperative to take a step back and consider the production and postharvest handling systems in their entirety. Many pre-harvest factors directly and indirectly influence the development of postharvest disease, even in the case of infections initiated after harvest. Traditionally fungicides have played a central role in postharvest disease control. However, trends towards reduced chemical usage in horticulture are forcing the development of new strategies. This provides an exciting challenge.

(g) Modern technologies

There is need for adoption of modern technologies through improved provision of advisory services by the public and private sector extension service providers. Need for enhancement of compliance with standards and product safety through sensitization. Need for promotion on use of integrated pest and disease management. Facilitate the development of long-term plans and suitability maps/profiles for various eco-zones for horticulture investment.

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Cash Acounting Practices and Moderating Role of Board Structure on Profitability of Sugar Manufacturing Companies in Kenya

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Abstract
This research aimed at analyzing the influence of Cash Accounting practices on profitability of manufacturing companies using evidence from Kenya's sugar industry. The following specific objectives were addressed by this study: to assess the influence of cash Accounting practices on financial performance of sugar Manufacturing companies in Kenya and to determine the influence of Board structure as a moderating factor on the financial performance of sugar manufacturing companies in Kenya. This study was guided by cash preference model. This research adopted a descriptive research design in which a census of all the targeted population of 12 manufacturing companies jointly from sugar manufacturing industry were drawn from a list of 800 manufacturing companies in Kenya, whereby a proportionate random sample of 109 employees were interviewed from all the 12 sugar manufacturing companies in Kenya. Questionnaires were administered as the main tool of data collection whereby 102 questionnaires were collected representing a 93.6% response rate. Descriptive statistical techniques were applied to describe application of strategic financial management practices in the sampled manufacturing companies which were sugar manufacturing companies in this study. Inferential statistical techniques such as Correlation analysis and regression analysis were applied to test the hypotheses of association and differences. Gathered data was processed by computer and the Statistical Package for Social Science (SPSS) which was the main computer software that was utilized in data analysis. The cash accounting practices' null hypothesis was rejected implying a significant effect on profitability. Board structure was found significant implying board structure as a moderating value has a significant effect on profitability.It is important for organizations to prepare cash budgets on a monthly basis so that they can control cash receipts and payments. Also, organizations need to utilize computers in cash accounting since they are efficient and effective. This study suggests the need for further research on other economic factors besides cash accounting practices that influence the profitability of sugar manufacturing companies and other companies.

1.0 Introduction

1.1 Background

Business environment has become intensively dynamic and increasingly unpredictable in recent decades, correspondingly, financial management of companies has become more demanding. To achieve competitiveness, companies apply different strategies and financial management should be used as one of the main supporting system for strategy implementation. For this purpose strategic financial management has been developed (Ramljak and Rogosic, 2012).

Mohamed, et al (2010) identified the components of strategic financial management as strategic investment practices, strategic financing practices, strategic capital structure practices and strategic cash practices. Chung & Chuang (2010) classified financial management practices into the following five specific areas: cash accounting, financial reporting and analysis, capital budgeting and accounting information system.

In India, Ready and Ready (2012) made an attempt to measure the financial distress of selected sugar factories by applying Altman's Z score model. They came to conclusion that selected sugar factories representing poor financial performance which may lead to bankrupts but one of them

had taken financial practices turnaround measures to improve its financial performance. Maheswari and Reddy (2012) analyzed capital structure of selected sugar mills in Chittoor district in India in terms of structure of working capital, financing structure, Current ratios, working capital turnover and operating cycle. They found out that most firms that had not implemented cash accounting practices were seriously performing poorly. Herekar and Shinde (2012) have taken a review of challenges facing sugar firms in Maharashtra and suggested some remedies thereon. They have identified problems being faced by sugar such as lack of professional financial management skills, Price crash, and High interest risk burden and cash risk.

In Vietnam, Kieu (2004) indicated that efficiency in strategic financial management practices such as strategic accounting information system, capital structure and strategic financial planning and good performance in financial characteristics such as cash accounting and business activity has greatly impacted positively on financial performance. Similarly in china, the study conducted by Chung & Chuang (2010) also reveals efficiency in capital structure management, working capital management, financial reporting and analysis; capital budgeting and prudent financial management have a positive impact on profitability of business organizations.

A study by Transparency international, (2012) on institutional integrity of the sugar manufacturing firms in Kenya, concluded that the sugar industry in Kenya will face collapse if the current scenario characterized by frequent company shut downs, huge debt, unwise investment practices and cash shortages are not resolved before the COMESA protectionism clause will be lifted soon. However the clause was extended to February 2017 in order to enable the country realign her industries to compete favorably with other COMESA block members since, the countries, output is expensive compared to its competitors in the COMESA trading block (Hanzard, 2014) .Thus these sugar firms should strive for optimal cash balances. Kraus, (2011) is of the opinion that optimum cash accounting enhances cooperate efficiency at all levels of operations.

1.2 Statement of the problem

The core problem affecting Kenya's sugar industry is the protracted persistent deterioration in profitability (Kibet, 2013). Accordingly, most factories have accumulated large debts amounting to KSh. 58 billion as at 31st Dec 2014 (Naibei, 2014). Consequently approximately 50% of sugar companies in Kenya each year experience a declining financial performance (profitability) hence going under receivership despite the government and the private sector in Kenya having invested heavily in creating an enabling financial environment for doing business in Kenya (Momanyi and Mugenda, 2014). This prevailing problem of financial inefficiency is different from previous researched financial issues because it involves not only public factories but also private factories (KSB, Annual report 2015). This crisis in the Sugar industry may call for compact cash management practices. Some compact financial management practices include cash accounting management practices (Pandey, 2008). The main purpose of this qualitative study was to examine the applications of cash management practices by employees in sugar companies in western, Kisumu, Kwale and Transmara regions of Kenya in order to notify policymakers on the best financial management practices to increase profitability. The data gathered in this study may provide the government and concerned managers with information relating to how they may address or mitigate factors contributing to the current profitability issues among sugar companies in Kenya.

1.3 Research Objectives

1.3.1 General Objective

The general objective of this study was to determine the influence of cash accounting practices and moderating role of board composition on profitability of sugar manufacturing Companies in Kenya.

1.3.2 Specific objectives

i. To determine the influence of cash accounting practices on profitability of sugar Manufacturing companies in Kenya
ii. To investigate the influence of Board structure as a moderating factor on the profitability of sugar manufacturing companies in Kenya

1.4 Research Hypotheses

H_{01}: There is no statistical significant relationship between cash accounting and profitability of sugar manufacturing companies in Kenya

H_{02}: There is no statistical significant relationship between Board structures as a moderating factor on the profitability of sugar manufacturing companies in Kenya

2.0 Literature Review

2.1 Cash Preference Model

This model concept was first developed by John Maynard Keynes in his book The General Theory of Employment, Interest and Money (1936) to explain the determination of the interest rate by the supply and demand for money. In macroeconomic theory, cash preference refers to the demand for money, considered as cash.

According to Keynes, money is the most liquid asset. Cash is an attribute to an asset. The more quickly an asset is converted into money the more liquid it is said to be. As shown in figure 2.1 bellow, According to John Mynard Keynes (1936), Cash trap is visualized in an IS–LM diagram. A monetary expansion (the shift from LM to LM') has no effect on equilibrium interest rates or output. However, fiscal expansion (the shift from IS to IS'') leads to a higher level of output with no change in interest rates: Since interest rates are unchanged, there is no crowding out. A cash trap is a situation, described in Keynesian Economics, in which injections of cash into the private banking system by a central bank fail to decrease interest rates and hence make monetary policy ineffective. A cash trap is caused when people hoard cash because they expect an adverse event such as deflation, insufficient aggregate demand, or war. Common characteristics of a cash trap are interest rates that are close to zero and fluctuations in the money supply that fail to translate into fluctuations in price levels In its original conception, a cash trap refers to the phenomenon when increased money supply fails to lower interest rates. Usually central banks try to lower interest rates by buying bonds with newly created cash. In a cash trap, bonds pay little or no interest, which makes them nearly equivalent to cash. Under the narrow version of Keynesian theory in which this arises, it is specified that monetary policy affects the economy only through its effect on interest rates. Thus, if an economy enters cash trap, further increases in the money stock will fail to further lower interest rates and, therefore, fail to stimulate.

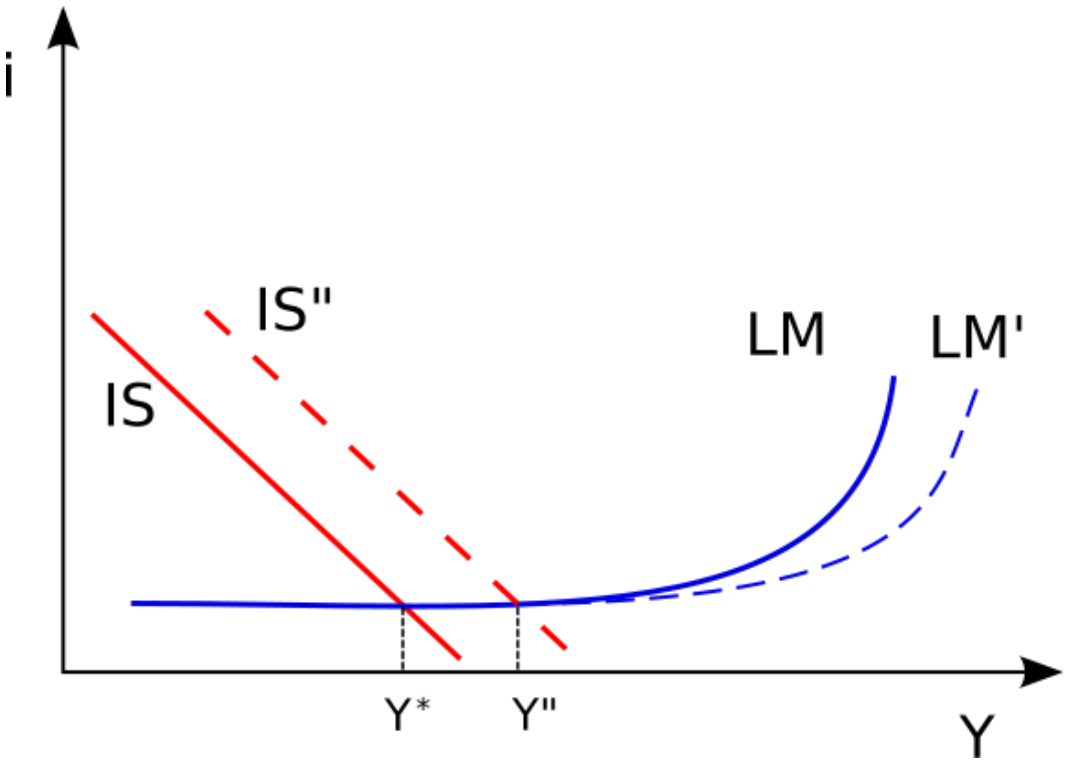

Figure 2.1: Cash Trap

According to Keynes, 2000 demand for cash is determined by three motives: first, the transactions motive: people prefer to have cash to assure basic transactions, for their income is not constantly available. The amount of cash demanded is determined by the level of income: the higher the income, the more money demanded for carrying out increased spending. Secondly, the precautionary motive: people prefer to have cash in the case of social unexpected problems that need unusual costs. The amount of money demanded for this purpose increases as income increases. Thirdly, Speculative motive: people retain cash to speculate that bond prices will fall. When the interest rate decreases people demand more money to hold until the interest rate increases, which would drive down the price of an existing bond to keep its yield in line with the interest rate. Thus, the lower the interest rate, the more money demanded (and vice versa). From this theory, it is evident that any manufacturing company must embrace relevant financial management practices concerning its cash/ cash in order to remain competitive and relevant in the market either by adopting traditional, modern or both approaches of cash management and application.

2.2 Conceptual framework

A conceptual framework for the this study shows the relationship of strategic Li management practices on financial performance of manufacturing companies which has been shown in Figure 2.1 below which conceptualizes that Capital structure management practices influence on financial performance of sugar manufacturing companies ascertained through profitability.

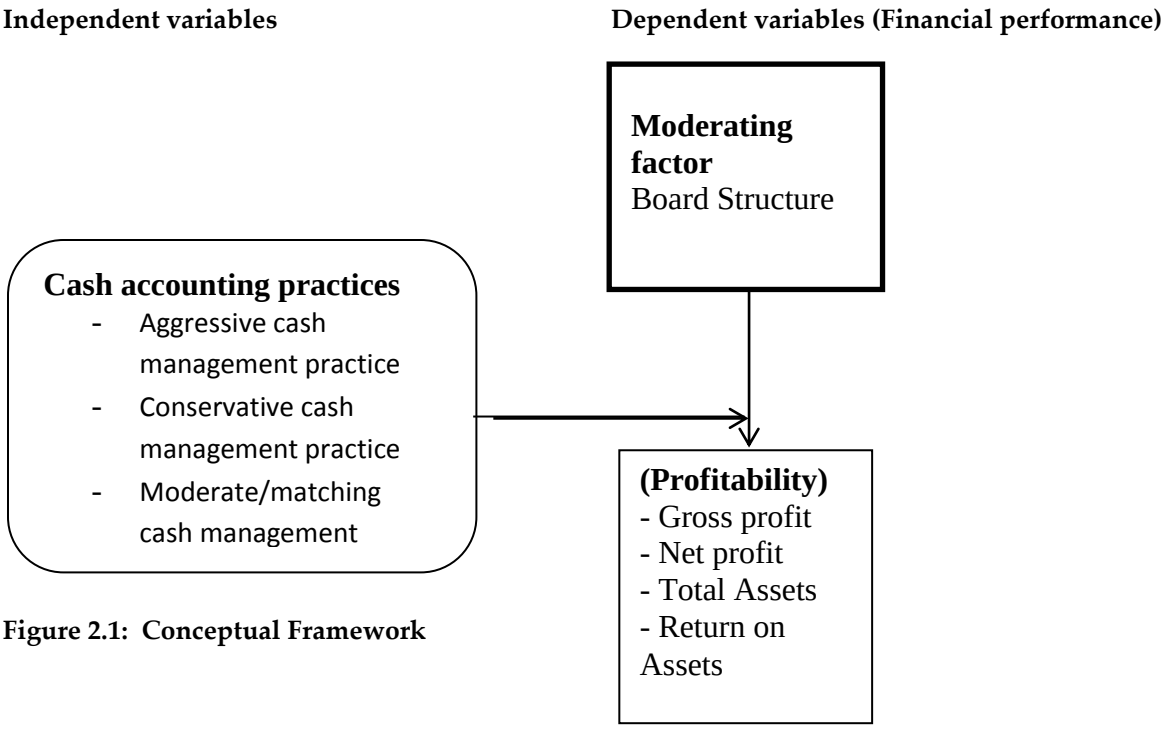

Figure 2.1: Conceptual Framework

2.3 Empirical Literature review

2.3.1 Cash practices

According to Wasike ... et al., (2009), Sugar manufacturing companies need cash and other cash assets or current assets to pay their bills or current liabilities as they fall due If a company has insufficient current assets in relation to its current liabilities, it might be forced into liquidation. Cash problems can arise from the failure to convert current assets into cash in a timely manner or from excessive bad debt losses. Therefore, cash is an important aspect that conveys a good picture about the ability of the firm to generate cash and pay short term liabilities and long term debts as they fall due (Kiogora, 2012). Hence, Cash ratios are computed to compare the relationship between various groups of current assets and current liabilities to measure the cash position of a business. Mathenge (2012) argues that cash ratios help in ascertaining the effectiveness of the financial management. Current, quick and cash ratios are the three types of cash ratios that are normally computed. Sri (2011) in his study on cash management on profitability in steel industries in India used current ratio and absolute cash ratio as measures of cash. They found a positive relationship between cash and profitability. However, for the purpose of this study, debts and current assets as well as cash management practices were considered.

Oludhe (2011) did a causal research design which this was facilitated by the use of secondary data which was obtained from the CBK publications on banking sector survey. The study used multiple regression analysis in the analysis of data and the findings have been presented in the form of tables and regression equations. The study also found that there is a strong impact between the CAMEL components on the financial performance of commercial banks with the R2 values being lowest at 0.594 in 2007 and highest at 0.943 in 2009 implying that in 2007 CAMEL components

could explain 59.4 percent variations in financial performance and 94.3 percent variations in financial performance in 2009. The study also established that capital adequacy, asset quality, management efficiency and cash had weak relationship with financial performance (ROE) whereas earnings had a strong relationship with financial performance. This study concluded that CAMEL model can be used as a proxy for credit risk management. The study thus recommended that commercial banks should also try to keep their operational cost low as this negates their profits margin thus leading to low financial performance. This is depicted by the strong effect of earnings on financial performance.

2.3.2 Board structure as a moderating factor

Direct monitoring by the shareholders is governed through the board of directors who were elected by shareholders. The board of directors is the ultimate decision making organ of the company. The board plays a major role in the corporate governance frame work and is mainly responsible for monitoring managerial performance and achieving an adequate return for shareholders. The board also acts as an intermediary between the principals (shareholders) and the agents. (Managers) ensuring that capital is directed to the right purpose (OECD report 2004).

3.0 Methodology

3.1 Research Design

This study adopted a descriptive survey design to answer the research questions. According to Salkind (2009), descriptive survey is a method of collecting data by interviewing or administering a questionnaire to a sample of individuals which can be used when collecting information about peoples' attitudes, opinions, habits or any other social issues. Descriptive research design was appropriate for this study as it helped in understanding the influence of strategic capital structure management practices in sugar manufacturing companies in Kenya and therefore answers the "what" question of the study.

3.2 Target Population

According to Salkind, (2010), population is the complete group of a general set of elements relevant to the research. Kenya has a population of 1050 manufacturing companies from all over the 47 counties (Kenya Manufacturer Association, 2015). The target population was the 12 sugar manufacturing companies in Kenya. Given the small number of 12 firms in the Sugar industry in Kenya, which of course do not warrant sampling to be undertaken (Salkind, 2010), a census study was conducted to capture all the twelve (12) sugar manufacturing firms operational in Kenya (Mugenda, Momanyi, & Naibei, 2012).Therefore, in this research, all the 12 Sugar manufacturing companies in Kenya with their employees amounting to 12,500 people (KSB, 2015), were defined as the target population from where the sample was drawn for research people.

3.3 Sample and sampling technique

Kombo and Tromp (2009) and Kothari (2004) describe a sample as a collection of units chosen from the universe to represent it. A study that collects too much data is also wasteful. Therefore, before collecting data, it is essential to determine the sample size requirements of a study (Gerstman, 2009). Given the small number of 12 firms in the Sugar industry in Kenya, which of course did not warrant sampling to be undertaken (Salkind,2010), a census study was conducted to capture all the 12 sugar manufacturing firms operational in Kenya (Mugenda, Momanyi & Naibei, 2012). However sampling was adopted to ascertain the number of respondents from the sugar manufacturing companies. The sample was obtained using coefficient of variation. Nassiuma (2000) asserts that in most surveys or experiments, a coefficient of variation in the range of $21\% \leq C \leq 30\%$ and a standard error in the range $2\% \leq e \leq 5\%$ is usually acceptable. This study therefore used a

coefficient variation of 21% and a standard error of 2%.The lower limit for coefficient of variation and standard error was selected so as to ensure low variability in the sample and minimize the degree of error (Kothari, 2007). Purposive sampling was further adopted to identify the respondents from each company to suite the total sample of 109 respondents. Therefore the Heads of Departments from key departments were sampled purposively to respond to the researcher.
Nassiuma, (2000) gives the following formula in relation for determining sample size:
Given by: **$n = NC^2 / \{C^2 + (N-1)\ e^2\}$** Where: n= sample size, N =accessible population, C= coefficient of variation, e= standard error.
Thus $n = 12{,}500\ (0.21^2) / \{0.21^2 + (12500-1)\ 0.02^2\} = 109$

3.4 Data Processing and Analysis
Murphy III (2010) indicated that multiple regression analysis allows the appraiser to determine whether a relationship exists between several independent variables and a dependent variable. As indicated in chapter one, the research problem in this study was to determine whether a relationship existed between financial management practices and financial performance of sugar manufacturing companies. This study used multiple regression analysis to investigate simultaneous influence of Cash Accounting practices (LIQ). The multiple regression equation in this study without the moderating variable was as follows:
$\boldsymbol{y = \beta_0 + \beta_1 cash + \varepsilon}$ **Without moderating factor**
Where:
Y = Profitability
β = beta, the coefficient of cash accounting Practices as an independent variable
LIQ= cash accounting practices (Aggressive cash management, Conservative cash management, Moderate cash management)
ε = error term that denotes the unexplained practices affecting financial performance.
With the moderating effect (Board Structure), the model translates as follows:
$\boldsymbol{y = \beta_0 + \beta_5 cash * BS + \varepsilon}$ **With moderating factor**
Where:
Y = financial performance = Profitability
β = beta, the coefficient of cash accounting practices as independent variable and moderating variable
BS = Board structure

4.0 Data Analysis and Discussion
4.1 Correlation analysis for construct cash accounting practices with profitability
A correlation analysis for the construct cash accounting practices was conducted to find out how cash accounting practices correlated with profitability. Table 4.1 shows that the Pearson correlation coefficient was 0.522 a clear indication that cash accounting practices has a positive correlation with profitability (p-values >0.05). (Wong,2012). The significance of cash accounting practices verses profitability enhancement as indicated in the table 4.1, all the plots are on the first quant rate in the line of best fit. These findings indicate that there is a strong relationship between cash accounting and profitability. According to Nyabwanga, 2011), cash management assists the company budget and apply funds according to the laid down policies hence excellence performance.

Table 4.1: Correlation analysis for construct cash accounting practices with profitability

Correlations

Constructs	correlations Basis	profitability	Cash a/c practices
profitability	Pearson Correlation	1	.522**
	Sig. (2-tailed)		.000
	Sum of Squares and Cross-products	40.321	19.303
	Covariance	.399	.191
	N	102	102
Cash accounting practices	Pearson Correlation	.522**	1
	Sig. (2-tailed)	.000	
	Sum of Squares and Cross-products	19.303	33.903
	Covariance	.191	.336
	N	102	102

**. Correlation is significant at the 0.01 level (2-tailed).

4.2 Simple regression analysis for construct cash accounting practices

Table 4.2 presents the regression model the regression model of cash accounting practices strategy with a coefficient of determination of R2 = 0.288 and R= 0.536 at 0.05 significance level. The coefficient of determination indicates that 53.6 % of the variation on financial performance is influenced by cash accounting strategy. This shows that there exists a positive relationship between cash accounting practices strategies on financial performance. The test of beta coefficient shows that there is a significant relationship between cash accounting strategy and financial performance as positive. The coefficient significance of cash accounting effect as .281 and is significantly greater than zero since the significance of t-statistics 0.00 is less than 0.05. This demonstrates that the high level of cash accounting strategy as having a positive effect on financial performance. These findings are in line with (Kibet, 2012) that cash practices strategy issues such as Aggressive cash management practice, Conservative cash management practice and Moderate cash management practices affect profitability.

Table 4.2: Simple regression analysis - strategic cash accounting practices with financial performance

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson	Sig. F change
1	.536[a]	.288	.281	.53593	1.979	.000

a. Dependent Variable: profitability
b. Predictors: (Constant), CASH PRACTICES

4.3ANOVA for strategic cash accounting practices with profitability

ANOVA was conducted to establish the homogeneity of data. As indicated in

Table 4.3, if the observations were drawn from the same population, their variances would not differ much. An F statistic of 40.380 indicated that the combined model was significant. This was supported by a probability value of (0.000). The reported probability of (0.000) is less than the conventional probability of (0.05). According to the analysis of Variance table there were significant differences between the cash practices in the mean number of profitability F(1, 100) = 40.38 P<0.05.33.

Table 4.3: ANOVA – Strategic cash Accounting practices and profitability

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11.598	1	11.598	40.380	.000[b]
	Residual	28.723	100	.287		
	Total	40.321	101			

a. Dependent Variable: profitability

b. Predictors: (Constant), STRATEGICCASH CASH

4.4 Regression Coefficients of strategic Cash Accounting Practices and Financial Performance

Analysis of the regression model coefficients is shown in table 4.4. From the table there is a positive beta co-efficient of 0.757 as indicated by the co-efficient matrix with a P-value = 0.000 < 0.05 and a constant of 0.611 with a p-value = 0.000 < 0.05. Therefore, both the constant and strategic Cash management practices contribute significantly to the model. Therefore, the model can provide the information needed to predict profitability from strategic Cash accounting practices. The regression equation is presented as follows: Y = 0.611+0.757X2 + ε; Where Y = Financial performance, X2 is the strategic Cash Accounting practices and ε is the error term.

Table 4.4: Regression Coefficients of strategic Cash Accounting Practices and Profitability

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.611	.446		1.369	.004
	CASH practices	.757	.119	.536	6.355	.000

a. Dependent Variable: Profitability

Model = Y = 0.611+0.757X2

4.5Correlation analysis for construct cash Accounting practices strategy and board structure composition with financial performance

A correlation analysis for the construct cash accounting practices as financial management strategy and board structure composition was conducted to find out how cash accounting techniques of financial management combined with board composition correlate with financial performance. Table 4.5 shows that the Pearson correlation coefficient was 0.652 which indicates that capital structure strategy with board structure as a moderating factor have a strong correlation with financial performance (p-values > 0.05). These findings indicate that there is a strong relationship between board structure combined with capital structure and financial performance. These findings concur with study conducted by Coles etal (2010) which concluded that1 board behaviors due to their composition in terms of education and gender balance may affect managers in their day to day application of cash accounting practices. Therefore board structure greatly influences the company's cash Accounting practices strategies in an organization hence influencing the financial performance of the organization.

Table 4.5: Correlation analysis for construct Cash Accounting practices and board structure composition with financial performance

Correlations

Constructs	correlation basis	profitability	LS_BS
Profitability	Pearson Correlation	1	.652**
	Sig. (2-tailed)		.000
	Sum of Squares and Cross-products	40.321	135.484
	Covariance	.399	1.341
	N	102	102
LS_BS	Pearson Correlation	.652**	1
	Sig. (2-tailed)	.000	
	Sum of Squares and Cross-products	135.484	1071.121
	Covariance	1.341	10.605
	N	102	102

**. Correlation is significant at the 0.01 level (2-tailed).

4.6 Simple regression analysis for construct Board structure practices and Profitability

Table 4.6 presents the regression model the regression model of Board structure practices as a moderating factor with a coefficient of determination of $R^2 = 0.305$ and $R= 0.553$ at 0.05 significance level. The coefficient of determination indicates that 52.93% of the variation on Profitability is influenced by board decisions. This shows that there exists a positive relationship between board composition practices with Profitability. The test of beta coefficient shows that there is a significant positive relationship between board composition and financial performance. The coefficient significance of board composition is at .298 and is significantly greater than zero since the significance of t-statistics 0.00 is less than 0.05. This demonstrates the high level of board composition as having a positive effect on financial performance. These findings are in line with (WestPhal, 2010) that Board composition in terms of executive and non-executive and executive directors, educated and non-educated directors 'decisions affects financial performance.

Table 4.6: Simple regression analysis - Board structure practices and Profitability

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson	Sig. F change
1	.553[a]	.305	.298	.52926	1.741	.000

a. Dependent Variable: Profitability

b. Predictors: (Constant), BOARDSTRUCTURE

4.7 ANOVA for Board Structure practices and Profitability

ANOVA was conducted to establish the homogeneity of data. As indicated in

Table 4.7, if the observations were drawn from the same population, their variances would not differ much. An F statistic of 43.945 indicated that the combined model was significant. This was supported by a probability value of (0.000). The reported probability of (0.000) is less than the conventional probability of (0.05). According to the analysis of Variance table there were significant differences between the board structure in the mean number of profitability $F(1, 100) = 43.945$ $P<0.05$

Table 4.7: ANOVA – board structure composition and profitability

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	12.309	1	12.309	43.945	.000[b]
	Residual	28.011	100	.280		
	Total	40.321	101			

a. Dependent Variable: profitability

b. Predictors: (Constant), BOARDSTRUCTURE

4.8: Regression Coefficients of Board Structure Practices and profitability

Analysis of the regression model coefficients is shown in table 4.8. From the table there is a positive beta co-efficient of 0.693 As indicated by the co-efficient matrix with a P-value = 0.000 < 0.05 and a constant of 1.097 with a p-value = 0.000 < 0.05. Therefore, both the constant and Board structure practices contribute significantly to the model. Therefore, the model can provide the information needed to predict profitability from Board structure practices. The regression equation is presented as follows: Y = +1.097X4; Where Y = Financial performance, X4 is the Board structure practices and ε is the error term.

Table 4.8: Regression Coefficients of Board Structure Practices and Profitability

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.097	.355		3.091	.003
	BOARDSTRUCTURE	.693	.105	.553	6.629	.000

a. Dependent Variable: Profitability

Model = Y = 1.097+0.693X4

4.9 Influence of Board Structure as a Moderating Factor with cash accounting Practices on the profitability of Sugar Manufacturing Companies in Kenya

Some researchers have pointed out that large boards have a range of expertise and can bring a diversity of views and experience, increase the opportunity for a broad geographic representation, and provide extensive director resources for constituting board committees to deal effectively with complex issues (e.g. Rao and Lee-Sing, 1995).

Table 4.9 presents results on the moderating effect of board structure. It can be seen from the table that there is a positive and significant moderating effect of board structure on the relationship between strategic cash accounting practices and profitability (β =0., ϱ<0.05).The regression model (Table 4.10) supported the proposed positive moderating effect of board structure. It can be seen from table 4.10 that there is a positive and significant moderating effect of board structure on the relationship between strategic cash practices and profitability (β = 0., ϱ<0.05).The results infer that the board is effective in monitoring the financial process and constraining opportunistic managerial reporting. In so doing, there is better utilization of finances leading to improved profitability.

Finally, the study has indicated that board structure positively and significantly moderates the relationship between strategic cash accounting practices and profitability. With the board

committees, there is better understanding and knowledge on the firm operation. Therefore, the diversity of views and experience of the board makes it easier for the organizations to plan and control cash resulting to improved financial performance.

Table 4.10: Board Structure as a Moderating Factor on the Financial Performance

	model 1			model 1			model 1			model 1		
	B	Std. Error	Sig.	B	Std. Error	Sig.	B	Std. Error	Sig.	B	Std. Error	Sig.
(Constant)	-1.563	0.41	0.18	0.02	0.42	0.96	-0.4	0.39	0.29	0.42	0.49	0.4
3.cash	0.27	0.09	0	0.21	0.09	0.02	0.11	0.08	0.19	-1.9	0.76	0.02
6.LS*BS										0.56	0.21	0.01
R Square	0.51			0.57			0.65			0.68		
Adjusted R Square	0.5			0.56			0.63			0.66		
F	34.5			32.5			36.1			33.1		
Sig.	.000b			.000c			.000d			.000e		

a Dependent Variable: profitability
b Predictors (: (Constant) cash, cash*BS

Board structure as a moderating factor model:

$$y = \beta_0 + \beta_1 + cash + \beta_2 cash * BS + \varepsilon$$

Hence the combined model with moderating factor findings model:

Y = -1.563 +0.270X3+ 0.56 LS*BS

4.10 Test of hypotheses

Hypothesis 1 (H_{o1}) stated that strategic cash accounting practices had no significant effect on financial performance. According to table 4.6 bellow, However, research findings showed that strategic cash accounting practices had coefficients of estimate which was significant basing on β_2= 0.291 (p-value = 0.000 which was less than α = 0.05) hence the null hypothesis was rejected. This indicated that for each unit increase in cash accounting practices, there was 0.291 units increase in financial performance. Furthermore, the effect of strategic cash Accounting was stated by the t-test value = 3.917 which implied that the standard error associated with the parameter was less than the effect of the parameter.

Hypothesis 2 (H_{o2}) postulated that Board structure had no significant effect on profitability, according to table 4.11 bellow, Research findings showed that board structure had coefficients of estimate which was significant basing on β_4= 0.265 (p-value = 0.002 which is less than α = 0.05) implying board structure has a significant effect on profitability. This indicates that for each unit increase in the composition of the board, there is 0.265 units increase in financial performance. Furthermore, the effect of board structure was stated by the t-test value = 3.189 which implies that the standard error associated with the parameter is less than the effect of the parameter.

Table 4.11: Multiple regression Analysis
Strategic financial management practices model:

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
	B	**Std. Error**	**Beta**	**t**	**Sig.**	**Tolerance**	**VIF**
(Constant)	-1.563	0.454		-3.445	0.001		
cash practices	0.411	0.105	0.291	3.917	0.000	0.776	1.288
BOARDSTRUCTURE	0.34	0.107	0.265	3.189	0.002	0.622	1.609

a) Predictors: (Constant),strategic cash /cash management practices, Board structure composition
b) Dependent Variable: profitability

$Y = \beta 0 + \beta 1LIQ + \varepsilon$
Hence the findings model:
$Y = -1.563 + 0.411X1 + 0.34X2$

5.0 Conclusion and Recommendations

5.1 Conclusion on the evaluation of influence of strategic cash accounting practices on profitability of sugar manufacturing companies in Kenya

The study has shown that strategic cash accounting practices have a positive and significant effect on the financial performance. This implies that cash accounting practices make it easier for the organizations to plan and control finances. This process can be made easier by the use of computers hence organizations can balance between the conservation of cash and its quick application in investments. However majority of the managers in the sugar manufacturing companies strongly agreed that they had not been embracing salient cash accounting practices. For instance no strategies on the cash conversion techniques, no strategy on the minimum cash balances to be retained by the companies' bank account, neither did they have fixed accounts at the bank. Managers agreed that whenever there were cash surpluses, the employees and suppliers could be paid promptly outside the credit period and laid down cash policies. This has contributed to the dwindling of profitability of most sugar manufacturing companies.

5.2 Conclusion on Investigation of influence of Board structure as a moderating factor on profitability of sugar manufacturing companies in Kenya

The study has exhibited that board structure has a significant effect on profitability. This implies that whenever the board of directors has both male and female members, chairman of the board of directors acts as the C.E.O of the organization, directors have past experience in the position of directorship from other organizations, most of directors come from outside the shareholders and majority of Board of directors' compensations are within the budgeted amount, then this may lead to a better profitability of an organization financially.

5.3 Recommendations

Strategic cash accounting practices contribute significantly to improved profitability. It is important for organizations to prepare cash budgets on a monthly basis so that they can control cash receipts and payments. Also, organizations need to utilize computers in cash management since they are efficient and effective. To sum up, any available cash should be applied in future ventures to ensure that there is no misuse of funds especially by Board of Directors.

5.4 Areas for Further Research

This study recommends that another study be done to augment finding in this study. Specifically, a comparative study across different industries might also be a more valuable contribution to this area of research. Moreover, there is no evidence that financial performance is entirely dependent on the two independent variables. As such further research need to be carried out to establish what other economic factors contribute significantly to financial performance.

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Relational Bonds and Customer Loyalty: Insights from Related Literature

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Abstract
The pursuit by organizations to retain their current customers and increase their market share has made customer relational bonding and the adoption of retail mix critical for organizations. The study focused on effect of relational bonds strategy on customer loyalty. A number of objectives were addressed by this study; it assessed the effect of financial, social, structural and customization bonds on customer loyalty. A number of papers with bias to bonding were identified by examining the table of contents of the leading journals followed by a scrutiny of the key words used in each paper in the journal. The literature search included journals published by numerous publishers, for the period 2011–2016. These papers were filtered on the basis of their focus and the dates of publication. After this process, there were approximately 24 papers whose copies were collected and formed a basis of this review. A number of outcomes were identified. Financial, social, structural and customization bonds have an effect on the loyalty of customers in the retail chains. The financial bonds are crucial in relationship development hence most retail chains to embrace non monetary financial bonds. It's important to create theoretical support in identifying different social bonds so as not to have the social bond frequently being included as one type of bond in a relational or relationship bond measurement scale. Retail chains to embrace structural bonding to give them an edge in competition, but equally to focus in non service sector that has very little of structural bonding. It's equally important to have intimate knowledge of individual customers needs and through the development of customized solutions that are tailored to the specific needs of the individual customers. The relationship between the relational bonds and customer loyalty developed in this paper is expected to contribute to the existing body of relationship marketing and management literature in terms of exploring the nature of relationships. The management will use the findings of this study to guide them in their customer relationship decisions. Furthermore, the findings of this research will be source of reference for the academicians who intend to carry out studies in relation to the subject of relational bonds and customer loyalty in retail firms and related organizations.

Key Words:*Customization, Customer loyalty, Financial, Social, Structural bonds*

1 .0 Introduction

Relationship marketing as put forward by Bagalle (2008) quotes the seminal work of Dwyer et al. (1987) which laid the groundwork for Relationship Marketing theory in the United States. Her research, along with subsequent studies, where she cited the works of (Claycomb & Frankwick, 2005; Dwyer et al.; Wilson, 1995) who among other authors, proposed that buyer seller relationships transition through various progressive phases. According to Kotler and Armstrong (2008), building a successful business and retaining customers in the business world of today can be exceedingly difficult. Customers expect quality because they want to feel that their needs and wants are well catered for by the products and services that are being offered by the retailer. Kotler and Armstrong emphasize paying careful attention to the customer makes them feel valuable and they encourage them to patronize the products and services of the business. Consequently, retailers need to utilize all their resources to ensure that they retain, attract and make the customers feel happy and valuable. This gives the business a chance in terms of profitability and number of customers thus becoming competitive.

Customer loyalty is an important aspect of marketing in the 21st century (Duffy, 2005). Baker & Bass (2003) attributes this to the rise of relationship marketing. The term customer loyalty "is a physical and emotional commitment given by customers in exchange for their needs being met" (Stone, Woodcock &Machtynger, 2000). A customer loyalty scheme is a framework that guides an organization in choices that determine the nature and direction of attracting, maintaining and enhancing customer behavior characterized by a positive buying pattern and attitude towards the company, its products or services over time by rewarding loyal customers" (McMullan & Gilmore, 2008). In the competitive and turbulent business environment, it becomes primordial for business operators to sustain business developments and foster customers trust by upholding good practices in their operations. The success of businesses is only likely to result if short- term operational activities are consistent with long-term strategic intentions (Levy &Weitz, 2007).

In today's highly competitive markets whoever provides quality product and better services will definitely have an advantage over the others. This challenge is augmented by the diversity of the Kenyan consumer market and increasingly saturated supermarkets in the retail industry (Cant & Machado, 2004). Managing customers is more important than ever in ensuring that they not only purchase products from the store, but also maintain a lifetime of patronage and maximize customer lifetime value (Rowley, 2005). For an organization to keep its customer loyal, ensuring customer satisfaction is paramount. Customer satisfaction is a key strategy that businesses use to gain customers loyalty.

A successful customer loyalty scheme leads to customer retention. Depending on the industry, an improvement of 5 percent in customer retention leads to an increase of 25 percent to 85 percent in profits (Kerin, Hartley & Rudelius, 2009; Reichheld & Sasser, 1990). Furthermore, firms spend more than five times as much obtaining a new customer than retaining an existing one (Kotler & Keller, 2006; Wills, 2009). Satisfied customers are committed to store offering, expressing a positive attitude and eager to provide consistent patronage (Duveen-Apostolou, 2006). Berry stressed that the aim is to transform indifferent customers into loyal ones and solidify their relationship to the store. This argument further enforced that twenty-first century consumers have evolved into becoming 'increasingly promotion literate' (Egan, 2001). The dilemma faced by marketers is to develop a retail mix that not only effectively satisfies its target market, but also builds customer commitment and retention. Berry (1995) introduced the concept of relational bonding levels that are categorized as financial, social, and structural within the relationship marketing literature which have been treated as focal components in buyer-seller relationships (i.e., Arantola 2002; Liang and Wang, 2005; Lin, Weng, and Hsieh, 2003). Bonds have been defined as "psychological, emotional, economic, or physical attachments in a relationship that are fostered by association and interaction and serve to bind parties together under relational exchange" (Smith, 1998).

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The major aim of this paper is to review literature and try to incorporate the viewpoints of different researchers associated with customer loyalty and the results of surveys conducted among various customers in the retail industry in Kenya and beyond. The following section provides an outline of the research methodology used in this study. This will be followed by literature review in Section 3. Section 4 will present the pilot survey amongst few selected researchers and also a few customer respondents. Section 5 deals with the discussion part which is considered to be the heart of this paper. This section presents a theoretical framework of relational bonds in the retail sector depicting conceptually the impact of each factor on the overall retention of customers basing the various bonding strategies available which include social, financial, structural and customization bonding strategies and how it affects customer loyalty. This is briefly explained with help of a set of propositions. Section 6 describes, in brief, the managerial implications of the paper. The

concluding section summarizes the present work and highlights its contribution to growth of marketing literature as an area of specialty and relationship marketing in particular. This part also reveals the limitations of the present work and future research directions.

2 .0 Research Methodology

In the current study, a number of papers with bias to bonding identified as it was done by Ngacho and Das (2015), by examining the table of contents of the leading journals followed by a scrutiny of the key words used in each paper in the journal. The literature search included journals published by numerous publishers, for the period 2011–2016. These journals provided over 70 papers with majority being those of international journal of relationship marketing. These papers were filtered on the basis of their focus and the dates of publication. Specifically, those papers which did not address relationship marketing, customer relationship management and bonding were eliminated. After this process, there were approximately 24 papers whose copies were collected and formed a basis of this review. The researcher came across few papers that had various discussions on relational bonds more so in banking sector, higher institutions of learning, hotels, travel agencies, telecommunication and information technology though none has been done in retail sector where there is both service and goods and also having a transactional service setting.

Through researchers observations of relational bonds, a number of classifications of bonds have been put up by different authors including economic, social, confidence and emotional bonds by Lima and Fernandes (2015), where they looked at relationship bonds and customer loyalty, a study that was carried across different service contexts, while Shruthi and Devaraja (2012) had classified the various bonds as financial, social, customization and structural bonds that most researchers have based on. After identifying the bonds relevant to the customer loyalty, a discussion ensued with a group of experts of business management and relationship marketing in particular where their opinion on relational bonding was sought. Subsequently, different classifications on the basis of their resemblance in terms of meaning, some items were merged into one hence developing common items that were to be used in the study. A preliminary questionnaire was designed pertaining to the bonding constructs.

3.0 Literature review

Literature review was carried out by identifying of various relational bonds that have been studied by different scholars this involved directed search of published and related studies that discusses theories and presents empirical results that are relevant to the study at hand (Zikmund et al., 2010) and the analysis of customer loyalty that was narrowly tailored, addressing only the scholarship that is directly related to the research question (Kaifeng and Miller, 2010).This was followed by a brief pilot survey to testify the appropriateness of the various identified relational bonds and how it affects customer loyalty.

In the study carried out by Alrubaiee and Al-Nazer (2010), bonding was classified into two categories: social bond and structural bond, where Social bond had a number of dimensions including social interaction, closeness, friendship and performance satisfaction. According to Sarwari and Minar (2014), relational bonds including financial, social, and structural bonds have been treated as focal components in buyer seller relationships which are referred to as Berry's (1995) three levels of relationship marketing (RM). Bonds have been defined as "psychological, emotional, economic, or physical attachments in a relationship that are fostered by association and interaction and serve to bind parties together under relational exchange" (Smith, 1998). While Shruthi and Devaraja (2012) had classified the various bonds as financial, social, customization and structural bonds.

3.1 Customer Loyalty

Customer loyalty is defined as strongly held commitment to a product or brand in a manner that the customer desires to patronize and buy the product consistently in the future without resort to switching factors and marketing appeals Abubakar et al (2014). Sarwari and Minar (2014) looked at the suggestions that had been put forward by Bove and Johnson (2000) that loyalty is one outcome of improved relational bonds. They argued that, "customer loyalty is a primary goal for most businesses today. This has led to an explosion in the use of different types of bonds which bind the customer to the firm through high switching costs". Pullman and Gross (2004) maintain that loyal customers are the key to the success of many services, particularly those in the hospitality setting.

The paper picked on the six items adapted from four sources by Abubakar et al (2014) study. See table 1 below that was used to measure customer loyalty using 5 point likert type scale anchored on 1= strongly disagree and 5= strongly agree. Thus understanding the link between bonds and loyalty is critical to understanding relationship marketing. In the retail banking industry, the tenure of the relationship between banks and their customers is naturally long (Leverin & Liljander, 2006). The practice in the banking industry and other financial houses has been a deliberate and calculated approach to establishing long term relationship consistent with efficiency building and long run profitability even though researchers do not agree on the rationale for such tendency (Hamidizadeh, Jazani, Hajikarami, & Ebrahimi, 2011).

Table 1: Customer loyalty measurement items and sources

Items	Sources
I conduct all my banking affairs with my I never seriously considered changing bank I would recommend my bank to friends and relatives I prefer to pay my bank higher prices than leave for a competitor I like to say positive things about my bank to other people I will consider my bank as my first choice in future	(Beerli et al.,2002; Caceres et al., 2007; Ehigie, 2006; Zeithaml et al.,1996)

Long term loyalty is the focus of this research because it is better for business organizations and elsewhere to nurture enduring relationships with their customers particularly given the stiff competition that characterized the retail landscape (Ehigie, 2006). Relational bonds are widely considered as cornerstones for keeping customers loyal (Parasuraman 1991, Berry 1995). Zeithaml and Bitner (1996) maintain that firms usually use bonds to tie customers more closely and build loyalty. This view is supported by a range of authors who suggest that bonds of various types improve relationship strength and quality, leading to increased consumer loyalty (Lin, Weng and Hsieh, 2003; Liljindar and Strandivik, 1995; Wilson and Mummalaneni, 1986).

In addition, Sheth and Parvtiyar (1995) also suggest that any relationship that creates customer value will create bonding between consumers and the organization, even though Customer loyalty is not a permanent thing. If the customer value decreases to such a level that it becomes obvious to customers that offers from competitors are better, customers will engage with the others instead. Example is given by Jacobsen et al (2004) where customers are loyal to a specific hotel chain but the hotel chain does not have a hotel in the area where customers are, ultimately may force them to shift their allegiance. Thus, in a situation of strong bonds with everything available in terms of easy of service or product acquisition then customers will be more committed in the relationship and less likely to switch to competitors.

Jacobsen et al (2004), found out that Customer loyalty is more important for certain companies. They gave example of souvenir shop that does not make big efforts in making customers loyal while repurchase being more important for the survival of other companies. According to Blomqvist et al (2000) there is one fundamental way in how to put more effort in customer loyalty which is the right marketing, where they say it is possible to build up a loyal base of customers with a high frequency of purchases. With a loyal base of customers, the company can reach a stable market share which consists of loyal customers who are easier to defend from competitors. Feurst (1999) went further and divided customer loyalty into four different types. The categories are graded by how strong the loyalty is. Customers are more engaged in the offer when the grade of loyalty is high and thereby customers are harder for competitors to get. The grades go from enforcement from the outside to inner commitment. The first two grades are easier to create if set in relationship with the other two, but at the same time these customers are easier for competitors to steal. The first grade is Forced loyalty. This grade is categorized by obstacles. These can be, lack of time, lack of alternatives, or that it is laborious or expensive to change supplier. An example could be that you choose a bank close to you geographically, even if there are better alternatives. Second is bought Loyalty. This is conscious loyalty It is based on some sort of bonus that customers receive in money or discount, if they are loyal. An example could be that the customers are loyal because when they buy five of something they get the sixth for free. Third is divided into two Practical Loyalty a, Habit. This is unconscious loyalty. The customers' choices are based on routines. Customers always use one supplier and will continue to do so without thinking about it. If they change, they will choose within an evoked set of suppliers. For example when customers use the same hairdresser all their lives. Practical loyalty b, Convenience. Customers are aware of their loyalty to the easier way of doing things that the offer supplies. Fourth is the Engaged Loyalty Quality where Customers are aware of their loyalty to the functionality of the service or product. The customers have certain demands on quality that the supplier provides and lastly is the Engaged Loyalty Commitment. Here the customers are aware of their loyalty to a symbolic value, or status and social values and inner awards. They get a certain feeling when using the service or product.

Soderlund (2001) divides loyal customers into two main groups, loyal customers and strongly loyal customers. Within the loyal group there are satisfied and unsatisfied customers. The satisfied customers do not have to be loyal but there is a correlation between satisfied customers and loyal customers. There are unsatisfied customers who are loyal. The combination of unsatisfied customers and high loyalty is sometimes called false loyalty. The overall reason for this combination is factors that are obstacles for the customer to choose supplier. These factors are called switching costs, or switching barriers. Based on the assumption that a satisfied customer is a loyal customer, Soderlund (2001) argues that high level needs seem to have the largest potential to create strong loyalty. He talks about factors that seem to create strong loyalty. An example could be high level needs, or values. These can be freedom, a meaningful life, happiness, and other feelings.

3.2 Financial Bonds and Customer Loyalty

Sarwari and Minar (2014) referred to financial bonds as frequency marketing or retention marketing, where the service provider uses economic benefits to secure customer loyalty (Berry and Parsuraman, 1991; Berry,1995) which they regarded as the first level of securing customer loyalty. Previous researchers agree that one motivation for consumers to engage in relationships with service providers is to save money (Peltier and Westfall 2000). Non-monetary time savings are also proposed as 'financial' bonds, even though no money is involved (Lin, Weng, and Hsieh,

2003). In the study carried out by Shruthi and Devaraja(2012), they said that financial bond is based on financial rewards for repeat customers or customers who buy in large volumes and usually provide some short-term gains. Sarwari and Minar (2014), on their empirical study on five star hotels in Bangladesh they said that hotels try to provide some kind of financial bonds like discounts to those customers who always prefer their hotel to stay and during their check in. Berry and Parsuraman, (1991) and Berry (1995) point out that the problem associated with financial bonds is that they are the easiest type of bond for competitors to imitate. The implication is that every retail chain may want to compete on price by either reducing it to woo many customers to their outlets. This may call for the retail outlets to use non-monetary time savings are also proposed as 'financial' bonds, even though no money is involved (Lin, Weng, and Hsieh, 2003).

3.3 Social Bonds and Customer Loyalty

Krolikowska while conceptualizing four new bonds in business recognized Social bonds as one of a number of relationship bonds which develop between individuals and can impact positively on long-term relationships (Wilson and Mummalaneni, 1986). Social bonding includes sales and service agent relationships as well as other positive interpersonal relationships between the buyer and seller (Berry, 1995). Sellers in a buyer–seller dyad use a variety of tactics, such as personal selling, promotional offers, and customer loyalty programs, to build relational bonds in an attempt to create customer loyalty and increase sales (Peng & Wang, 2006). Social bonds can lead to positive outcomes such as customer retention (Seabright et al, 1992), word-of-mouth recommendations (Price and Arnould, 1999), trust (Nicholson et al, 2001) and loyalty and satisfaction (Guenzi and Pelloni, 2004). Sarwari and Minar (2014), in their study on hotels in Bangladesh say that Social bonds represent personal ties between the consumer and organization, i.e. interpersonal interactions, friendships and identifications.

Berry and Parasuraman (1991) and Berry (1995) referred to social bonds as intermediate level of relationship marketing in securing customer loyalty, where the service provider goes further than price incentives to build lasting relationships with the customer, building social bridges. Liang and Wang (2005) also point out that firms deliver their friendship or gratitude by giving gifts to their customers, which serves to build stable relationships and enhance relationship quality as evidenced by Sarwari and Minar (2014), in their study on hotels in Bangladesh where five star hotels provide different types of gift for their loyal customers. For instance, as a member of Global Hotel Alliance, Pan Pacific Sonargaon hotel provide their customers with different types of traditional saris like Muslin, Jamdani. However social bonds have not received the same level of research attention in the business and marketing literature. Social bond continues to be measured as a unidimensional construct. It is suggested that this may be due to a lack of theoretical support in identifying different social bonds and also due to the social bond frequently being included as one type of bond in a relational or relationship bond measurement scale e.g. Smith (1998) and Rodriguez and Wilson (2002).

3.4 Structural Bonds and Customer Loyalty

Shammout and Algharabat (2013), in their investigation into the determinant of Jordanian customer's loyalty towards travel agencies considered Structural bonds to be the highest level of bonding within relationship marketing, reason being that companies can strengthen their relationship with customers by adding structural bridges in addition to the financial and social bonds, where they cited the works of (Berry, 1995; Campbell et al. 2006). Example given by Sarwari and Minar (2014) is that of the Scandic hotel chain which introduced WAP-based technologies (i.e. web based communication) to improve communication with their customers (Louvieris, Driver,

and Powell-Perry, 2003). Frequent guests were provided with a WAP-enabled device, on which to access reservation and other information, which provided value adding services for customers that were not readily available elsewhere.

Structural bonds exist when a business enhances customer relationships by offering solutions to customer problems in the form of service-delivery systems, rather than remaining dependent upon the relationship building skills of individual service providers (Lin et al., 2003; Sheth & Parvatiyar, 2000, Lin,Weng, and Hsieh, 2003). Shammout and Algharabat (2013) while carrying out their investigation found out that this type of bonds were necessary for tourism services, because they provide embedded value adding services for customers that are not readily copied by a competitor (Berry & Parasuraman, 1991). For instance, hoteliers use of telecom and IT facilities for enhancing guest services, latest technology for better quality of services , expertise of service professionals in their areas of operation, providing relevant information to the guests, relying on the organization for taking decisions for their benefit and welfare, and careful evaluation of the guest's needs (Jain & Jain, 2006). That is, competitors find difficulty to emulate such services due to the high costs in transformation. Since structural bonds build customer feelings of 'empowerment' and offer some level of psychological control to customers in the buyer-seller relationship (Peltier &Westfall, 2000).

3.5 Customization Bond and Customer Loyalty

In customization bond an attempt is made to encourage customer loyalty through intimate knowledge of individual customers and through the development of customized solutions that are tailored to the specific needs of the individual customers (Shruthi and Devaraja, 2012). Mass customization refers to the use of flexible process and organizational structures to produce varied and often individually customized products and services at the price of standardization and mass produced alternatives. On the basis of the review on the four bonding strategies employed by various organizations, very little has been done on the customization bonds.

4.0 Pilot Survey

The list of the four constructs that were derived from the literature review were shared with three experts comprising two academicians and one business consultant in order to get their viewpoints regarding the suitability of the constructs that were being used to measure customer loyalty in retail industry in Kenya. The researcher picked on two marketing lecturers in Masinde Muliro University of science and Technology in Kakamega Kenya and Kibabii University in Bungoma Kenya. Experience in their area of specialization played a crucial role in their selection. They had equally played a role in the drafting of county governments strategic plans for Busia,Vihiga and Bungoma and equally participated in training programs for Kenya Commercial Bank. The business consultant has been involved in youth enterprise programs dealing with youth training in entrepreneurship skills and talent development within the country for over a period of eight years. The literature review along with the feedback received from experts on various bonds and measuring of customer loyalty enabled the researcher to develop a conceptual framework. This framework (Figure 1) demonstrates how financial bonds, social bonds, structural bonds and customization bonds influence customer loyalty in terms of three customer loyalty indicatorsi.e Customer life time value, Retention and Net promoter score. The diagram further reveals how the above four factors are interrelated.

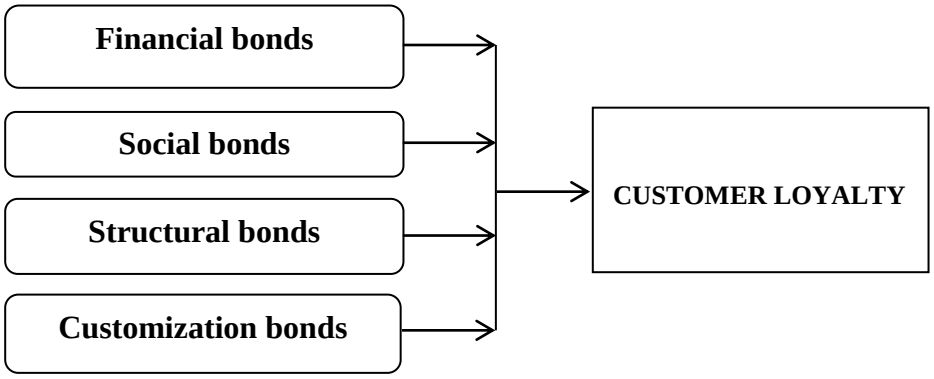
The conceptual framework below enabled the researcher to design a preliminary questionnaire on the relationship between relational bonds and customer loyalty. The questionnaire was presented to the same experts once again with a view to seeking their expert opinion on the adequate and

appropriate coverage of all the items affecting customer loyalty and also the framing of each question. The comments received helped the researcher in refining the questionnaire further.

Figure 1: Conceptual Framework

Independent variables **Dependent Variable**

Relational Bonds



Source: Adopted from Begalle, 2008 and Shruthi and Devaraja (2012) and modified for this research.

Questionnaires were then administered to a few representative respondents based in Kakamega County in order to judge its workability in reality. The aim was to examine whether the respondents understood the language of the questionnaire and whether the items on which responses being sought were appropriate. The questionnaire survey was carried out through personal interview amongeleven supermarket clients, who were randomly selected as they came to buy their items from the supermarket. The list of the stakeholders used in this survey was drawn mainly from clients who were picked randomly but only those who had loyalty cards. This implies that these respondents are capable of providing the information requested in the questionnaire. The respondents indicated that various relational bonding strategies are very much relevant to the retail industry and more specifically in the supermarkets. They, however, asked for some of the questions to be rephrased for ease of understanding given the varying level of education of the prospective respondents. They explained that there were items that could fall under more than one classification group or some terms meant the same thing. These viewpoints aided in the design of final questionnaire whose validity and reliability was further sought before actual administration.

Reliability was tested by use of eleven questionnaires that were piloted with randomly selected supermarkets clients from Kakamega town who were not included in the final study sample. This was meant to avoid response bias in case they may have completed the same questionnaire twice. The eleven questionnaires were coded and input into Statistical Package for Social Sciences [SPSS] version 22 for running the Cronbach reliability test. The reliability of the questionnaire was tested using the Cronbach's alpha correlation coefficient with the aid of Statistical Package for Social Sciences (SPSS) software. The closer Cronbach's alpha coefficient is to 1, the higher the internal consistency reliability (Sekaran, 2010). A coefficient of 0.7 is recommended for a newly developed questionnaire. Conversely the resulting measure below 0.7 warrants the questionnaire as unreliable. However it should be noted that there is no rule to suggest that a Cronbach's alpha

greater than 0.70 indicates a good instrument (RevelleZinbarg, 2010). Although, it is commonly agreed among researchers that an alpha greater or equal to 0.7 shows that an instrument is reliable in measuring what it was intended to measure. The pilot study also help the researcher in clearing any ambiguities and in ensuring that the questions posed measure what it will be intended to measure.

5.0 Discussion

The relationship between the relational bonds constructs and customer loyalty as depicted in Figure 1 through arrows has been captured with the help of four propositions. An arrow emanating from a particular relational bond to the customer loyalty indicates that, that particular bond influences the customer loyalty of the particular retail chain. The financial bonds main purpose is to assist consumers save money. It may take the form of financial rewards like discounts. Though financial bonds can easily be imitated by competitors they are crucial in relationship development hence most retail chains to embrace non monetary financial bonds. Social bonds develop long term relationship within individuals. It can take the form of personal selling, promotional offers and customer loyalty programs to build the relationship. It's equally important to create theoretical support in identifying different social bonds so as not to have the social bond frequently being included as one type of bond in a relational or relationship bond measurement scale e.g. Smith (1998) and Rodriguez and Wilson (2002). From the review, little research attention has been given to social bonds as is the case of other relationship marketing constructs such as trust, commitment and loyalty.

Because of the nature of the structural bonds that entail high costs of transformation ((Berry & Parasuraman, 1991), retail chains should embrace structural bonding to give them an edge in competition, but equally to focus in non service sector that has very little of structural bonding. It's equally important to have intimate knowledge of individual customers needs and through the development of customized solutions that are tailored to the specific needs of the individual customers (Shruthi and Devaraja, 2012), this is where marketing lies. Of the four bonds discussed in this study, this is an area that very little research study has been done. Based on the conceptual framework of the relational bonds and customer loyalty of the retail chains shown in Figure 1, the researcher has developed a set of four propositions. These are described below in a concise form.

- Proposition 1: Financial bonds have an effect on the loyalty of customers in the retail chains.
- Proposition 2: Social bonds have an effect on the loyalty of customers in the retail chains.
- Proposition 3: Structural bonds have an effect on the loyalty of customers in the retail chain.
- Proposition 4: Customization bonds have a direct effect on the loyalty of customer in the retail chain.

6.0 Managerial implications

In the current era of hyper competition, marketers appear to focus more and more on customer retention and loyalty. A number of studies have been done and what comes out is that retaining customers offers a more sustainable competitive advantage than acquiring new ones. The conceptual framework shown in Figure 1 provides valuable insight to the managers involved in retail industry with regard to the interplay of different relational factors on customer loyalty. This will enable the retail managers to understand the antecedents and consequents of each relational factor and its impact on customer loyalty. Of course, the exact nature of relationship between the antecedents and a factor could only be ascertained after collecting relevant data from the respondents and carrying out appropriate statistical tests. The relative impact of each relational factor on the customer loyalty could also be assessed after conducting suitable statistical tests. this

will go hand in hand in enhancing the understanding and sensitivity of the retail manager about different dimensions of retail industry environment.

7.0 Conclusions

In this paper, the researcher has demonstrated the rationale behind considering four relational bonds on customer loyalty namely finance, social, structural and customization bonds .The new framework incorporates an additional bond .i.e. customization and thus expands the perspective of relational bonds to customer loyalty framework. This has been followed by the identification of the relational bonds through an extensive review of literature. Review of literature pertaining to relational bonds has given us an insight on identifying the broad constructs influencing customer loyalty. The researcher carried out a pilot survey amongst few clients in order to find out the appropriateness of the relational bonds and was able to develop a conceptual framework of the customer loyalty with the help of the four relational bonds .The researcher conceptually demonstrated how various relational factors have an influence on customer loyalty and hence leading to customer retention and more profits for the retrial industry. Through the use of the conceptual framework, the researcher was able to design a preliminary questionnaire and administer the same to a few respondents to find out its efficacy in bringing out responses from them.

The relationship between the relational bonds and customer loyalty developed in this paper is expected to contribute to the existing body of relationship marketing and management literature in terms of exploring the nature of relationship as described above. As much as a lot has been realized in terms of knowledge, the paper is not without limitations. The relational bonds have been identified and subsequently classified based on literature review, preliminary pilot survey and researchers own subjective judgment. Secondly, the propositions put forth in this paper are merely based on researchers own observation, understanding and the concepts developed through literature review and pilot survey. The empirical testing of the propositions has not been shown in the paper which would have evaluated the validity and theoretical soundness of the conceptual framework from practical standpoint. The same would be considered as the foundation of our future research directions.

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Effects of Perinatal Deltamethrin Exposure on Electrophysiological Properties of Embryonic Ventricular Cardiomyocyte

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Abstract

Pyrethroid insecticides are among of the most commonly used residential and agricultural insecticides. Based on the increased use of pyrethroids and recent studies showing that pregnant women and children are exposed to pyrethroids, there are concerns over the potential for developmental cardiotoxicity and other abnormalities. However, there have been relatively few studies on the developmental cardiotoxicity of pyrethroids. The purpose of this study was to investigate whether perinatal deltamethrin exposure altered mice embryonic cardiac electrophysiology. Pregnant mice were administered 0 or 3 mg/kg of DM by gavage daily from gestational day (gd) 10.5 to gd 17. 5. Whole cell patch-clamp technique was used in electrophysiological study, and real time RT-PCR was applied to analyze the molecular changes for the electrophysiological properties.DM exposure resulted in increased mortality of pregnant mice and decreased viability of embryos. Moreover, DM slowed the maximum depolarization velocity (Vmax), prolonged the action potential duration (APD) and depolarized the maximum diastolic potential (MDP) of embryonic cardiomyocytes. Additionally, perinatal DM exposure decreased the mRNA expression of N^+ channel regulatory subunit Navβ1, inwardly rectifier K^+ channel subunit Kir2.1, and delayed rectifier K^+ channel subunit MERG while the L-type Ca^{2+} channel subunit, Cav1.2 expression was increased. On the contrary, DM administration did not significantly alter the β-adrenergic or muscarinic receptor activities on embryonic cardiomyocytes. In conclusion, developmental DM exposure altered mRNA expression of embryonic cardiac ion channels therefore impacting embryonic cardiac electrophysiological properties. This highlights the need to understand the persistent effects of pyrethroid exposure on cardiac function during development due to potential forcardiac arrhythmogenicity.

Keywords: *Pyrethroid, Deltamethrin, Embryonic cardiomyocytes, Action potential, Developmental exposure.*

1.0 Introduction

Pyrethroid insecticides, synthetic versions of the natural compound pyrethrin produced by the *Chrysanthemum flower* have been used for more than 40 years and account for more than 30% of the worldwide insecticide market (Barr et al., 2010). Type I and type II pyrethroids cause paralysis and

ultimately death of the organism by keeping sodium channels open in the neuronal membranes. Type II pyrethroids, such as deltamethrin, are defined by an α-cyano group that is known to produce a long lasting inhibition of voltage-activated sodium channels (Ray and Fry, 2006; Shafer et al., 2005). Pyrethroids are generally considered to be a safer alternative to other insecticides because they exhibit low mammalian toxicity and low environmental persistence (Demoute, 1989). Consequently, their use has increased tremendously since the cancellation or reduction in the use of many organophosphorus pesticides (Grube et al., 2010; Horton et al., 2011). Their relative low toxicity is attributed to a combination of efficient detoxification mechanisms in mammals (Soderlund et al., 2002) and lower sensitivity of ion channels (Ray and Fry, 2006). However, metabolic detoxification mechanisms are not fully developed in very young mammals, potentially increasing susceptibility to pyrethroids in this population (Sheets, 2000). In recent years, significant levels of pyrethroid metabolites, including those of deltamethrin, have been found in the urine of pregnant women and children (Berkowitz et al., 2003; Morgan et al., 2007; Naeher et al., 2010; Whyatt et al., 2007). Furthermore, deltamethrin, which is widely used to control malaria vectors, has also been detected in the breast milk of lactating women (Bouwman et al., 2006). The latter data pose questions regarding the safety of deltamethrin, as developmental cardiotoxicity, neurotoxicity and other adverse developmental effects are currently being studied in these susceptible populations (Shaferet al., 2005). Thus, it is important to understand the consequences of pyrethroid exposure during development.

An increasing number of studies point to toxicant exposure during critical developmental periods as having long-term effects, including contributing to cardiovascular and neurological disease in adulthood. Indeed accumulating evidence has shown that early life environmental exposure is probably the most important component in the aetiology of some diseases including cancer, metabolic and cardiovascular pathologies (Barker, 1990;Groom et al., 2011, Novotny et al., 1999;Oliveira et al., 2011;Vaiserman, 2011), and it is also the main cause of epigenetic pattern alterations that vary from tissue to tissue and change with ageing (Hayes, 1982, Relton and Davey, 2010). Pyrethroid compounds can cross the placental barrier and are known to interfere with hormonal and neurological development, the immune system and other physiological functions (Chanda and Pope, 1996;Doucet et al., 2009;Gupta et al., 1985; Muto et al., 1992). Indeed, due to their widespread use, pesticides have been measured in the urine of children (Babina et al., 2012; Ding et al., 2012) and adults (Imai et al., 2014; Mckelvey et al., 2013), including pregnant women (Dewailly et al., 2014;Qi et al., 2012). In addition, these pesticides have also been measured in umbilical cord blood and sera (Wickerham et al., 2012) and meconium (Ostrea et al., 2009) of newborn humans, and the breast milk of lactating humans (Corcellas et al., 2012) and other mammals (EPA, 2009; Stürtz N et al., 2006), which suggests that fetal and early postnatal exposure to these pesticides is possible. Select pyrethroids have also shown greater toxicity in neonatal than in adult rats, possibly due to incomplete development of detoxifying enzymes(Cantalamessa, 1993). In humans, symptoms of systemic pyrethroid poisoning resulting from accidental exposure or intentional ingestion are well characterized (ATSDR et al., 2003; Ray and Forshaw, 2000; Soderlundet al., 2002). However, data on the human health effects of pyrethroids (particularly cardiovascular developmental effects) at the lower environmental doses encountered by the general public are limited, and data on developing children are particularly sparse.

To date, there are limited studies that have examined the effects of synthetic pyrethroids on developmental outcomes. A study by Bell and colleagues reported an increased risk of fetal death due to congenital anomalies when synthetic pyrethroids were used in the same township, range, or section during the 3rd to 8th week of pregnancy (Bell et al., 2001). Similarly, Hanke and colleagues

found a significant reduction in birth weight among the offspring of mothers potentially exposed to synthetic pyrethroids during the three months prior to conception and the first trimester of pregnancy (Hanke et al., 2003). In laboratory animals, one study showed that cypermethrin was able to induce oxidative stress and produce apoptosis through the involvement of caspases in zebrafish embryos (Shi et al., 2011). Another study conducted with rats demonstrated that deltamethrin increased early embryonic deaths and caused growth retardation (Abdel-Khalik et al., 1993). Since global use of pyrethroids has increased, especially in regions burdened by arthropod-borne diseases, a consequent rise in acute pyrethroid exposures in humans demands a more complete understanding of their mode of action and effect on development. Therefore we aimed to investigate the impact of type II pyrethroid deltamethrin on electrophysiological properties of embryonic hearts.

2.0 Materials and Methods

2.1 Chemicals

Deltamethrin was purchased from Sigma Chemical Co. (St. Louis, MO). All other reagents were from Sigma or as indicated in the specified methods.

2.2 Mice and deltamethrin administration

Eight to ten week-old mice (male mice: 28–30 g; female mice: 24–26 g) were maintained on a 12-h light/dark cycle in a controlled temperature (20–25^{0}C) and humidity (50 ± 5%) environment with food and water available ad libitum. All procedures were conducted in accordance with the U.S. National Institutes of Health (NIH) Guide for Care and Use of Laboratory Animals and approved by the Institutional Animal Care and Use Committee at Tongji Medical College of Huazhong University of Science and Technology.

According to our previous reports, male mice can be effectively used if four females and two males are randomly placed together in one cage and pregnancy rate is reported to be higher (Zhang et al., 2010). Therefore, for mating purposes, four females were housed overnight with two males starting at 12:00 P.M. Females were checked by 7:00 A.M. next morning, and the presence of a vaginal plug was designated as gestational day (gd) 0.5 and males were removed leaving single-housed female mice. Based on the documented exposure of pregnant women to pyrethroids (Berkowitzet al., 2003; Castorina et al., 2010; Richardson et al., 2015; Williams et al., 2006) and to mimic likely exposures in the human population, female mice were orally administered either 0 or 3 mg/kg BW deltamethrin, dissolved in corn oil and mixed with peanut butter (~100 mg; Skippy Creamy Peanut Butter) daily from gd 10.5 to gd 17.5 by gavage (Armstrong et al., 2013; Caudle et al., 2005).

2.3 Single cell preparation

The pregnant mice were sacrificed by cervical dislocation and embryos exposed and their hearts harvested. Ventricles were enzymatically dissociated into single cells as previously described (Fleischmann et al., 2004; Liu et al., 2010). The single cells were plated onto sterile gelatin-coated glass cover slips, cultured in Dulbecco's Modified Eagle's Medium (DMEM, Gibco, USA) containing 20% fetal bovine serum (FBS, Gibco, USA) and kept in the incubator for 24-36 h for later use. Spontaneously beating cardiomyocytes were used for functional studies.

2.4 Electrophysiological Recordings

Action potentials (APs) were recorded using Axopatch 200A amplifier in whole-cell patch-clamp technique and a Digital 1200 interface controlled by pCLAMP 9.0 software. Data were analyzed using Clampfit software (Axon Instruments, USA). Patch pipettes (2-3 MΩ tip resistance) were fabricated from borosilicate capillaries using an electrode puller (700C,Japan). All patch-clamp

experiments were performed at 37°C. Cardiomyocytes were superfused with the normal Tyrode's solution containing (mM): NaCl 140, KCl 5.4, $CaCl_2$ 1.8, $MgCl_2$ 1, HEPES 10, D-glucose 10 (pH 7.4 with NaOH). Patch pipettes were filled with the internal solution (mM): KCl 50, K-asparate 80, EGTA 10, HEPES 10, Na_2ATP 3.0, $MgCl_2$ 1.0 (pH 7.4 with KOH).

2.5 Quantitative RT-PCR

Total RNA was extracted from embryonic ventricles using TRIzol (Invitrogen, USA). Revere transcription was performed on 2 ng of total RNA. Briefly, 2 ng of total RNA was reverse transcribed to cDNA. First strand cDNA was synthesized by using M-MLV reverse transcriptase (Invitrogen, USA) with dT (18) oligo (Ribo, China).

For real-time quantitative RT-PCR, the SYBR-Green PCR MasterMix (TOYOBO CO., LTD, Japan) was used with gene-specific primers listed in Table 1. Real-time quantitative PCR was performed using 1.6 μl the first strand cDNA, 0.4 μl 10 mM forward and reverse primers, 10 μl SYBR-Green PCR MasterMix to total 20 μl volume. The PCR processing consisted of 40 cycles of 10 s denaturation at 95°C, 20 s annealing at 60°C, and 15 s extension at 72°C. All reactions were run in triplicate. Reaction and signal detection were measured by Mx3000P real-time PCR system (Agilent Stratagene, USA). The CT values of each gene were converted into absolute copy numbers using a standard curve for GAPDH.

2.6 Data and statistical analysis

For the analysis of individual electrophysiological experiments, APs were analyzed by averaging using AP analysis software programmed by Dr. Philipp Sasse (University of Bonn, Germany). Data are presented as mean ± SEM, with n representing the number of experiments or cells for analysis. Student's paired or unpaired *t* test was used where applicable. A value of p of less than 0.05 was considered statistically significant.

3.0 Results

3.1 Deltamethrin increased the mortality rate of pregnant mice and decreased embryo viability

Intragastric administration of deltamethrin decreased both the livability of pregnant mice and the number of fetuses. In the control group, all the twenty pregnant mice (100%) survived. Five days of deltamethrin administration resulted in the death of 42.8% pregnant mice (six out of the total of fourteen (Fig. 1 A). As shown in Fig. 1 B, the control group pregnant mice had a significantly higher average number of embryos (12±0.6/mice) than the deltamethrin group (5±0.8/mice) ($p<0.01$).

3.2 Effects of deltamethrin on action potentials and expression ofIon channels in embryonic ventricular myocytes

By recording the APs, deltamethrin was found to significantly alter the AP parameters: the maximum diastolic potential (MDP) depolarized from -58.5±1.2 mV to -53.9±0.6 mV, the maximum depolarization velocity (Vmax) decreased from 53.5±6.3 V/s to 34.9±5.9 V/s, and the action potential duration at 90% of repolarization (APD90) was significantly prolonged from 105.3±9.0 ms to 148.7±14.7 ms ($p<0.05$, n=25) (Fig. 2 A, Table 2). These changes suggested alteration of ion channels such as Na^+ ion channel, L type Ca^{2+} channel and K^+ channels. Thus, we investigated the expression pattern of Nav1.5, Navβ1, Cav1.2, Kir2.1 and MERG by real time RT-PCR. The results demonstrated that there was no change in Nav1.5, however, Cav1.2 was upregulated while Navβ1, Kir2.1 and MERG were downregulated (Fig. 2 B-C). We postulate that these findings in ion channels may be responsible for the effect of deltamethrin on APs.

3.3 Deltamethrin did not alter the β-adrenergic or Muscarinic-regulation on embryonic ventricular myocytes

Pyrethroid compounds can cross the placental barrier and are known to interfere with hormonal and neurological development (Chanda and Pope, 1996; Doucetet al., 2009; Guptaet al., 1985; Mutoet al., 1992). Accordingly, we evaluated the impact of deltamethrin on hormonal regulation in mouse embryonic cardiomyocytes. Application of isoproterenol (ISO) led to a significantly typical and comparable increase of the AP frequency ($n=14$, $p<0.05$) (Fig. 3).On the other hand, application of carbachol (CCh) led to a significant negative effect on AP frequency of the mouse embryonic cardiomyocytes ($n=16$, $p<0.05$) (Fig. 4). Similar responses to both ISO and CCh were found in the control group as well as the deltamethrin groups ($p>0.05$, Fig. 3 B and Fig. 4 B), indicating that deltamethrin had no effect on either β-adrenergic or muscarinic receptors signaling in embryonic cardiomyocytes.

3.4 Discussion

Although there have been several reports on the potential developmental neurotoxicity of pyrethroids in animals, the data on cardiotoxic effects are limited. More recently, attention has focused on the potential for developmental pyrethroid exposure to contribute to cardiovascular neurobehavioral dysfunction in humans. In the U.S. general population, data from the 1999–2002 rounds of the NHANES found that children aged 6–11 yr had much higher urinary metabolites of pyrethroids compared with adults (Barret al., 2010). Additionally, urinary pyrethroid concentrations in children have increased since the phase-out of residential uses of other pesticides, leading to concern over potential cardiovascular as well as neurodevelopmental effects (Morgan, 2012). The present study investigated the electrophysiological effects of the type II pyrethroid, deltamethrin (Castorinaet al., 2010) on murine embryonic ventricular myocytes. The novel findings were that DM significantly prolonged ventricular action potential duration (APD), depolarized the maximum diastolic potential (MDP), and slowed the maximum depolarization velocity of phase 0. Importantly, our study has demonstrated that DM increased calcium ion channel Cav 1.2 transcript, while decreasing Nav β1, Kir 2.1 and MERG ion channel transcripts. Moreover, DM administrationincreased the mortality rate of pregnant mice and decreased embryo viability. On the contrary, DM did not significantly impact hormonal regulation of embryonic cardiomyocytes. Some of our study results are in agreement with those of other authors who have reported similar findings with the use pyrethroids on mammalian cardiac electrophysiological properties (De La Cerda et al., 2002; Spencer and Sham, 2005; Spencer et al., 2001). However, contrary to our study, a study by Kavlock et al. (1979) (Kavlock et al., 1979) found no evidence of fetotoxicity or teratogenicity resulting from exposure of rat or mouse dams to (Castorinaet al., 2010). To the best of our knowledge this is the first study to report deltamethrin-induced changes in cardiac ionic channel transcript levels especially during development.

Under voltage-clamp conditions, the most striking effects of deltamethrin were on I_{Na}. The classical well known mode of action of deltamethrin is related to its preferential binding to sodium channels (Casida and Durkin, 2013; Vais et al., 2001), and more precisely with a particular amino acid sequence in the intracellular linker connecting domains II and III of cockroach sodium channel (Du et al., 2009). Underlying the fast inactivation of cardiac Na^+ channels by DM appears to be a mechanism similar to N-type inactivation of *Shaker* K^+ channels (Hoshi et al., 1990). The region between channel domains III and IV (III-IV linker) seems to act as an inactivation particle that swings over the open inner pore mouth. Interestingly, a mutation in the III-IV linker region (ΔKPQ) is associated with a severe form of human long-QT syndrome (LQT3); (Wang et al., 1995). Our data is an addition to previous research findings which have reported that pyrethroids modify gating

characteristics of voltage sensitive sodium channels by downregulating the regulatory subunit Navβ1 in embryonic myocytes. A number of studies(Baroudi et al., 2000; Fahmi et al., 2001; Ko et al., 2005; Nuss et al., 1995) found that co-expression of Navβ1 subunit with the Nav1.5 subunit increased the Na^+ current density, accelerated the rate of recovery from inactivation, and caused a negative shift in steady-state inactivation with no effect on voltage-dependent activation, as well as hastening the rate of inactivation. Therefore, the decrease in Navβ1 by DM would theoretically decrease the Na^+ current, which in turn would decrease the maximum depolarization velocity of phase 0 in embryonic ventricular myocytes.

Previous reports have demonstrated that pyrethroids can prolong the APD and provoke sporadic early after-depolarizations (EADs) in cardiac myocytes (Spenceret al., 2001). EADs are significant for exacerbating the dispersion of myocardial action potential duration, with a possible direct link to arrhythmias (Belardinelli et al., 2003; Restivo et al., 2004). This arrhythmogenic effect has been explained by increased I_{Na} persistence because these agents shift Na^+ channel activation to more negative potentials and can slow the rate of voltage-dependent inactivation and/or deactivation (Denac et al., 2000; Honerjäger, 1982; Soderlundet al., 2002). The decrease in Navβ1 in our study could also explain the persistent I_{Na} increase and the prolonged APD. Furthermore, we observed increase in Cav1.2 ionic channel transcript and a decrease in Kir2.1 and MERG ionic channel transcripts. Therefore, it is plausible that a sustained increase in inward Ca^{2+} current and a decrease in K^+ current during repolarization may be responsible for not only the prolongation of the ADP (Bennett et al., 1995; Wang et al., 1995), but may also explain the arrhythmogenic effect of DM on the heart (January and Riddle, 1989; Kaseda et al., 1989). The decrease in Kir2.1 ionic channel transcript may also explain the mechanism behind the decrease of MDP in our study. Our data also showed an intact hormonal regulation on the electrical properties of embryonic ventricular myocytes, as evidenced by lack of significant differences in the response of the cells to isoproterenol (a beta adrenergic agonist) or carbachol (a muscarinic agonist) applications in both control and DM groups. This may suggest that DM acts directly on cardiac ionic channels and probably at the molecular level to alter cardiac activity rather than altering hormonal or autonomic nervous activity of the heart.

It has been reported that children, particularly neonates can be biologically more sensitive to the same toxicant exposure on a body weight basis than adults(Cantalamessa, 1993; Sheets et al., 1994).Although pyrethroids are considered to be safer than other insecticides, rodent studies suggest that early-life and pubertal pyrethroid exposures alter neurobehavioral functioning(Farag et al., 2007; Shaferet al., 2005; Sinha et al., 2006). Therefore care should be taken to minimize exposure of children, pregnant women and animals to pyrethroids owing to their popularity and increased usage in pest control. In our study, there was increased mortality of pregnant mice and decreased viability of embryos at 3 mg/kg DM dosage compared to some previous studies (Armstrongetal., 2013; Kung et al., 2015; Richardsonet al., 2015). This could be due to the fact that our study administered DM daily to the pregnant mice compared to other studies that administered every 3 day during gestation and lactation. This may have resulted in accumulation of DM to toxic levels in the maternal system as well as increased transfer to the embryos, hence the toxic effects. However, our results are in agreement with some previous studies which reported that DM caused various adverse effects in epidemiological and experimental studies (Abdel-Khaliket al., 1993; Agarwal et al., 1994; He et al., 1989; Lukowicz-Ratajczak and Krechniak, 1992; Scassellati et al., 1994). For example in one study, when DM was given to pregnant rats from day 6 to day 15 of pregnancy, caused retardation of growth, hypoplasia of the lungs, dilation of the renal pelvis and increase in placental weight (Abdel-Khaliket al., 1993). Concerning effects on DM on

adult humans, He et al. in an epidemiological survey, studied 325 cases of deltamethrin intoxication from the Chinese population and reported symptoms such as paraesthesia, dizziness, headache, nausea, anorexia, fatigue, blurred vision, increased sweating among others (Heet al., 1989).

The main limitation of this study is that we did not perform dose-response effect of DM on the pregnant and therefore we could not conclusively state the dose at which lethality occurred. However, Based on the documented exposure of pregnant women to pyrethroids (Berkowitzet al., 2003; Castorinaet al., 2010; Richardsonet al., 2015; Williamset al., 2006) and to mimic likely exposures in the human population, female mice were orally administered either 0 or 3 mg/kg BW deltamethrin. This dosage is lower than the developmental no observable adverse effect level (NOAEL) (12mg/kg) (Kavlocket al., 1979) and span the no observable effect level (1mg/kg), which is used by the Environmental Protection Agency to set allowable limits of pesticide exposure of humans.Additionally, administration of the toxicant to the mother makes it difficult to determine the precise dose that the embryo is exposed to because DM is rapidly metabolized in the liver and excreted in the urine with half life of about 6 hours. Therefore, dosing the pregnant female diminishes the amount of pyrethroid that reaches the embryo by providing an opportunity for maternal enzymes to detoxify the pyrethroid, which makes it difficult to quantify the doses the embryos are exposed to. Nonetheless, future studies should conduct dose-response experiments to determine the precise dosage at which lethality begins to appear for extrapolation of such results to humans to be relevant and to firmly establish our study findings. Effects of DM on the histologic features of embryos hearts were examined with study results demonstrating no structural differences between the DM treated group and controls (Data not shown). Nevertheless, our study demonstrated novel findings regarding the effect of DM on embryonic cardiac electrophysiology that should be reported and adds knowledge to the toxic effects of pyrethroids on animals and humans.

4.0 Conclusions

In conclusion, developmental DM exposure impacted embryonic cardiac electrophysiological properties by changing the expression pattern of cardiac ionic channels. These results highlight the risk of low-dose toxicant exposure during the critical developmental period on more subtle endpoints such as cardiac arrhythmogenicity and drug response.

Conflict of interest

None declared.

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Setting, Moderation and Marking of University Examinations: A Comparative Review of Policies from Universities in East Africa and the United Kingdom

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Abstract
Universities especially in Africa are today faced with the challenge of producing competent and highly skilled manpower necessary to serve the needs of humanity in the 21st century. The quality of assessment in these institutions could play a major role in the realization of this role. The United Kingdom is home to not only the oldest but also the best universities in the world. The East African Community on the other hand being a region in Africa may not be famed for this characteristic. In fact, studies have shown that a number of universities in the region — Kenya, Uganda, Tanzania, Burundi, Rwanda and South Sudan are faced with a number of challenges related to the quality of education that takes place in these institutions. Consequently, this necessitated the current study which sought to investigate the nature of the examination policy framework in these institutions with the view of establishing similarities, differences as well as possible weaknesses inherent in some of these policies. Research methodology involved a content analysis of policy documents. Findings: there exist a number of differences in policies on setting university examinations. In Uganda Martyrs University for instance, the policy does not specify who is supposed to set examinations. On the other hand, in a university like Manchester Metropolitan, policies on examinations are guided by the Quality Assurance Agency's UK Quality Code — a practice that is not common in other universities from the United Kingdom as well as in East Africa. The study established a number of differences in policies on moderation of examinations. For instance, unlike in other universities, policies in the University of Eldoret specify timelines within which various activities on moderation are done. In marking, University of London is the only university whose policies clearly state what should be done when examination irregularities are detected during marking. A number of similarities were noted with regard to setting of university examinations. In almost all institutions, it was established that end of semester examinations are set and typed by a member of staff who taught that specific course. In moderation, it was common practice that examinations have to be moderated both internally and externally before they are administered. On the other hand, it was common that both internal and external examiners take part in marking-related activities. Recommendations: universities should clearly state in their examination policies on how cases of examination irregularities should be handled when detected during marking. They should also formulate new policies to allow for Conveyor Belt System of marking.

Key Words: *Examinations, Marking, Moderation, Policies, Setting*

1.0 Introduction

Examinations form an essential part of quality teaching and learning. This is because it is through a quality examination process that teachers can know the effectiveness of their teaching strategies as well as the extent to which learners have understood content taught. For universities, examinations offer a window through which quality graduates can be churned out in readiness for the job market. Besides, examinations form the core of curriculum design and innovation. However, this can only be possible if structures and policies are put in place in support of examination processes. Examination practices that are grounded on sound policies can guarantee quality assessment of learners in institutions of higher learning. Consequently, it was with regard to these facts that the current study sought to undertake a comparative review of the policy environment of university examinations. The specific objectives of the study were to:

1. Identify similarities and differences that exist in policies that guide the setting of examinations in universities in East Africa and United Kingdom.
2. Identify similarities and differences that exist in policies that guide the moderation of examinations in universities in East Africa and United Kingdom.
3. Identify similarities and differences that exist in policies that guide the marking of examinations in universities in East Africa and United Kingdom.

2.0 Literature on University Examinations

According to Ogula et al. (2006) in any quality assessment, there has to be an objective of each assessment, topics and sub-topics to be covered. There ought to be a variety in question types reflecting all areas of the course outline. Hughes (1989) argues that to enhance reliability in examination marking, adequate training of markers, detailed marking schemes and double marking or benchmarking are very essential.

Johnson (2001) identified four principles that make a good examination: content validity, scorer reliability, discrimination and objectivity. Content validity – an examination should be a representative sample of the content of the whole course. Scorer reliability – if two markers mark the same examination script, they should arrive at similar scores devoid of huge deviations. In other words, for an examination to have reliability, the same examination should give similar results if it is to be taken on two different occasions and questions should be clear and unambiguous. Having a good marking scheme ensures reliability of marking. It should specify the range of responses expected and the mark allocation for each question should be commensurate with the demands of the question. Discrimination – examination items should be able to differentiate between achievers and weak students. Objectivity – examination should be fair to all students and give them equal opportunities regardless of age, gender, religion or any other natural distinction. Identifying students by say index number rather than their names reduces subjectivity in marking.

A study by Oluoch (2014) established that some tutors do not get opportunities to attend induction seminars and workshops. In addition, new tutors who join institutions of higher learning or those with little or no teaching experience tended to experience difficulties in handling examinations.

2.1 Setting of University Examinations

This is the process of preparing questions to be used in assessing content learnt (Ogula et al., 2006). Ogula is of the view that it is common that academic staffs are responsible for producing their own examinations together with their marking schemes and thereafter send copies of these to external examiners for moderation. Ogula goes ahead to say that examination papers and marking schemes should be set, internally moderated, vetted by the external examiner, printed and proof read at the appropriate time.

In producing quality examinations, if an examiner wants to use color in their questions, they should make sure that this does not disadvantage color blind students. They should also ensure that their choice of question style avoids an excessively high standard deviation in the students' marks. This generally results from papers where hard-working but weaker students can find nothing to answer. They should set questions where weaker students can do at least part of the question. When doing this, examiners should try to make their questions coherent and progressive, rather than a sequence of disjointed and unrelated parts. Besides, they should ensure that questions are not all directly lifted from classroom notes.

When setting examinations, the setter should give guidance to the students by asking themselves these questions: do students understand what is expected of them in the examination? Do they understand the level of detail and accuracy required in a good answer? Do they know the format or areas to be tested? On the other hand, Ogula et al., (2006) says that given that members of university academic staff write their own examination papers, it is vital that they proof-read their examination questions carefully to ensure that there are no errors.

According to Bloom (1994), quality examinations should incorporate Bloom's six cognitive domains of knowledge: *knowledge*— ability to remember facts, terms and basic concepts without necessarily understanding what they mean; *comprehension*— ability to demonstrate understanding of facts and ideas by organizing, comparing, interpreting and describing the main ideas; *application*— ability to use acquired knowledge to solve practical problems in new situations; *analysis*— ability to examine and break information into component parts, determining how the parts relate to one another, identifying motives or causes and making inferences and find evidence to support generalizations; *synthesis*— ability to build a structure or pattern from diverse elements and putting parts together to form a whole; *evaluation*— ability to present and defend opinions by making judgments about information, validity of ideas or quality of work based on a set of criteria.

2.2 Moderation of University Examinations

Moderation is the process of ensuring that assessments are marked in an academically rigorous manner with reference to agreed marking criteria (Hughes, 1989). Universities accept variety in moderation practices by recognizing the varying demands of different disciplines and the different requirements of various types of assessed material. Hughes argues that Colleges should choose the most appropriate practices for their programs from models of moderation using agreed criteria.

Good moderation practices should: seek to ensure accuracy and fairness; be appropriate and acceptable to the discipline being taught; be suitable to the material being assessed; be suitable to the means of assessment being used; and be clearly evidenced in the feedback provided to students. In most universities, moderation policies apply to all aspects of student assessment that contribute to the award or final classification of an award, including: conventional examinations, formally assessed coursework such as projects or dissertations and laboratory or any other practical work (Johnson, 2001).

According to Johnson (2001), there exist a variety of models of moderation. Examples are: *universal double blind marking*— the first marker makes no notes of any kind on the work being marked and the second marker examines the work directed by independent judgment. Later, both examiners award marks and make comparisons; *universal non-blind double marking*— the first marker provides feedback for the student on the assessment and the second marker assesses the work with this information known but without accessing marks awarded by the first marker; *moderation of the entire cohort as check or audit*— the first marker provides feedback for the student and awards a mark; *moderation by sampling of the cohort*— the second marker samples work already first marked with feedback for students and marks attached, in order to check overall standards; *partial moderation*— any of the above may be applied to particular types such as fails, firsts or borderlines.

2.3 Marking of University Examinations

Ogula et al. (2006) defines marking as the process of judging the correctness of a student's academic work based on a specified criterion. Marking criteria have categories such as from 70 % to 100 %, from 60 % to 69 %, from 0 % to 39 % and so on. Marking advice is usually made available to markers in relation to all forms of assessment used within Schools or Departments. In pursuit of assessment practices that are fair, valid and reliable universities apply double-marking (preferably

"blind" where the first mark is not made known to the second marker). Besides this, for formal written examinations most universities operate anonymous marking system.

Case 1: Uganda Martys University

This is a private university located in Nkozi town, Uganda. It was established in 1993 by the Roman Catholic Church in Uganda. By 2014, the university had a population of slightly over 5, 000 students and over 400 administrative staff. The university operates a total of nine campuses among them the main campus in Nkozi, Lira, Mbarara, and Mbale campus. It was randomly sampled because it is located in one of the countries of East Africa ─Kenya, Uganda, Tanzania, South Sudan, Rwanda and Burundi. The following section highlights the policies that guide examination processes in this university.

Setting of examinations

1. Quality assurance mechanisms for determining student assessments, both continuous and final shall be developed.

Moderation of examinations

1. Uganda Martyrs University shall establish a systematic mechanism for the internal and external moderation of examinations. Guides for examinations and coursework moderation and external examiners shall be developed and followed accordingly.
2. In the absence of external examiners, departments shall develop systems that are coherent with the quality assurance framework approved by University Senate. These shall include a minimum of internal moderation procedures that ensure validity of student assessment and reliability of marking and a maximum of external examination.
2. Moderators shall be required to be academically competent in the field they are called upon to moderate. Their primary concern according to the policy is to check the accuracy of the examination papers, their suitability and relevance for the level for which they are intended to be addressed.

Duties of moderators before examinations are done (pre-examination period):

i. Moderating all examination questions, paying attention to language use and spelling.
ii. Moderating the marking scheme with regard to and allocation of marks and scoring criteria.
iii. Moderating the general instructions on the front cover of the question paper.
iv. Ensuring that there is a balance between time allocated for the paper in relation to the questions and marks allocated.
v. Ensuring that special tables, formulae and other technical documents accompanying the question paper are available.
vi. Editing and suggesting improvements to the questions in collaboration with the examiners.

Duties of moderators during examinations:

i. They shall be available to attend to any query from candidates in case the examiner is not around for whatsoever reason as well as provide any assistance as may be required.

Duties of moderators after examinations are done (post exam period):

After all examination scripts have been marked, the moderator shall:

i. Check if the marking scheme/indicative marking criteria has been strictly followed.
ii. Check if all questions are properly marked and marks entered on the performance sheet.
iii. Check the accuracy of all totals.

iv. Report to the Administrative Officer in charge of examinations through the Dean/Director on any anomalies noted.

Marking of examinations

1. Uganda Martyrs University shall establish a Board of Examiners consisting of internal and external examiners for each program on offer. The Board of Examiners shall determine whether a candidate has successfully completed or failed an examination on the basis of the set pass mark.

Case 2: University of Eldoret

This is a public university situated in Eldoret town, Kenya. The university was founded in 1946 by white settlers as a large scale farmers' training center before becoming a fully fledged university in 2013. Currently it has over 33, 000 students pursuing various programs. It was sampled purposefully because it is one of the many universities that have acquired charters recently and therefore one of the growing academic institutions in the country. The following section highlights the policies that guide examination processes in this university.

Setting of examinations

1. University of Eldoret examinations in collaborating institutions shall be set, invigilated, marked, moderated and released by the relevant schools.
2. Setting and typing shall be done by the course lecturer (internal examiner).
3. Lecturers responsible for a course shall set questions for regular, supplementary and special examinations and prepare marking schemes within the first four weeks of the semester.

Moderation of examinations

1. Departmental Board of Examiners consisting of the Dean of School, Head of Department, Examination Coordinator and Timetable Coordinator shall moderate papers internally before sending them to External Examiners.
2. A copy of the question papers with marking schemes and course outlines shall be sent to External Examiners for moderation.
3. Heads of Departments shall ensure that comments from External Examiners are discussed and incorporated into the question paper by Internal Examiners.
4. The Principal Internal Examiner or Head of Department shall send copies of moderated examinations to the registrar in charge of academic affairs for reproduction and safe custody five weeks before the start of regular examinations.
5. All copies of draft examination papers except the moderated ones shall be destroyed by shredding.

Marking of examinations

1. Internal Examiners shall mark and enter Continuous Assessment Tests (CATs) as well as regular examination marks and submit them to the Principal Internal Examiner six weeks from the last day of the semester examinations.
2. All the examination individual mark sheets shall be accurately completed, checked and signed by the internal examiner, the Head of Department and the Dean of the School.
3. Examiners shall not divulge marks to candidates.
4. Internal examiners shall mark scripts on a semester basis and release examination results to the Head of Department within a period of two weeks after the end of the examinations.

5. The Head of Department shall forward examination results to the respective Deans who shall relay provisional results to senate for consideration and approval. Senate shall accept, vary or modify provisional examination results presented to it.
6. After release of provisional results, a candidate may appeal for remarking within a period of two weeks through the Dean of School and a copy sent to the Deputy Vice Chancellor in charge of academics giving reasons thereof.
7. A fee of five hundred Kenya shillings per paper shall be paid for remarking.
8. The Dean, in consultation with the Head of Department, shall nominate an independent examiner who had not taught or examined the candidate in that particular course to remark the scripts and forward marks to the Chairperson of Senate for consideration through the Deputy Vice Chancellor in charge of academic affairs.

Case 3: St. John's University

The university is private and it was established in 2007 by the Anglican Church of Tanzania. It is located in Dodoma city, Tanzania. The university has a population of over 4, 500 students. It was sampled randomly to represent universities in Tanzania. The following section highlights the policies that guide examination processes in this university.

Setting of examinations

1. The process of examining shall be done under maximum confidentiality and integrity. The staff member setting the examination papers shall be responsible for the security of the papers.
2. Two papers shall be set for each course. One will be randomly chosen by the Head of Department for use in the university examination. The one not used for the first sitting shall be used for any supplementary and or special examination that shall be offered.
3. All examinations shall be set by a member of the academic staff who coordinated the course or by the Head of Department.
4. An external examiner shall be a reliable person competent in the subject area and not an employee of St. John's University.
5. External examiners shall be appointed by the Dean of School, Director of Institute or Center, subject to approval by senate.

Moderation of examinations

1. All examinations shall be internally moderated in the presence of the staff member responsible for the paper or by at least one appropriate senior member of staff.
2. The final version of examination questions and the authorized syllabus shall be moderated by the External Examiner in the second semester of every academic year during the process of moderating the marking.
3. All examinations set by internal examiners shall be externally moderated in second semester of every academic year.

Marking of examinations

1. All tests, assignments, semester papers and other forms of assessment done during the semester shall be marked before examination week by the internal examiners.
2. Marking of all examinations and the compilation of results shall be done by internal examiners in accordance with a time schedule given by the Deputy Vice Chancellor in charge of academic affairs.

Case 4: Manchester Metropolitan University

This is a public university located in Manchester city, United Kingdom. The university was established in 1970 as a polytechnic before gaining university status in 1992. By 2016, it had a population of 32, 485 students, hence making it the fifth largest university in UK by student numbers. This was the main reason why it was purposefully sampled for the study. The following section highlights the policies that guide examination processes in this university.

Setting of examinations

Policies on university examinations are developed in line with the Quality Assurance Agency's UK Quality Code.

1. Assignment briefs shall be verified before being given to students. This verification shall consider the consistency of the assignment task in relation to other units at the same level in the same discipline, check that the learning outcomes will be fully addressed by the task and that the marking criteria conforms to those in the program specification and that the feedback strategy fits with the program and the university's policy.
2. This internal verification shall be done by a member of staff who does not directly contribute to that particular assessment.
3. External verification shall be done by the subject's external examiner. This examiner shall look at a sample of assignment briefs which is sufficient to confirm the currency, appropriateness and standards shown by the brief.

Moderation of examinations

Internal moderation of marking:

1. It shall involve a review of a sample of marks and comments on assignment tasks to ensure that marking criteria have were fairly, accurately and consistently applied during first marking.
2. It shall be done by colleagues from the discipline.
3. Moderation may begin before all of the work for a cohort has been assessed, provided that a reasonable sample is available which represents a range of marks and if possible, markers.

External moderation of marking:

1. External moderators shall do a review of a sample of marked and submitted work by the appointed external examiner for the program or subject.
2. External examiners shall not be involved in the determination of marks for individual students but rather provide the program team with an external, independent overview of their marking processes and the fairness and effectiveness of these processes.

Marking of examinations

Since examination scripts are not routinely shared with students, the marker does not need to write detailed feedback on the scripts except insofar as it may help with showing how marking decisions were made. Besides this, the marker shall initial each page to indicate that it has been marked, and to initial the final mark box to indicate that it has been checked.

1. First marking

First marking shall involve judging student responses against the criteria in the assignment brief. Marking of examinations shall be routinely made anonymous.

2. Second marking

It shall be required for assignment tasks which exceed 30 credits in value and recommended for 4 others. Second marking shall take any of these three forms: Independent marking – where the second marker marks the assignment exactly as it was submitted, with no comments appended by the first marker and no access to the marking and feedback comments provided by the first marker; Team marking — where two or more markers work together in making judgments and providing feedback on submitted work; Seen marking – when the second marker marks the assignment with access to the marks and feedback provided by the first marker.

3. Third marking

Third marking shall be considered when second marking results in a significant difference between marks awarded by the two markers and the markers are unable to agree on a final mark. It shall be necessary to consult with external markers at this point but external examiners shall not act as second or third markers. Their role shall only be limited to moderation of the process.

Case 5: University of London International Academy

The university is located in London city, England. It is a public university with a population of over 54, 000 students spread out in over 180 countries. It was established in 1858. Its affiliated institutions of higher learning include Kings' College London, London School of Economics, UCL Institute of Education and Heythrop College. It was sampled purposefully because it is one of the oldest universities in not only UK but also the world, and therefore an institution with stable systems. Besides this, the researcher chose it because it offers its programs internationally. The following section highlights the policies that guide examination processes in this university.

Setting of examinations

1. Internal Examiners shall participate in setting examinations and shall be expected to attend any meetings of the Examination Board held to determine the outcome of examinations.
2. External and intercollegiate Examiners shall be invited to participate in the setting of examinations.
3. Every examination paper shall be approved by at least one external or Intercollegiate Examiner.

Moderation of examinations

1. External Examiners shall be appointed to take part in moderation of examination scripts.

Marking of examinations

1. Every examination script shall be marked by at least 2 examiners or by one assessor and one examiner, who shall thereafter prepare an agreed list of marks.
2. The Chair of the Board of Examiners shall assign examiners into pairs for the purpose of double marking and shall ensure that the performance of pairs of Examiners is monitored by the Board.
3. Where both first and second marks are known to examiners, they must report to a Chief Examiner or chair on any significant difference which can't be resolved with the other marker.
4. Associate Examiners shall be qualified and experienced colleagues who shall not be employees of the University and shall be appointed to mark examinations in line with university policy.
5. Assistant Examiners shall be appointed to assist in marking scripts where there are large numbers of candidates.

6. The University and all Examiners shall be required to comply with the Data Protection Act of 1998 which establishes legal rights for individuals with regard to the processing of their personal data, including examination results.
7. Examiners shall be vigilant in their assessment of all elements of the examination for instance irregularities (collusion, impersonation or presentation of unauthorized material) and shall refer it to the Senior Assessment Manager in charge of examinations.
8. Examiners shall be responsible for agreeing the final mark of each element of assessment and ensuring the correct recording of marks on all scripts and mark sheets presented to the university.
9. Where there is divergence of opinion between examiners and in the mark awarded by each, Examiners shall be required to display how those differences were resolved.
10. Examiners shall ensure the confidentiality of candidates by making reference to the candidate number only in all documentation.
11. External/Intercollegiate Examiners shall inspect all scripts and other examination-related materials to be able to assess whether marking and classification are of an appropriate standard and consistent. This shall include: a sample of scripts from the top, middle and at the bottom of the range.
12. On illegible examination scripts: If an examination script is illegible or incomprehensible by the markers, the following procedure shall be followed:
    i. If the first pair of markers is unable to understand the relevant text, it will be referred through the Chair of the Board of Examiners to a second set of markers.
    ii. If the second pair of markers is unavailable, the Chair of the Board of Examiners shall refer the script to an External or Intercollegiate Examiner.
    iii. If the second pair of markers (or External/Intercollegiate Examiner) is also unable to read the text, a mark of zero shall be awarded for those parts.
    iv. If a candidate is awarded a zero mark on the above basis, the candidate shall be notified of the reason for the zero mark upon release of examination results.

Case 6: University of St. Andrews

The University of St. Andrews is a British public research university founded in 1410. Currently, it has a population of over 10, 745 students, 1, 059 academic staff and 1, 480 administrative staff. It is located in St. Andrews, Fife, Scotland, United Kingdom. The university is made up from a variety of institutions, including three constituent colleges — United College, St. Mary's College and St. Leonard's College and 18 academic schools organized into 4 faculties. Students are from over 120 nationalities. The institution was sampled purposefully because one, it is an institution with a long history of existence and two because it offers it has an international presence. The following section highlights the policies that guide examination processes in this university.

Setting of examinations

1. Assessment shall be made up of students' abilities in the various modules that they take. It shall take place against published criteria that are appropriate for the work in hand and must reflect what modules and programs at specific levels intend to deliver.
2. Standard setting shall not involve relative (norm-referenced) methodology that requires the fitting of marks to predetermined, normally distributed, grade curve such that a fixed proportion of students achieve certain grades.
3. For more qualitative works such as essays, the normal standard setting methodology is that every student's work is assessed individually using criterion referenced standards e.g. marking schemes.

4. In some disciplines such as Medicine where assessments are likely to vary in difficulty, procedures which take cognizance of the degree of difficulty may be used for instance the Bute Medical School. It ensures consistency of results between different forms of assessment and between different modules and requires that specific levels of competency be shown in order to pass a test.
5. External examiners and Deans shall play a critical role in standard setting. They shall play a role in approving examination questions.

Moderation of examinations

1. In moderation, a sample of scripts shall be second marked and the moderator either endorses the first marker's evaluation or suggests changes.
2. Moderation shall be carried out by suitably qualified members of staff who shall scrutinize a sample of marked work. The moderator shall see samples of work in each assessment banding, including fails, plus any contentious, borderline or undecided marks.
3. Following moderation (or second/double marking), a discussion shall take place between the examiner and moderator, which may lead to some adjustment of the original marks.
4. Where a module is to be marked by a single member of staff, a significant element of the assessed work must be moderated internally.
5. University policy does not require that an External Examiner always reviews examination scripts but he/she shall be invited to moderate a mix up of course work and examinations across the year thought their term in office.

Marking of examinations

1. A student's final module grade shall not be awarded on the basis of a single individual's assessment of all elements. In extraordinary cases where this occurs, it shall be communicated to the External Examiner and the relevant Deans.
2. In blind double marking, two markers shall attribute a mark and a full set of comments to a script without conferring during the initial marking process.
3. In second marking, the second marker shall produce his or her mark and comments having seen the annotations and comments of the first marker.
4. Systematic double marking and second marking of all assessed work are not a requirement of the University policy but some Schools may choose to adopt these practices.
5. Postgraduate students, inexperienced markers and all members of staff who are new to St. Andrews shall always be supported through second marking or moderation by more experienced colleagues until they are completely familiar with the relevant practices.
6. External Examiners shall not act as markers, but shall be asked to routinely review examinations on a rolling schedule. Such a schedule shall ensure that some assessed work from each element of a school's programs is seen by an External Examiner at least once every 3 to 4 years.

3.0 Research Design and Methodology

The study adopted a descriptive survey methodology. According to Orodho (2009) a descriptive survey design is a method of gathering data from respondents under settings which have not been controlled or manipulated in any way. This design was suitable for the study since the researcher aimed at gathering data by analyzing policy documents without manipulating any variables through experiments.

The documents that were analyzed were policy assurance documents and those outlining general university examinations rules and regulations, usually available in official university websites. The researcher went through the 8 steps of doing document analysis as proposed by O'Leary (2014). In the first stage, a list of texts to be explored was created. These were mainly quality assurance documents and documents outlining general university examination rules and regulations. In the second stage, a consideration on how texts will be accessed with attention to linguistic and cultural barriers was made. This was followed by an acknowledgement and address of inherent biases. In the fourth stage, the researcher developed appropriate skills for research followed by an exploration of strategies to ensure credibility of the data. Step six involved searching specific data as dictated by the study objectives. In step seven, the researcher made some ethical considerations, especially with regard to confidential documents. Finally, a backup plan for the entire process was developed.

The researcher sampled a total of 6 universities through purposive and simple random sampling techniques. Out of these, three were from the East African region (1 public and 2 private) and the other three were from the United Kingdom (both public). Data collection involved doing a document analysis of policy documents that touch on university examinations. This analysis was based on the study objectives and it mainly focused on establishing similarities and differences with regard to setting, moderating and marking of examinations in these institutions.

3 Findings

This section presents the study findings along three main themes: setting, moderating and marking of university examinations. In each of these themes, policy similarities and differences were identified.

4.1 Differences observed in policies on setting university examinations

Table 1: Differences in policies on setting examinations

University	Differences In Policies On Setting Examinations
Uganda Martyrs University	- Policy does not specify who is supposed to set examinations.
Manchester Metropolitan University	- Policies on setting examinations are developed according to the Quality Assurance Agency's UK Quality Code. - An academic staff member from the department who didn't teach the course being assessed is the one who sets the examination.
University of Eldoret	- Timelines on setting examinations and preparing marking schemes are specified —within the first 4 weeks of the semester. - Examinations in the main university and all collaborating institutions are set by the relevant schools.
St. Johns' University	- Two papers are usually set for every course whereby one is randomly selected by the Head of Department to be used for regular examination whereas the other is used for any supplementary or special examination that shall be offered.
University of London	- Internal and Intercollegiate Examiners collaborate to set common examinations.
University of St. Andrews	- Standard setting doesn't involve norm-referenced methodology that requires performance to assume a normal curve. - In some disciplines such as medicine, procedures which take cognizance of the degree of difficulty may be used e.g. The Bute Medical School.

4.1.1 Discussion

As presented above, there exist a number of differences in policies on setting university examinations. In Uganda Martyrs University for instance, the policy does not specify who is

supposed to set examinations. On the other hand, in a university like Manchester Metropolitan, policies on examinations are guided by the Quality Assurance Agency's UK Quality Code – a practice that is not common in universities from the United Kingdom as well as in East Africa. University of Eldoret policies seem to be clearer on timelines for doing various procedures related with setting examinations – something that lacks in other universities. In Tanzania's St. Johns' University, whenever examinations are set policy requires that two different papers be set whereby one is subsequently used for regular exams and the other used for any special or supplementary exams that may be on offer. Apart from University of London, policies in the other universities do not specify if internal and intercollegiate examiners in any way collaborate when they set common university examinations. The study also established that it was only in University of St. Andrews whereby in some disciplines such as Medicine, procedures which take cognizance of the degree of difficulty are used such as the *Bute Medical School.*

4.2 Differences observed in policies on moderating university examinations

Table 2: Differences in policies on moderating examinations

University	Differences in Policies on Moderating Examinations
Uganda Martyrs University	- In the absence of external examiners, departments are allowed to develop systems that are coherent with the quality assurance framework approved by university Senate. - The role of moderators is three fold: before examinations are done, during examinations and after examinations are done. Before examinations, they moderate examination questions, the marking scheme, instructions etc. During examinations they are required to be there and provide any necessary assistance to students. After examinations, they check if the marking scheme is being followed by markers and accuracy of tallies.
Manchester Metropolitan University	- No major differences noted.
University of Eldoret	- Timelines within which to send copies of moderated papers to the registrar in charge of academics are specified –5 weeks before the start of regular examinations. - All copies of examination papers except the moderated ones are destroyed by shredding.
St. Johns' University	- Moderation of papers set to be done can take place in the presence of the course lecturer or any other appropriate senior member of staff. - Examination questions and the authorized syllabus are moderated by External Examiners in the second semester of every academic year during moderation of marking. - Examinations set by internal examiners are moderated internally in the second semester of every academic year.
University of London	- No major differences noted.
University of St. Andrews	- Where a module is to be marked by a single member of staff, a significant portion of the assessed work must be moderated internally.

4.2.1 Discussion

The study established a number of differences in policies on moderation of examinations. In Uganda Martyrs University, the study found out that the role of moderators extends from the pre-examination period to the post-examination period. Unlike in other universities, policies in the University of Eldoret specify timelines within which various activities on moderation are done. In St. John's University, moderation is usually done in the second semester of every academic year. This is not observed in other universities. It was only in St. Andrews that the policy requires that a significant proportion of a student's work be moderated internally where a module is marked by a single member of staff.

4.3 Differences observed in policies on marking university examinations

Table 3: Differences in policies on marking examinations

University	Differences in Policies on Marking Examinations
Uganda Martyrs University	- No major differences noted.
Manchester Metropolitan University	- Markers are not supposed to write feedback on scripts especially if it doesn't help with showing how marking decisions were arrived at. - University policy allows for first, second and even third marking. Second marking is required for assignment tasks which exceed 30 credits whereas third marking is considered when second marking results in significant differences between marks awarded by the two markers.
University of Eldoret	- Timelines within which internal examiners are supposed to submit marks to the Principal Internal Examiner are clearly specified – 6 weeks from the last day of the semester examinations. - Examiners are not allowed to divulge marks to candidates. - Timelines within which Internal Examiners are supposed to mark and submit marks for end of semester examinations are specified –2 weeks after the end of the examination period. - After release of examinations, a candidate can appeal for remarking within 2 weeks. - A fee of 500 Kenya shillings per paper must be paid by the student before remarking is done.
St. Johns' University	- All tests and other forms of assessment done during the semester are marked before examination week. - Marking of examinations and compilation of results by internal examiners is done in accordance with a time schedule given by the Deputy Vice Chancellor in charge of academic affairs.
University of London	- Every examination script is marked by at least 2 examiners. - Chair of Board of Examiners assigns examiners into pairs for double marking. - Associate examiners are allowed to mark live scripts. - Assistant examiners are appointed to assist in marking scripts where there are large numbers of candidates. - Examiners are required to comply with the Data Protection ACT of 1998 which establishes legal rights for individuals with regard to the processing of their personal data. - Instances of examination irregularities are reported to the Senior Assessment Manager in charge of examinations. - Only candidates' numbers are used to in all examination-related documentation. - Where there are illegible scripts, two different pairs of examiners mark it. In case the second pair is not able to read, a mark of zero is awarded for those parts.
University of St. Andrews	- Postgraduate students are allowed to mark examinations provided that they are closely guided by experienced colleagues. - Systematic double marking and second marking are not a requirement of university policy but discretion of respective Schools. - A single examiner cannot mark a candidate's entire work, unless in extra-ordinary cases and with prior communication to the external examiner and the relevant Deans.

4.3.1 Discussion

The study established that unlike in other universities, policies in University of Eldoret give timelines within which various activities associated with marking should be done. In this university also, for a student to be considered for remarking, they must pay a fee of 500 Kenya shillings per paper. However, this was not a policy requirement in the other universities. The University of London is the only university whose policies on marking clearly state what should be done when examination irregularities such as plagiarism, collusion and submission of unauthorized materials occur. Besides this, it was in this institution only that the policy allows two pairs of markers to mark illegible scripts. Moreover, unlike in other institutions, examination policies allow assistant examiners to be appointed for marking in cases where there is a large candidature in a paper. It was also established that it was only in this university that examiners are required to comply with the UK Data Protection Act of 1998 which establishes legal rights for individuals with regard to the processing of personal data. In university of Manchester, the policy allows for first, second and even third marking. In University of St. Andrews, the policy allows

postgraduate students to participate in marking examinations, unlike the case was in other universities. On the same note, in St. Andrews systematic double marking and second marking are not a requirement of university policy but discretion of respective Schools.

4.4 Similarities observed in policies on setting university examinations

Table 4: Similarities in policies on setting examinations

University	Similarities in Policies on Setting Examinations
Uganda Martyrs University	- No major similarities noted.
Manchester Metropolitan University	- Examinations are moderated internally by a member of staff who does not directly contribute to that particular assessment. - Examinations are moderated by external examiners before they are administered.
University of Eldoret	- Setting and typing of examinations is done by the course lecturer (internal examiner) who also prepares marking schemes.
St. Johns' University	- Examinations are set by a member of academic staff who coordinated/taught the course or by the Head of Department.
University of London	- Internal Examiners participate in setting examinations.
University of St. Andrews	- For qualitative works such as essays, every student's work is assessed individually using criterion referenced standards e.g. marking schemes. - External examiners and Deans play a critical role in standard setting by approving examination questions.

4.4.1 Discussion

A number of similarities were noted with regard to setting of university examinations. In almost all institutions, it was established that end of semester examinations are set and typed by a member of staff who taught that specific course. Setting of other essential documents such as marking schemes was also a common policy requirement.

4.5 Similarities observed in policies on moderating university examinations

Table 5: Similarities in policies on setting examinations

University	Similarities in Policies on Moderating Examinations
Uganda Martyrs University	- There is both internal and external moderation of examinations. - Moderators are required to be academically competent in the field they are called upon to moderate. - The primary concern of moderators is to check the accuracy of the examination papers, their suitability and relevance for the level for which they are intended to be addressed.
Manchester Metropolitan University	- Internal moderation of marking involves a review of a sample of marks and comments on assignment tasks to ensure that marking criteria are fairly, accurately and consistently applied. - Internal moderation is done by employees of the university. - External examiners are not involved in the determination of marks for individual students, but rather provide the program team with an external, independent overview of their marking processes and the fairness and effectiveness of these processes.
University of Eldoret	- Departmental Board of Examiners moderate papers internally before sending them to External Examiners. - Copies of examination papers with marking schemes and course outlines are sent to External Examiners for moderation. - Heads of Departments ensure that comments from External Examiners are discussed and incorporated into the examination papers by Internal Examiners.
St. Johns' University	- All examinations are moderated internally. - Final versions of examination questions and authorized syllabuses are moderated by External Examiners.
University of London	- External Examiners take part in moderation of examination scripts.
University of St.	- In moderation, a sample of scripts is second marked and the moderator either endorses the first

Andrews	marker's evaluation or suggests changes. - Internal moderation is done by suitably qualified members of staff. - External Examiners review examination scripts.

4.5.1 Discussion

Just like in setting, the study established that there were a number of similarities in policies on moderation of examinations. In all universities, policies require that examinations have to be moderated both internally and externally before they are administered. On the same note, policies required that other related documents such as marking schemes and course syllabuses be moderated before marking commences. In most universities, policies recommend that external examiners should not actually mark examination scripts but rather evaluate the fairness and effectiveness of marking processes.

4.6 Similarities observed in polices on marking university examinations

Table 6: Similarities in policies on marking

University	Similarities in Policies on Marking Examinations
Uganda Martyrs University	- Board of Examiners consisting of internal and external examiners for each program on offer determine whether a candidate has successfully completed or failed an examination on the basis of the set pass mark after marking.
Manchester Metropolitan University	- No major similarities noted.
University of Eldoret	- Internal and external examiners take part in marking examinations at the end of every semester.
St. Johns' University	- No major similarities noted.
University of London	- Associate Examiners (external examiners in other universities) are qualified and experienced colleagues who are not employees of the University and who get appointed to mark examinations in line with university policy. - External Examiners inspect all scripts and other examination-related materials to assess whether marking and classification are of an appropriate standard and consistent.
University of St. Andrews	- External Examiners do not act as markers; their role is to routinely review examinations on a rolling schedule.

4.6.1 Discussion

A number of similarities were noted in marking of university examinations. In all universities, both internal and external examiners are required by policy to take part in marking-related activities. External examiners do not actually mark examination scripts but rather provide an independent overview of the fairness and effectiveness of marking processes.

5.0 Conclusion

Policies on examinations bear similarities and differences in almost equal measure. The study concludes that universities in United Kingdom have policies that are more elaborate especially with regard to marking when compared to their counterparts in the East African region.

6.0 Recommendations

After a thorough analysis of various policy documents on university examinations, the researcher made a number of observations that subsequently led to the following recommendations:

i. Universities should clearly state in their examination policies on how cases of examination irregularities such as plagiarism, collusion and impersonation should be handled when detected during marking.

ii. Universities should formulate new policies to allow for Conveyor Belt System of marking.

iii. Those universities whose policy frameworks do not clearly give timelines on when various setting, moderation and marking-related activities should take place should adjust their policies to include this.

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Principals' Information Systems' Utilization on Management of Communication in Public Secondary Schools in Nyamira County, Kenya

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Abstract
Communication remains and is a determining factor in the smooth running of institutions of learning. But on the other hand, its poor management in these institutions contributes to a great extent; to the provision of poor quality services, hence low quality education. This paper argues that the methods employed in the management of communication should take into consideration the paradigm shift in global communication trends. The purpose of this study is to establish the utilization of 'Information Systems' (IS) on communications in public secondary schools in Nyamira County. A survey design and mixed method approach were used in the study and a questionnaire was the main tool for collection of data. The target population was 182 principals of public secondary schools distributed in 5 sub-counties. Stratified random sampling technique was used to obtain a sample of 80 principals. This questionnaire was utilized to obtain information from the principals. The data collected was analyzed using Analysis of Variance (ANOVA). The findings of the study show that Website and e-mail were found to be the main channels of communication from schools to education headquarters and has greatly reduced the cost of incurred in the process. It was found that Information Systems utilization has a direct relationship with its outcomes on management of public secondary and communication.

Key Words: *Information Systems, Management, Communication, Utilization*

Introduction

Communication which is a driver of curriculum implementation and supervision means to make known, to impact or to transmit information and it forms a bridge between principals, teachers and education officials, since principals must receive and give ideas, reports and instructions, explain problems and give demonstration (Kirimi, 2013). Nduta (2014) noted that communication with employees is important even in small organizations in order to keep them informed about new products, customer wins, important appointments, and any new business opportunities.

Prudent finance management, effective curriculum implementation and supervision and communication, are key to quality education provision. This means that the traditional methods of school management and administration are insufficient in enhancing quality in educational institutions (Okon, Akpan & Ukpong, 2011). New knowledge and skills are thus imperative in improving efficiency. Information Systems (IS) is thus a tool for use in the information and data gathering, and analysis in public secondary schools in the 21st century (Makera, Meremo, Role, and Role, 2013). IS refers to the telecommunications (telephone lines and wireless signals). It therefore means that they encompass; computers and enterprise software, middleware, storage and audio-visual systems that transmit, access, store and manipulate information (FOLDOC, 2013). For the purposes of this study IS refers to e-mail, computer software, SMS, e-learning and information management systems whereas, DVDs, internet, projectors, computers (laptop, mobile phones and Desk Tops) are infrastructures that enable IS to work.

E-mail and computer software were used in education in the United States of America, and the United Kingdom, mainly to process information on personnel, and to link local and central education administration offices (Castels, 1996 &Twinning, 2002). Spectrum Community Secondary School in Britain, installed computer system that had administrators' APPLE Package

consisting of attendance periods for students and teachers, and demographic aid for textbooks, and for monitoring, and this proved very useful (Simair, 2006). Computers and DVDs for instance, can be used in keeping students and various administration resources records (Maki, 2008& Makera,Maremo, Role,E and Role,J, 2013).

In Kenya, various policies such as, the e-government,-e-learning and teaching, and IS for educational management of information systems (EMIS), have been developed (Siele, 2006). GOK (2008) through Sessional paper No.1 of 2005 introduced 'Education Management Information Systems' (EMIS) policy in education which was to improve access to education and decision making leading to quality education. Similarly, Sessional paper No.10 of 2012, introduced 'Science, Technology and Innovation' (STI) policy whose aim was similar.

Equally, The Kenya National Examination Council (KNEC) has developed online registration of (KCSE) and (KCPE) candidates' policy and this compels school principals and head teachers to use internet for this service. Although, the government has introduced Information Systems policies, Oloo (2009) found out that 42.9% of the schools had computers, with national schools having better facilities than county and sub- county ones. Similarly, a study by Ocharo,*et al*(2015) observes that most principals in schools have computers in their offices making easy it for IS utilization. Onderi and Makori (2013) opines that schools in this area have inadequate human and physical facilities, whereas, schools with adequate facilities perform better than those with inadequate ones in national examinations. According to Kaguri, Ibantu, and Thiaine (2014), it is because of careless financial and budgeting, poor financial reports and arbitrary auditing process. The studies by Makori and Onderi (2013) and Kaguri, Ibantu and Thiaine(2014) indicate inadequacy of facilities and inefficient financial management in public secondary schools. This, thus underscores the need for introduction of new skills in management, where IS may be the option for utilization in the management of public secondary schools in Nyamira County, Kenya.

Statement of the Problem

Principals of public secondary schools are faced with communication challenges such as inappropriate information delivered, cost incurred and delay in delivering and obtaining information. This leads to the provision of poor quality education; thus producing graduates who cannot drive the economy towards the achievement of Sustainable Development Goals (SDGs) and Vision 2030. Communication network within the schools is of great concern as relying on outdated modes of communication affects management (Wangui & Miriti, 2014). Consequently, the school principals need to put into place new ideas that may assist to boost communication efficiency. It is on this basis that; Meziobi (2006), opined that 'Information Systems' (IS) may be a tool that can be employed to address these challenges and boost the principals' ability to manage communication. Since most principals in Nyamira County have computers in their offices, it is easy to implement utilization of information systems, (Ocharo *et al*, 2015). Utilization of 'Information Systems' comes in hand to address these challenges because our country (Kenya), hinges the achievement of the Sustainable Development Goals (SDGs) and Vision 2030 on technology. Therefore, the present study seeks to establish the utilization of 'Information Systems' on management of public secondary schools in Nyamira County, Kenya.

Purpose of the Study

The purpose of this study was to establish the utilization of IS on management of public secondary schools in Nyamira County, Kenya.

Objectives of the Study

The following objectives guided study:

Determine IS utilization on the management process of communication, in sub county, county and national public secondary schools in Nyamira County, Kenya.

Research Questions

The following questions were answered by the study:

- How are the 'Information Systems', utilized on the management of communication in public secondary schools in Nyamira County, Kenya?

These questions were further tested using the following null hypothesis:

- H0: There is no significant difference in IS utilization on the management of communication process between sub county, county and national public secondary schools in Nyamira County, Kenya

Significance of the study

This study would be valuable to students and parents of Nyamira County as it would provide information on the utilization of IS on finance management, curriculum supervision and implementation; communication as it would a supplement to learning resources. The parents would benefit from the prudent management of finance resources, thus reducing wastage. Utilization of IS in school administration and management would drastically reduce resource wastage and bring about efficiency (Makera *et al*, 2013). The students would attain higher academic qualifications enabling them to join competitive courses in the universities. The principals would benefit from the information on utilization of information systems in monitoring implementation and supervision of school curriculum and its use in management of students, support staff and teachers, and efficient finance management. The ministry of education and policy makers would benefit from data on how best schools could be run and may use this same information in rolling out policy on school administration using Information Systems (IS).

Scope of the Study

The study would focus on the management of finance, curriculum implementation and supervision; and communication of only public secondary schools in Nyamira County. Only public secondary schools were selected because they had similar administrative structure. The IS utilization was only restricted to the management of finance, curriculum implementation and supervision; and communication as stated in the objectives because they directly related to the provision of quality education. Although, there are many types of information systems, the study only used; SMS, MIS, e-mail, e-learning and website because they are relevant to finance, curriculum implementation and supervision; and communication.

Conceptual framework

Information systems such as e-mail, SMS, Website and IMS as independent variables, bring efficiency in school finance management, communication, curriculum implementation and supervision.

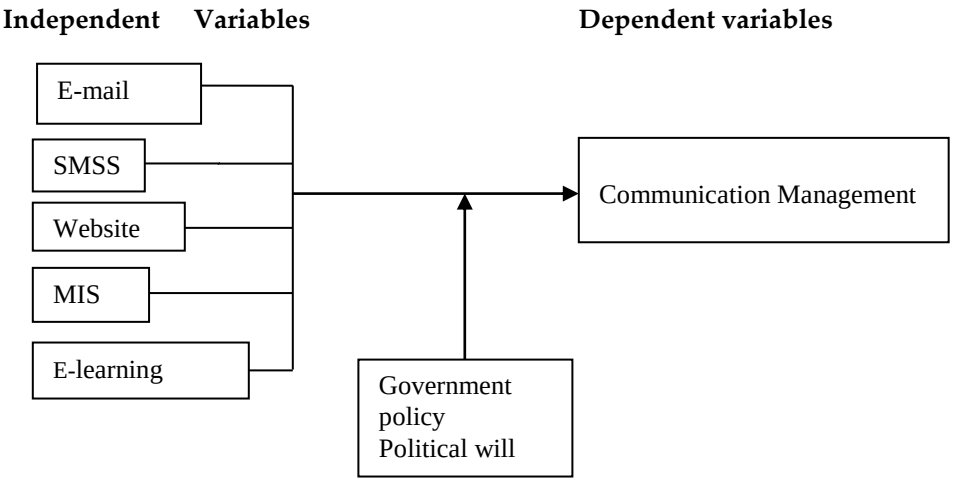

Figure 1.1: Conceptual Framework

This conceptual framework shows how the independent and dependent variables relate to each other in the study. The independent variables; e-mail, SMS, website, MIS and e-learning are expected to positively influence the dependent variables; finance management, curriculum implementation and supervision; and communication to bring efficiency and effectiveness in public secondary school management.

2.0 Literature Review

2.1 Utilization of information systems on management of communication in public schools

Institutions are made up of more than one department and therefore there should be a good and efficient communication network within to interconnect these departments so as to enable a smooth flow of information. King and Godwin (2002) argue that for institutions involved in learning, parents must take part in shaping their children behavior by always encouraging and motivating the children to develop positive attitude towards school, good classroom conduct and self-esteem and this can only be achieved through effective communication. Armstrong (2009) agrees with Ling and Godwin that effective communication is vital in running of institutional programmes. Any change in an organization such as contingent pay, working methods, technology, and services need to be known by employees; and therefore effective communication will help improve relationship at work, teamwork, decision making and problem solving techniques amongst the employees (Robinson and Judge, 2007). Lack of effective communication therefore will lead to poor quality education resulting in graduates who cannot deliver quality services. A study on the influence of communication channels on management practices in Kenyan Public Universities revealed that MMUST relies on HODs, Group representations, memos, notice boards, face to face and telephone to communicate (Namasaka, et *al* (2013). While, Mutua (2014) said that Newspapers, radio and Telephones are important channels for communication with customers, investors and the community during product launching because they reach a larger target market however, with increasing digitalization these channel are increasingly being rarely used.

Communication within an organization is very important and when it is effective, it enables constructive teamwork, since colleagues understand the way that communication is done and they feel recognized (Njiru, 2015). Nakpodia (2010) argued that communication within the school

enhances discipline and maintains law and order. A study by Odhiambo (2005) found that Principals used school assemblies, staff meetings, HODs, memos, staff reports and consultations to communicate within the school, however, the channels are prone to distortion due language barriers and absenteeism on the part of the recipients thus they become inadequate in conveying messages to the recipients. Similarly, Kiriago (2013) found that when oral communication was used by students, administrators, HODs, teachers and support staff to communicate to their external target audience, there is a high tendency of people to forget too fast. However, it has been observed that technology such as internet has improved communication as it enables users to access news, search for information, plan and book vacations and even buy households from home (Kefalaki, 2012).

One of the common challenges of communication is failing to communicate the deliberations of meetings with staff in time leading to information failure or late communication (Mamuli, Mustosto, Namasaka and Odera, 2013).It is also noted that 'Top-down' communication affect organization cohesion as employees don't feel that their supervisor interact with them enough or communicate reliable information about the organization to them (Njuru, 2015).Effective communications within the institutions thus serve as a driving force behind successful activities hence there is need for every organization to embrace utilization of good channels of communication. Management information systems therefore provide information to administrators and the teachers for informed planning, policy making and evaluation (Madiha, 2014). It is such an important tool for management of schools as teachers and other members of staff can sign in online as they come and leave school. Management information systems are utilized on tracking students who have defaulted on fee payment (Benwari, 2014).

Information Systems, need structures which will enable them work. Kamile (2006) opined that the number of computers, computers connected to internet, their location; and software used in schools are part of the important facilities for utilization of 'Information Systems' in schools. Although Information Systems have proved so vital in public secondary school management, not all schools have utilized the technology. Aduwa-Ogiegbaen and Iyam (2005) argue that lack of appropriate software which was culturally suitable to Nigeria, was a stumbling block to technology adoption. This finding was different from that of Kamile(2006), that found that school principals' perceptions about IS, determined the level of their utilization. While, Mingaine (2013) argued that: in Kenya the challenges of IS implementation were due to limited qualified teachers and high cost of infrastructure. On the other hand, Shah (2014) opined that management information systems (MIS) utilization was impeded by administrators' lack of time, skills, and technical support. Kidombo, Gakuu and Nderito (n.d) study in selected schools in Kenya, concurred with shah that lack of skills in 'Information Systems', prevented school managers from utilizing the technology.

Short Message Service (SMS) is a household name common in almost all mobile phone users, and as reported by Queensland Government (2013),its' civil servants even use government network in their departmental offices to communicate to friends, family members, do online banking or pay bill, access breaking news and other online media site. Carke(2015) said that in New Zealand, most schools use SMS to capture achievement data and parents are given report using the stored information and standard templates in SMS. This SMS technology has had a wide application in Tanzanian education sector where rural schools uses mobile network to send Education Management Information System(EMIS) and other statistical data via SMS to Ministry of Education and Vocational Training(MoEVT).

Traxer and Dearden (n.d) say that these returns are used by ministry officials in sub-saharan Africa in allocating resources, however their transmission process currently used by letter-post, courier or by phone conversation is slow, expensive and error prone and most are stored and never used. SMS has been used in notifying students about changes in the timetables and sending bulk learning material resources in the rural areas in the United Kingdom (UK) (Nix, Russel and Keagan, n.d). Obrien (2015) observed that parents want curriculum description and instructional programs, calendar of events and meetings, information on students safety(quality of teaching and educational program changes) communicated through e-mail, website, sms and voice messaging.

Queensland, government officials use SMS from their departments for personal use in communicating to friends, family members, and, for online banking and paying bills; but in New Zealand most schools use it to capture achievement data of students which are then sent to parent from stored information and standard templates. In Tanzania the SMS is used to send EMIS to the MoEVT headquarters whereas in Nyamira North Sub-county the studies did not reveal SMS usage. The study also found that there was low level computer implementation prompting usage of SMS as it has a high acceptability, coverage, ownership among teachers and is socially inclusive (Traxer and Dearden,n.d).

Sunday and Oni (2012) found that Nigerian school administration used, e-mail to send and receive, bulk information to and from parents and other stakeholders and receive and send information on students, staff and materials to and from government and other agencies. Cynon (n,d) said that schools and colleges use the website to advertise for places and students and parents apply through the website. Whereas management information systems are used in the offices to store data on students and personnel (Shah, 2014),

Shih and Kin(2003) argued that currently distance learning is primarily limited to colleges and corporate training secondary and elementary schools have not adopted it due limitations of network infrastructure, experiences, manpower, effective policy and acceptance from the employees.

Zajicova(2007) said that e-learning encompasses computer learning, internet resources and educational websites offering worksheets and interactive exercises for children . Questions can be answered online, and can answer emergency questions at any time. E-learning courses will help teachers and offer new ideas to make their lessons more attractive for their students and thus make them more active during the lesson. A study by Kiilu (2012) in Kitui County, which examined E-readiness implications of e-adoption in Kenya, found that 10% of secondary schools offer computer studies which are an indicator of e-readiness. However, another study by Muluva and Kyalo(2013), on relationship between principals' teachers' and students' attitude towards e-learning adoption in curriculum implementation, using cross-sectional survey research design found that the students' attitude had significant influence on schools' readiness to adopt e-leaning.

3.0 Research Methodology

3.1 Research design

This study employed survey design. This is a design which involves a brief interview and collection of information or data in its original form. The design is able to collect views from a large population using a single questionnaire (Cress well& Plano, 2011). This method was appropriate in this study to gather a lot of information on 'Information Systems' utilization using a questionnaire from the many sparsely populated schools within a short time. The researcher thereafter used 'Structured in-depth interview schedule' to collect more information on the utilization of information systems from two key informants (principals of the two national schools). A mixture

of quantitative and qualitative mixed method approach (paradigm) was suitable for this study as opined by Cresswell and Plano (2007) that Mixed Method Design methodology provides a better understanding which either method cannot. The researcher thus, administered 80 principals' questionnaires and 217 HODs' questionnaires in 80 public secondary schools in Nyamira County, Kenya.

In Mixed methods approach, the researcher based the inquiry on the assumption that collecting diverse types of data, best provided an understanding of a research problem as it brought with it, abroad survey in order to generalize results to the population and then focused, in a second phase, the researcher concentrated on detailed qualitative structured interviews on the key informants to collect detailed views from participants an idea shared by (Creswell, 2003).

3.2 Study area

The area of study was Nyamira County, Kenya. It is found in Nyanza region, bordering Bomet County, Kisii County, Homabay County and Kericho to the North Nyamira County lies between latitude 0030' and 00 45' south and between longitude 340 45' and 350 00' east and it has 182 secondary schools which is a large number, from where a representative sample was obtained. Each category of schools was fairly homogenous categorized into national, county and sub-county. The county had most of its parts with fair distribution of electricity which makes computer utilization and implementation possible. The area is widely covered by the Airtel and Safaricom mobile and internet network making every home accessible to mobile and internet usage. Therefore it was suitable for this study due to the presence of network and electricity which are the basic factors determining the usage of information systems.

3.3 Study population

The population of the study was drawn from 182 public secondary schools distributed in the five sub-counties of Nyamira County i.e. Nyamira North 54, Manga 28, Borabu 21, Nyamira South 47 and Masaba North 32. The schools are stratified as: National schools (2), County schools (24) and Sub-county schools (156).The respondents were 182 principals,

3.4 Sample size and sampling procedures

The sample size was obtained using Proportionate Stratified Random Sampling method. Mwangi (2015) said that this method involves the division of a population into strata with members sharing similar characters and then obtaining a random sample from each stratum that is proportional to the stratum's size as relates to the population.

The sample size was obtained using Willen (2013)' table 3.1.The margin of error for this study- that is the deviation between the opinions of the respondents and the entire population was 5% and the confidence level 95%. The total number of respondents for the study was 182. The study sample obtained from the table was 80 principals.

Table 3.1: Willem's 2013 sample size selection and confidence levels table

Population	Confidence level=95% margin of error			Confidence level=99% Margin of error		
	5%	2.5%	1%	5%	2.5%	1%
100	80	94	99	87	96	99
500	217	377	475	285	421	485
1000	278	606	906	399	727	943
10 000	370	1332	4899	622	2098	6239
100 000	383	1513	8702	659	2585	14227
500 000	384	1532	9423	663	2640	16055
1000 000	384	1534	9512	663	2647	16317

3.5 Instrumentation

The study used three types of data collection instruments namely; the principals' and HODs' questionnaires, and an interview schedule. The questionnaires have the advantage of allowing for minimal contact between the researcher and the participants, using multiple avenues to administer such as: hand delivery, snail mail, e-mail and online; participants' answers are readily recorded on prescribed forms. Therefore, the participants are independent in the process of responding to the items raised. In-depth interview schedule obtained detailed information on utilization of IS in, communication from principals of national schools. This is a one on one conversation and thus provides the researcher with the opportunity of getting clear information on misconceived ideas or information which the questionnaire could not.

3.6 Principals' questionnaire

This sought information on utilization of information systems on management of finance, curriculum implementation and supervision; and communication. It contained five sections with items on the types of information systems and how they are utilized: on collecting and managing school finances, implementing and supervising curriculum; and managing communication.

3.7 Data collection interview schedule

This obtained more information on the utilization of MIS, SMS, e-mail, e-learning and website on management of finance, curriculum implementation and supervision; and communication from key informants (principals of the two national schools). The researcher made appointments for a meeting with each of the principals of the two national schools in their schools separately. During the interview, the conversations were taped and transcribed later according to the themes.

3.8 Data collection procedures

The researcher obtained a consent letter from the school of post-graduate studies, and then proceeded to the National Council of Science and Technology to obtain a research permit. The researcher then prepared the data collection instruments ready. The instruments were administered by the researcher himself during the data collection process. Some of the completed questionnaires were collected the same day and those that were unable to, were given one week after which the researcher went round to collect them.

The interview schedule was conducted after making arrangements with the interviewees to compromise on the convenient time. During the interview the data was voice recorded and transcribed later into meaningful data.

3.9 Administration of principals' questionnaire

The questionnaires were self administered by the researcher upon visitation of the schools. The researcher requested the principals to fill the questionnaires as he waited. In some schools the researcher dropped the questionnaires for filling in order to be collected in another day, while in 20 schools the accounts clerk and the deputy principal assisted in filling them.

3.10 Methods of data analysis

The data was collected using questionnaires and in-depth interview schedule. The questionnaires containing data from the respondents were coded and edited to ensure completeness and consistency. The items in the questionnaire were divided into; demographic, general and specific IS utilization. Demographic data was analyzed using descriptive statistics, while general and Specific IS utilization data in Objective one; two and three were analyzed using one-way Analysis of Variance (ANOVA). Objective four was analyzed using regression. ANOVA is a statistical test which analyzes variance and it is helpful in analyzing two or more population means which enables a researcher to draw conclusions on various results and predictions about two or more sets of data (Howell, 2010). This method was appropriate in the analysis of this research data, for it considered data from sub county, county and national schools from public secondary schools in Nyamira County which formed three independent groups.

4.0 Resullts and Discussion

4.1 Utilization of Information Systems on Management of Communication

Communication in schools enables activities to be carried as and when required. Some communications are top-down, down-up and others horizontal; but all function to bring order within the school. The study investigated and answered the question:

- How are IS utilized on the management of communication between sub county, county and national public secondary schools in Nyamira county, Kenya?

4.2 Utilization of Information System on Communication by Principals

This information was sought in order to establish the type of IS and how they are utilized in public secondary schools in Nyamira County, Kenya. The study first determined the type of information systems using descriptive statistics. The second part of the study involved analysis of variance to determine significance of difference in IS utilization and then hypothesis testing. The data was further subjected to post hoc HSD analysis to identify the differences in levels of IS utilization between sub county, county and national public secondary schools.

4.3 Information System Utilization on Communication by Principals

The study sought from the questionnaire to find out the type of information systems utilized by principals on the management of communication in public secondary schools in Nyamira County. The results are illustrated in the form of frequencies and percentages in Table 4.23.

Table 4.1 Information Systems General Utilization on Communication by Principals

Information Systems	No. of schools	%	No of non users of schools	%
E-mail	20	**25.0**	60	**75.0**
MIS	18	**22.5**	62	**77.5**
SMS	61	**76.3**	19	**24.7**
Website	39	**48.8**	41	**51.2**

N=80

Data in Table 4.1 shows that Principals' utilization of SMS was 61 (76.3 %) compared to e-mail 20 (25.0%) and MIS 18 (22.5%) respectively. SMS utilization is important especially in calling for meetings because it is faster, cheaper and convenient to communicate as the communicated information can be retraced for reference. SMS is applicable in all forms of communication vertical, horizontal and diagonal communication. E-mails and MIS were minimally utilized because their ease of use is limited due to accessibility factors. This was further investigated using the 3rd null hypothesis at p< .05 statistical significance levels;

- H0: There is no significant difference in the utilization of IS on management of communication between sub county, county and national public secondary schools in Nyamira County, Kenya.

4.4 Information Systems Utilization on Communication by Principals

The study sought to find out the type of information systems utilized by principals in managing the communication process in their schools. The investigation was conducted from general to specific areas of information systems utilization.

4.5 Significance of Difference Analysis of Information Systems General Utilization on Communication by Principals

Analysis of significance of difference was conducted to establish the type of information systems utilized on the management of communication in sub county, county and national public secondary schools. The results are illustrated in the Table 4.2.

Table 4.2 Significance of Difference Analysis of Information Systems General Utilization on Management of Communication by Principals

		Sum of Squares	df	Mean Square	F	Sig.
com mis	Between Groups	51.580	2	25.790	**6.683**	**.002**
	Within Groups	297.170	77	3.859		
	Total	348.750	79			
Com-e-mail	Between Groups	40.755	2	20.377	**7.875**	**.001**
	Within Groups	199.245	77	2.588		
	Total	240.000	79			
Com sms	Between Groups	81.428	2	40.714	**64.031**	**.000**
	Within Groups	48.960	77	.636		
	Total	130.387	79			
Com webs	Between Groups	38.742	2	19.371	**36.197**	**.000**
	Within Groups	41.208	77	.535		
	Total	79.950	79			

In Table 4.2, analysis of variance was conducted to test for significance of differences in MIS, SMS, e-mail, e-learning and website utilization on curriculum implementation in public secondary schools in Nyamira County. It was established that there is a statistical significant difference at p< .002 in MIS utilization, MIS F (2, 77) = 6.683, at p< .001 for e-mail utilization, e-mail F (2, 77) = 7.875, at p< .000 for SMS and website utilization on communication. Since p< .002 , p< .000 and p< .001 are less than p< .05, the null hypothesis is rejected: 'There is no significance difference in IS utilization on management of communication in public secondary schools in Nyamira County, Kenya.' Therefore, the alternative hypothesis is accepted; 'There is a significant difference in IS utilization on management of communication in public secondary schools in Nyamira County, Kenya.' Thus the data has revealed that MIS e-mail, website and e-learning are utilized on the

management of communication, but their utilization varies between sub county, county and national public secondary schools in Nyamira County, Kenya. This is in agreement with the findings in Table 4.23 which show that the Principals' utilization of SMS was being 61 (76.3 %) compared to e-mail 20 (25.0%) and MIS 18 (22.5%) respectively.

The F-values show that the variability in e-mail (F=7.875) and MIS (F=6.683) is small compared to SMS (F=64.031) and website (F=36.197). Therefore, this means that e-mail and MIS utilization between sub county, county and national schools do not differ to a great extent but there is a great difference in utilization within sub county, county or national schools themselves. On the hand, website (F=36.197) and SMS (F=64.031) utilization between these categories of schools differ to a great extent but the differences in utilization within sub county, county or national schools is small. The small differences in the utilization of e-mail between sub county, county and national schools can be explained from the government policy that requires schools to file EMIS returns through e-mail. This therefore compels all school principals to utilize e-mail, thus narrowing the variability. While on the other hand, absence of a policy framework for utilization of SMS and website in communication has resulted in different utilization levels between sub county, county and national public secondary schools, thus bringing about great variability.

4.6 Significance of Difference Analysis of Information Systems Specific Utilization on Communication by Principals

This study sought to conduct analysis of variance to establish the significance of difference of specific IS utilization on the management of finance in sub county, county and national public secondary schools. The results are illustrated on Table 4.3.

Table 4.3 Significance of Difference Analysis of Information Systems Specific Utilization on Management of Communication by Principals

Variable	IS utilization	SSB	SSW	dfB	dfW	MSB	MSW	**F**	**Sig**
Used for	MIS	51.580	297.170	2	77	25.790	3.888	**6.683**	**.002**
communication	e-mail	40.755	199.245	2	77	20.877	2.588	**7.875**	**.001**
For convening meetings	SMS	59.760	55.760	2	77	29.580	.720	**41.500**	**.000**
For KNEC registration	Web site	7.840	7.360	2	77	3.920	.096	**41.011**	**.000**
Used for obtaining	SMS	53.527	56.160	2	77	26.764	.729	**36.690**	**.000**
information	e-mail	1.246	10.302	2	77	.624	.134	**4.664**	**.012**
Sending EMIS	e-mail	2.640	4.560	2	77	1.320	.059	**22.289**	**.000**
Sending information	e-mail	.637	8.113	2	77	.318	.105	**3.022**	**.000**
	SMS	18.428	23.760	2	77	9.214	.309	**29.859**	**.000**

*. The mean difference is significant at the 0.05 level.

N= 80(sub county- 54, county-24, national-2)

SSB-sum of squares between -sum of squares within, dfB-degrees of freedom between,dfW-dgrees of freedom within, MSB-mean squares between, MSW-mean squares within, F- anova value, sig-significance

In Table 4.3, analysis of variance was conducted to test for significance of differences between MIS, SMS, e-mail, e-learning and website utilization with respect to general communication, convening meetings, obtaining information, sending EMIS, and sending general information between; sub county, county and national public secondary schools in Nyamira County. It was found out that there is a statistical significant difference at p< .002 in MIS utilization on general communication;

MIS, F (2, 77) = 6.683, p< .002 between sub county, county and national public secondary schools. Since p< .002 is less than p< .05, the null hypothesis is rejected: 'There is no significant difference in IS utilization on management of communication between sub county, county and national public secondary schools in Nyamira County, Kenya.' Therefore, the alternative hypothesis is accepted: 'There is a significant difference in IS utilization on management of communication between sub county, county and national public secondary schools in Nyamira County, Kenya.' Thus, the study has found out that MIS is utilized on general communication.

From the F-values; (F=6.683) is small, indicating that there is a small variability in MIS utilization on communication between sub county, county and national public secondary schools in Nyamira County. Therefore the ratio of MIS utilization between sub county, county and national schools does not differ. On the other hand, there is a high variability in MIS utilization within sub county, county and national schools. Therefore, the MIS utilization may have been embraced in a few schools at sub county, county and national schools.

Similarly, there is a significant difference at p< .000 level in SMS utilization on: convening meetings; SMS, F (2, 77) = 41.50, obtaining information, SMS, F (2, 77) = 36.690, and sending information; SMS, F (2, 77) = 29.859, p< .000 between sub county, county and national public secondary schools. Since p< .000 is less than p< .05, the null hypothesis is rejected: 'There is no significant difference in IS utilization on management of communication in public secondary schools in Nyamira County, Kenya.' Therefore, the alternative hypothesis is accepted: 'There is a significant difference in IS utilization on management of communication between sub county, county and national public secondary schools in Nyamira County, Kenya. Thus, the data has revealed that MIS is utilized on convening meetings, obtaining information and sending information in sub county, county and national public secondary schools in Nyamira County, Kenya.

From the F-values (F= 41.5, F = 36.690 and F = 29.859), they indicate that there is an average variability in SMS utilization on convening meetings, obtaining information and sending information between sub county, county and national public secondary schools in Nyamira County. Therefore, the SMS utilization on convening meetings, obtaining information and sending information, has been embraced to different degrees in sub county, county and national schools. On the other hand, SMS utilization on convening meetings, obtaining information and sending information within the sub county, county or national schools shows low or minimal variance.

E-mail utilization shows a significant difference at p< .000 level in utilization on sending EMIS, e-mail, F (2, 77) =22.289, sending information, e-mail, F (2, 77) = 3.022 and on general communication, e-mail, F (2, 77) = 7.875; and at p< .001 on obtaining information e-mail, F (2, 77) = 4.664, p< .012 between sub county, county and national public secondary schools in Nyamira County, Kenya. Since p< .000, p< .001 and p< .012 are less than p< .05, the null hypothesis is rejected: 'There is no significant difference in IS utilization on management of communication between sub county, county and national public secondary schools in Nyamira County, Kenya.' Therefore, the alternative hypothesis is accepted: 'There is a significant difference in IS utilization on management of communication between sub county, county and national public secondary schools in Nyamira County, Kenya. Thus the data has revealed that e-mail is utilized on; sending EMIS, sending general information, for general communication and obtaining information in sub county, county and national public secondary schools in Nyamira County, Kenya. The question how IS are utilized on the management of curriculum implementation and supervision in public secondary

schools in Nyamira County, Kenya is answered. Equally, the 3rd null hypothesis was tested at p< .05 statistical significance levels.
Each of the two principals concurred that e-mail was utilized on; general communication, obtaining information, convening meetings and sending EMIS to TSC headquarters.

Detailed information on the utilization of e-mail was obtained from the in- depth interview of the principals. The explanations given indicate that e-mail is convenient and safe for utilization on sending and obtaining information. The information send through e-mail was said to be secure as it is accessed through use of secret password. The principal 1 in school 1 said that information sent through e-mail reaches the intended destination immediately. The principal further explained that sent information ranges from a few sentences to bulk notes and thus it is a sure method of a one to one communication. Whereas, principal 2 in School 2 does not dispute that, the principal said that the message may not reach the recipient immediately owing to the fact that the recipient may take time to check his or her e-mails. However, they were in agreement that e-mails are secure means of obtaining and sending information.

The two principals on the other hand concurred that e-mail has been very useful in sending EMIS to the TSC headquarters through a network, replacing the ordinary method where hard copies are sent through the post office; a method that takes long to reach the intended destination. Principal 1 in school 1explained that E-mail utilization on sending EMIS returns to TSC headquarters has greatly reduced the time and cost of sending hard copies through the post office thus improving communication efficiency and effectiveness. While principal 2 in school 2echoed the sentiments of Principal 1 in school 1, Principal 2 in school 2 but retaliated that e-mails could also be utilized on sending queries to education headquarters; however, the infrastructure development for its utilization was still low.

From the F-values (F= 22.289 , F = 3.022, F = 7.875 and F =4.664), show that there is a small variability in e-mail utilization on sending EMIS, sending general information, for general communication and obtaining information between sub county, county and national public secondary schools in Nyamira County. Therefore, the e-mail utilization on sending EMIS, sending general information, for general communication and obtaining information utilization between sub county, county and national schools has minimal differences; however its utilization on sending EMIS is slightly more varied. On the other hand e-mail utilization within each sub county, county and national schools varies more. This means that the sub county, county and national schools have not embraced e-mail utilization to the same level.

SMS utilization has a significant difference at p< .000 level on convening meetings, SMS, (2, 77) = 41.500, obtaining information, SMS, (2, 77) = 36.699 and on sending information, SMS, (2, 77) = 29.859 between sub county, county and national public secondary schools in Nyamira County. Since p< .000 less than p< .05, the null hypothesis is rejected: 'There is no significant difference in IS utilization on management of communication between sub county, county and national public secondary schools in Nyamira County, Kenya.' Therefore, the alternative hypothesis is accepted: 'There is a significant difference in IS utilization on management of communication between sub county, county and national public secondary schools in Nyamira County, Kenya. Thus the data has revealed SMS utilized on; convening meetings, obtaining information and sending information in sub-county, county and national public secondary schools in Nyamira County, Kenya.

The detailed information on how SMS is utilized was obtained through the in-depth interview of principals of national public secondary schools. When each of the principals was asked to explain how SMS was utilized for convening meetings, sending and sending information, Principal 1 in school 1 said that SMS was widely used in communicating within and outside the school while, principal 2 in school 2 said that SMS was very convenient in sending information to parents to inform them about general meetings. Principal 2 in school 2 said that; what was needed was to write a short message in the internet connected computer and making a single click, would send bulk messages to all intended parents of the school. Principal 2 in school 2 further explained:
It is a wonderful tool of communication as feedback is given immediately when the parents receive the message. Principal 2 in school 2 further explained that SMS could be used to convene staff meetings, HODs' meetings and urgent meetings in general because it was a quick and effective means of communication. Although, Principal 2 in school 2 said that SMS was the quickest means where feedback was instant; in some instances HODs reported that teachers played ignorance and failed to attend meetings blaming it on message failure.

From the F-values (F= 41.500 , F = 36.699 and F = 29.859), show that there is moderate variation in SMS utilization on convening meetings, obtaining information and sending information between sub county, county and national public secondary schools in Nyamira County. On the other hand, it means that SMS utilization on convening meetings, obtaining information and sending information within each sub county, county and national schools variation is reasonably high. This means that means that each sub county, county and national schools have embraced SMS utilization on convening meetings, obtaining information and sending information at different levels hence the variation.
Website utilization has a significant difference at $p < .000$ level on KNEC registration of KCSE candidates, website (2, 77) = 41.001 between sub county, county and national public secondary schools in Nyamira County. Since $p < .000$ less than $p < .05$, the null hypothesis is rejected: 'There is no significant difference in IS utilization on management of communication between sub county, county and national public secondary schools in Nyamira County, Kenya.' Therefore, the alternative hypothesis is accepted: 'There is a significant difference in IS utilization on management of communication between sub county, county and national public secondary schools in Nyamira County, Kenya. Thus the data has revealed that Website is utilized on KNEC registration in sub county, county and national public secondary schools in Nyamira County, Kenya.

When the principals of national public secondary schools were asked to explain how website is utilized, each of the two principals concurred that website was very useful in the registration of KCSE candidates, filing tax returns and as a source of information for research on teaching and learning materials; however, its utilization was hampered by power failures, lack of manipulative skills on the side of principals and HODs and lack of infrastructure such as internet.Principal 1 in school 1 explained:

> The website is the most common and reliable source of information available for students and teachers to search for teaching and learning materials. Any material that a teacher or a student is in need of is found on the website. Kenya National Examination Council (KNEC) utilizes the website for registration of Kenya Certificate of Secondary Education (KCSE) candidates online. It is also used by teachers to file, Kenya Revenue Authority (KRA) tax returns. There is no more queuing at KRA offices or filling hard copy forms. One needs to only visit the KRA website, access the online form and follow instructions as filling proceeds.

From the F-values (F= 41.001), it shows that there is moderate variation in website utilization on KNEC registration between sub county, county and national public secondary schools in Nyamira County. On the other hand, it means that website utilization on KNEC registration within each sub county, county and national schools variation is moderately low.

Post Hoc Multiple Comparisons of Information Systems Specific Utilization on Communication Management by Principals

Post hoc multiple comparisons was done to establish where the differences in IS utilization occurs between sub county, county and national public secondary of Nyamira County. This would indicate where variability in IS utilization occurred.

Table 4.4 Post Hoc Multiple Comparisons of Information Systems Specific Utilization on Communication

Dependent Variable	(I) cat of school	(J) cat of school	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
obt-inf-email	1 Sub county	2 County	**-.264***	.089	**.011**	-.48	-.05
		3 National	**-.264**	.263	**.577**	-.89	.37
	2 County	1 Sub county	**.264***	.089	**.011**	.05	.48
		3 National	**.000**	.269	**1.000**	-.64	.64
	3 National	1 Sub county	**.264**	.263	**.577**	-.37	.89
		2 County	**.000**	.269	**1.000**	-.64	.64
obt-inf- sms	1 Sub county	2 County	**-1.560***	.207	**.000**	-2.06	-1.06
		3 National	**-3.000***	.615	**.000**	-4.47	-1.53
	2 County	1 Sub county	**1.560***	.207	**.000**	1.06	2.06
		3 National	**-1.440**	.628	**.063**	-2.94	.06
	3 National	1 Sub county	**3.000***	.615	**.000**	1.53	4.47
		2 County	**1.440**	.628	**.063**	-.06	2.94
snd-inf- sms	1 Sub county	2 County	**-.360***	.135	**.025**	-.68	-.04
		3 National	**-3.000***	.400	**.000**	-3.96	-2.04
	2 County	1 Sub county	**.360***	.135	**.025**	.04	.68
		3 National	**-2.640***	.408	**.000**	-3.62	-1.66
	3 National	1 Sub county	**3.000***	.400	**.000**	2.04	3.96
		2 County	**2.640***	.408	**.000**	1.66	3.62
snd-inf- email	1 Sub county	2 County	**-.189***	.079	**.049**	-.38	.00
		3 National	**-.189**	.234	**.700**	-.75	.37
	2 County	1 Sub county	**.189***	.079	**.049**	.00	.38
		3 National	**.000**	.239	**1.000**	-.57	.57
	3 National	1 Sub county	**.189**	.234	**.700**	-.37	.75
		2 County	**.000**	.239	**1.000**	-.57	.57
reg knec-web	1 Sub county	2 County	**-.160**	.075	**.090**	-.34	.02
		3 National	**-2.000***	.223	**.000**	-2.53	-1.47
	2 County	1 Sub county	**.160**	.075	**.090**	-.02	.34
		3 National	**-1.840***	.227	**.000**	-2.38	-1.30
	3 National	1 Sub county	**2.000***	.223	**.000**	1.47	2.53
		2 County	**1.840***	.227	**.000**	1.30	2.38

*. The mean difference is significant at the 0.05 level.

obt-inf-email-obtaining information using e-mail, obt-inf- sms-obtaining information using sms, snd-inf- sms- sending information using sms, snd-inf- email- sending information using e-mail, reg knec-web-registering in KNEC using website

Information Systems utilization on communication cannot be ignored especially during this period of global digitalization. The data in Table 4.4, show that there is a significant difference at p< .011 and at p< .049 level in utilization of e-mail on obtaining and sending information between sub county and county public secondary schools of Nyamira County, with mean differences of; -.264 and -.189 respectively. Since p-value p< .011 and p< .049 are less than p< .05, the null hypothesis is rejected: 'There is no significant difference inIS utilization on management of communication between sub county and county; sub county and national public secondary schools in Nyamira County, Kenya.' Therefore, the alternative hypothesis is accepted: 'There is a significant difference in IS utilization on management of communication between sub county, county and national public secondary schools in Nyamira County, Kenya. Thus the data has revealed that there is a variance in e-mail utilization on obtaining and sending information between; sub county, county and national public secondary schools in Nyamira County, Kenya. A negative mean difference of-.264 and -.189 in its utilization is lower at sub-county compared to county public secondary schools. Therefore county schools have adopted the utilization because they have better capital resources for the acquisition of the necessary infrastructure.

Contrastingly, the data shows that there is no significant difference at p< .577 and p< 1.000 in e-mail utilization on obtaining and sending information between sub county and national; and county and national public secondary schools in Nyamira County respectively. Therefore, since p< .577 and p< 1.000 are greater than p< .05, the null hypothesis is not rejected: 'There is no significant difference in IS utilization on management of communication between sub county, county and national public secondary schools in Nyamira County, Kenya.' Thus, the findings show that the utilization of e-mail on obtaining and sending information between sub county and national public secondary schools does not vary. This argument can be attributed to the fact that sub county schools are striving to supplement the shortages in materials using information systems, while the national schools are trying to improve their effectiveness and efficiency through information systems.

In modern communication, SMS is the most common form of communication in all sectors of society. The data from the table indicate that there is a significant difference at p< .000 and p< .025 level in SMS utilization on obtaining and sending information between sub county and county public secondary schools of Nyamira County with mean differences of; -1.560 and -.360 respectively. Equally, the mean difference for SMS utilization on obtaining and sending information between sub county and national schools is -3.000 and between county and national schools is -1.440 respectively. This shows that SMS utilization is less at sub county and county schools when compared to national schools. This means that principals in sub county schools are not using SMS for obtaining and sending information as much as the county schools; and county schools are not using SMS for obtaining and sending information as much as the national schools do. Since p< .000 and p< .025 are less than p< .05, the null hypothesis is rejected: 'There is no significant difference in IS utilization on management of communication between sub county, county and national public secondary schools in Nyamira County, Kenya.' Therefore, the alternative hypothesis is accepted: 'There is a significant difference in IS utilization on management of communication between sub county, county and national public secondary schools in Nyamira County, Kenya. Thus the data has revealed that there is a variance in e-mail utilization on obtaining and sending information between; sub county, county and national public secondary

schools in Nyamira County, Kenya. Thus, the data in table 4.27 supports the argument that SMS utilization by principals is low in sub county schools which are smaller in size hence there is more physical contact between the principal and other workers enabling one on one communication, as compared to county and national schools that are large making, thus reducing physical contact and one on one communication in that order.

Contrastingly, the data shows that there is no significant difference at p< .063 in SMS utilization on obtaining information, between county and national public secondary schools in Nyamira County. Therefore, since p< .063 is greater than p< .05, the null hypothesis is not rejected: 'There is no significant difference in IS utilization on management of communication between sub county, county and national public secondary schools in Nyamira County, Kenya.' Thus, the findings show that the utilization of SMS on obtaining information between county and national public secondary schools does not vary. These two categories of schools have almost similar structures in their administrative organization therefore the utilization of SMS in obtaining information from the various departments does not vary.

The requirement by the KNEC body, that each school register the KCSE candidates online; using KNEC website, has revitalized the services offered by the body. The data in the table above show that Website utilization has a significant difference at p< .000 levels in registering KNEC candidates with a mean difference of -.160 between sub county and county,-2.000 between sub county and national; and -1.840 between county and national public secondary schools. Since p< .000 is less than p< .05, the null hypothesis is rejected: 'There is no significant difference in IS utilization on management of communication between sub county, county and national public secondary schools in Nyamira County, Kenya.' Therefore, the alternative hypothesis is accepted: 'There is a significant difference in IS utilization on management of communication between sub county, county and national public secondary schools in Nyamira County, Kenya.' Thus the data has revealed that website utilization on registering KNEC candidates is low at sub county schools compared to county and national; and county compared to national public secondary schools in Nyamira County, Kenya. This means that principals in sub county schools mostly use technicians at cyber cafes for KNEC registration of their candidates because of inadequate IS facilities at school. Quite a number of their counterparts in county schools also do the same as supported by the small mean difference of -.160 between sub county and county schools. This practice reduces confidentiality of school documents because of exposure to non-professional cyber cafes staff. Therefore, schools ought to embrace IS utilization at school level in order to uphold quality education.

Contrastingly, the data shows that there is no significant difference at p< .090 level in website utilization on KNEC registration between sub county and county public secondary schools in Nyamira County. Therefore, since the p< .090 is greater than p< .05, the null hypothesis is rejected: 'There is no significant difference in IS utilization on management of communication between sub county, county and national public secondary schools in Nyamira County, Kenya.' Thus, the findings show that the utilization of website on KNEC registration between sub county and county public secondary schools does not vary owing to the inadequate IS facilities and manipulation skills of the principals. Although it is a requirement by KNEC that schools register their candidates online from school, the practice has not been successful. This is because a good number of sub county and county schools lack adequate facilities such computers, electricity and internet which are pre-requisite for IS utilization. As such utilizing cyber cafes denies them the practice of the

skills and knowledge necessary for adoption of IS leading to low level IS utilization by principals of sub county and county public secondary schools.

Table 4.5 Post Hoc Multiple Comparisons of Information Systems Specific Utilization on Communication Continued

Dependent Variable	(I) cat of school	(J) cat of school	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
snd-kra web	1 Sub county	2 County	**-.240***	.090	**.025**	-.45	-.03
		3 National	**-2.000***	.267	**.000**	-2.64	-1.36
	2 County	1 Sub county	**.240***	.090	**.025**	.03	.45
		3 National	**-1.760***	.272	**.000**	-2.41	-1.11
	3 National	1 Sub county	**2.000***	.267	**.000**	1.36	2.64
		2 County	**1.760***	.272	**.000**	1.11	2.41
snd-emis-email	1 Sub county	2 County	**-.240***	.059	**.000**	-.38	-.10
		3 National	**-1.000***	.175	**.000**	-1.42	-.58
	2 County	1 Sub county	**.240***	.059	**.000**	.10	.38
		3 National	**-.760***	.179	**.000**	-1.19	-.33
	3 National	1 Sub county	**1.000***	.175	**.000**	.58	1.42
		2 County	**.760***	.179	**.000**	.33	1.19

snd-kra web- sending kra returns using website, snd-emis-email- sending EMIS – using e-mail

The utilization of IS on KRA and EMIS returns in Table 4.5, show that there is a significant difference at p< .025 level in utilization of website on filing and sending KRA returns with a mean difference of -.240 between sub county and county; and .240 between county and sub county: and at p< .000 level in utilization of e-mail on sending EMIS with a mean difference of -2.000 between sub county and national; and -1.760 between county and national schools. Since p< .025 and p< .000 are less than p< .05, the null hypothesis is rejected: 'There is no significant difference in IS utilization on management of communication between sub county, county and national public secondary schools in Nyamira County, Kenya.' Therefore, the alternative hypothesis is accepted: 'There is a significant difference in IS utilization on management of communication between sub county, county and national public secondary schools in Nyamira County, Kenya.' Thus, the data reveals that website utilization on filing and sending KRA returns with a mean difference of -.240 between sub county and county; and e-mail utilization on sending EMIS with a mean difference of -2.000 between sub county and national; and -1.760 between county and national schools, is low. The low utilization of website and e-mail among principals of sub county secondary schools is attributed to the inadequate skills and resources necessary for the IS adoption. This therefore means that these services are not offered to most sub county and county schools and as a result the principals seek these services from cyber cafes which are at a distance. Overall, there is a lot time wasted in the process of seeking for these services leading to poor quality of education.

This study established that SMS, website and E-mail are utilized by principals in the process of communication in the day to day running of the schools. However, the principals, in addition to SMS, website and e-mail, utilized MIS. It was established that SMS was mostly used in sending and obtaining information and for convening meetings. In addition to utilization on general school communication; e-mails used for sending EMIS to the Teachers Service Commission (TSC). These findings were contrary to the study of Mostosto, Namasaka and Odero (2013) that indicated

Masinde Murilo University of Science and Technology (MMUST) relied on HODs verbal communication, group representations, memos, notice boards, face to face and telephones for its communication. Whereas the website has provided fast, efficient and effective means of candidate registration for KNEC, Odero and Oroko, (2013), argue that it reduces multiple registration and impersonation cases in KCSE examinations in Kenya.

Odhiambo (2005) argued that principals used school assemblies, staff meetings, HODs as information carriers, memos, staff reports and consultations to communicate within the schools. However, it was noted that these channels are prone to distortion due to language barrier and absenteeism on the part of the recipients. This gap can be bridged by IS utilization such as MIS, E-mail, website and SMS which provide efficient and effective means not prone to distortion.
The study found from both HODs and principals, that SMS was utilized in sending and receiving information, and for convening meetings but as reported by Clarke (2015), in Newzealand, most schools use SMS to send achievement data of student to parents. While in Tanzania, it is used to send Education Management Information Systems (EMIS) and statistical data to the Ministry of Education and vocational training (MoEVT) .These studies agree with the present findings to the extent that SMS has a wide application in the management of Education, hence its utilization in the management of public secondary schools in Nyamira county, could bring effective and efficient service delivery.

Utilization of website in management of public secondary schools in Nyamira County was found to affect KNEC KCSE registration and filing of KRA returns, obtaining information, covering meetings and sending EMIS to TSC. This study agrees on part to that carried out by Sunday and Oni (2012), in Nigeria which found that school administration used E-mail to send and receive bulk information to and from parents and other stakeholders. This information could be mainly on students, staff and materials from the government and other agencies.

Where there is efficient and effective communication, information is received and sent on time; thus facilitating decision making. This would mean that vital information is passed to the ministry of education, TSC and the youth in schools on time; enabling them to participate in national issues. This would ensure that the graduates are well informed about national activities to be able to participate in nation building.

5.0 Conclusion

The study has established that there is a positive relationship between IS utilization and management of fee collection problem, lesson attendance by teachers and students, timetable, examination analysis, lesson delivery in class, and cost of communication. Information Systems have significantly improved; fee collection problem, number of lessons missed by teachers and students, number of days taken to analyze examinations, number of days taken to make timetable and the cost of communication between the school and education headquarters: thereby, improving service delivery leading to achievement of school set goals.

6.0 Recommendations

This study recommends the following;

i. All schools should be connected with electricity to enable them install computers in schools.
ii. The government of Kenya should provide internet connectivity to schools to enable them utilize information systems as a way of enhancing management efficiency.

iii. Every secondary school in Kenya should embrace IS utilization in order to overcome management challenges facing secondary school principals, as this study indicates, that fee collection problem, fraud, money loss and wastage of time can greatly be reduced from IS utilization.

iv. A policy framework should be developed to guide IS utilization development for all schools for them to experience fair and professional IS utilization and implementation.

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Influence of Selection on Academic Staff Retention in Universities in Kenya

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Abstract
Kenyan universities are operating in a highly competitive environment where supply of qualified academic staff is in deficit. One of the challenges these universities face is academic staff retention. This study sought to establish the influence of selection practices on academic staff retention in Universities in Kenya. The study was conducted in four public and four private universities and data was collected between the period June to September, 2016. The literature was reviewed as per the study objective. The study used mixed method research design. The target population was 2,768 academic staff from 8 (4 public and 4 private) universities. The sample size of 284 (276 departmental academic staff plus 8 (HR) registrars) was drawn. Data was collected using questionnaires and interview schedule.A validity index of 0.80 was obtained. Reliability of the questionnaires was measured and calculated using Cronbach's alpha and a correlation coefficient of 0.84 was achieved .Descriptive and inferential statistics were used to present data. Pearson correlation on commitment as a moderating variable was done and results showed that commitment affected selection practices significantly with the Pearson's correlation of 0.4000 and p-value of 0.000. Additionally, commitment did not affect retention significantly with a correlation of 0.021 and p-value of 0.764. The findings of the study revealed that selection practices had an influence on academic staff retention in universities with a frequency of 131 and a percentage of 64.8 %.The overall conclusion of this study is that selection practices had significance influence on academic staff retention in universities in Kenya. The study recommended that universities should review their practices on selection so as to help them to achieve and enhance academic staff retention.

Key Words: *Academic staff, Retention, Selection*

1.0 Introduction

Human Resource Management refers to the process of attracting, hiring, training, motivating and maintaining employees in an organization. Human resource management practices refer to organizational activities directed at managing the pool of human resources and ensuring that the resources are employed towards the fulfillment of organizational goals (Ng'ethe, 2012).Organizations practice HRM in order to attract and develop human capital. Human capital is the process that relate to training, education and other professional initiatives in order to increase the levels of knowledge, skills, abilities, values, and social assets of an employee which will lead to the employee's satisfaction and performance, and eventually on organizational performance. In Higher Education Institutions, HRM is one of the main functions that is normally undertaken because one of the core functions of HEIs is training and developing human resources. In the current global market, organizations are composed of competitors, regardless of their nature. To develop a competitive advantage, it is important that HEIs truly leverage on the workforce as a competitive weapon. A lot of emphasis of 'good' employment practices has however been placed on strategies towards retaining staff, (Hutchings and Burke 2006).

According to this study, selection is defined as the process by which specific instruments are engaged to choose from the pool of individuals most suitable for the job available (Ofori & Aryeetey, 2011). Selection involves the use of one or more methods to assess an applicant's

suitability in order to make the correct selection decision and can be alternatively seen as a process of rejection as it rejects a number of applicants and select only a few applicants to fill the vacancy. Thus, selection function may be a negative function rather than a positive function (Gamage, 2014). It is perceived that the university that selects high quality employees gets substantial benefits, which recur every year the employee is on the payroll. On the other hand, poor selection decisions can cause irreversible damage. It is often claimed that selection of workers occurs not just to replace departing employees or add to a workforce but rather aims to put in place workers who can perform at a high level and demonstrate commitment (Ballantyne, 2009).

Research undertaken on recruitment and selection practices include, Njine (2006) who did a study on 'employee recruitment and selection practices at nongovernmental organizations operating in Kenya' who concluded that there is need to have variety of recruitment and selection practices. Mugao (2004) who did a study on' recruitment and selection practices of pilots among commercial aviation firms in Kenya,' observed that Kenya Aviation firms do not have an elaborate Human Resource department to foresee recruitment and selection. Kagwaini (2008) did a survey of 'recruitment and selection practices among SMEs in Nairobi' and concluded that more human resources management skills and expertise are required to handle recruitment and selection. However, from the above literature reviewed, it is discovered that most studies have been done on staff selection and organizational performance and minimal studies have been done on the influence of selection practices on academic staff retention in universities in Kenya. This study therefore, intended to fill this research gap.

2.0 Methodology

Mixed methods research design was used which represents more of an approach to examining a research problem than a methodology. Mixed method is characterized by a focus on research problems that require, an examination of real-life contextual understandings, multi-level perspectives, and cultural influences; an intentional application of rigorous quantitative research assessing magnitude and frequency of constructs and rigorous qualitative research exploring the meaning and understanding of the constructs; and, an objective of drawing on the strengths of quantitative and qualitative data gathering techniques to formulate a holistic interpretive framework for generating possible solutions or new understandings of the problem, Creswell and Tashakkori (2007).The design enabled the researcher to combine both quantitative and qualitative research approaches. Qualitative approaches enabled collection of data in form of words rather than numbers. Simiyu (2012) observed that while qualitative approach underscores details, quantitative approach strives for precision by focusing on items that can be counted into predetermined categories and subjected to statistical analysis.

In this research, the study was done in eight purposively sampled universities in Kenya, namely: Masinde Muliro University of Science and Technology (MMUST); Kenyatta University (KU); Technical University of Mombasa (TUM); University of Kabianga (UoK);Catholic University of Eastern Africa (CUEA);University of Eastern Africa, Baraton (UAEB);Great Lakes University, Kisumu (GLUK) and Kabarak University (KBU).Four public and four private universities were purposively sampled with regard to their duration of existence since inception and their location; MMUST , KU (public universities) and CUEA,UAEB (private universities) have been in existence for over ten years and TUM,UoK (public universities),GLUK, Kabarak (private universities) have been in existence for less than ten years.(CUE,2015). The target population was 2,768 teaching staff from 8 (4 public and 4 private) universities out of the 67 public and private universities in Kenya listed by Commission for University Education, (CUE, 2015). The target respondents included all

the academic staff members and Registrars (HR) in the eight (8) purposively sampled public and private universities in Kenya which is in the approved range of 10% to 30% of the total population, Mugenda and Mugenda (2003).Stratified random sampling was used to choose the eight (8) universities from which the sample population was drawn and the census method was used to choose the Registrars (HR). The sample size of 284 (276 departmental academic staff plus 8 Registrars HR) was drawn as at August 2015. Sample Proportional to the Size (SPS) of academic staff in each of the selected universities and census were employed respectively

Questionnaires were used to collect data from the academic staff and interview schedules were used to collect data from Registrars in charge of Human Resources. This study used internal and external validity. To achieve internal and external validity, questionnaires and interview schedules for HROs were used, and then triangulation was used to determine validity of the results. A validity index of 0.80 was obtained which is more than .70 the least accepted value of validity in survey research (Amin 2005). Data reliability was measured using Cronbach's apha coefficient which ranges between 0 and 1 (Kipkebut,2010).A correlation coefficient of 0.87 was achieved and was considered sufficient for yielding consistent results for the study. Data collected from the field was coded and analyzed using computer supported software to adduce descriptive statistics, Pearson Correlation, Multiple regression analysis and ANOVA to produce results as per the study objective.

3.0 Findings and Discussions

3.1 Respondents' Profile

The section presents data on the response rate and distribution of respondents by gender in the eight sampled universities in Kenya.

Table 3.1: Response rate in the Eight Universities under the study

ersity	onnaires	nnaires	
MMUST	32	28	87.5%
KU	150	81	54%
TUM	23	22	95.6%
UoK	14	14	100%
CUEA	22	21	95.4%
UAEB	15	15	100%
KBU	13	13	100%
GLUK	9	8	88.8%
Total	**278**	**202**	**72.2%**

Source: Research Data, 2016

As indicated in table 3.1, the highest number of respondents were received from Kenyatta University with 40.0% (81), followed by MMUST 13.8 %(28), then TUM 10.8 % (22), CUEA 10.3% (21), UEAB had 7.4% (15), UoK about 6.9% (14) , KBU had 6.4% (13) and GLUK 3.9% (8).This reflects the population of the academic staff in each of the universities (Sample Proportional to Size) with Kenyatta University having the highest number of academic staff since it is the largest and the oldest among the public universities in the study sample. GLUK had the least number of respondents due to its size and the nature of the programmes it offers.

Table 3.2: Gender representation in public and private universities

Type of University	Male	Female	Total
Public	69 (47.6%)	76 (52.4%)	145 (100.0%)
Private	32(56.1%)	25 (43.9%)	57 (100.0%)
Total	101 (50%)	101 (50%)	202

Source: Research Data, 2016

Out of the 202 respondents 69 (47.6%) males were from the public universities under the study, 76 (52.4%) were female and 32 (56.1%) were male and 25 (43.9%) were female from the sampled private universities as provided in Table 3.2. This indicates that generally there were more female respondents from the sampled public universities in comparison to the male respondents and more male respondents from private universities in comparison to the female respondents. This indicates the wide discrepancy between male and females in employment of this cadre of staff in the public and private universities. Concerted efforts have to be put in place to encourage female enrolment in postgraduate programmes in private universities, support them to stay in those programmes, ensure that they are able to complete their programmes successfully, and to mentor them to pursue academic careers. These efforts will lead to growth in the numbers of female staff who can then serve as role models and mentors for subsequent generations of female students and help them sustain their careers when they become academics.

3.2 Selection practices on academic staff retention in Universities in Kenya

This section gives results and discussions of the second objective which was to establish the Influence of selection practices on academic staff retention in Universities in Kenya as follows:

Table 3.3: Influence of selection practices on academic staff retention in Universities in Kenya

Selection Practices	Type of University	SA	A	NA/ DA	DA	SDA
Academic departments are normally involved in the shortlisting exercise	Public	27 (18.6%)	34 (23.4%)	29 (20.0%)	29 (20.0%)	26 (17.9%)
	Private	17 (29.8%)	22 (38.6%)	12 (21.1%)	6 (10.5%)	0 (00.0%)
	Total	44 (21.8%)	56 (27.7%)	41 (20.3%)	35 (17.3%)	26 (12.9%)
The departments normally help the HR department in developing the shortlisting criteria	Public	22 (15.2%)	47 (32.4%)	20 (13.8%)	30 (20.7%)	26 (17.9%)
	Private	17 (29.8%)	28 (49.1%)	12 (21.1%)	0 (00.0%)	0 (00.0%)
	Total	39 (19.3%)	75 (37.1%)	32 (15.8%)	30 (14.9%)	26 (12.9%)
Interviewing exercise does not involve any member of the department	Public	12 (8.3%)	15 (10.3%)	41 (28.3%)	42 (29.0%)	35 (24.1%)
	Private	0 (00.0%)	0 (00.0%)	0 (00.0%)	24 (42.1%)	33 (57.9%)
	Total	12 (5.9%)	15 (7.4%)	41 (20.3%)	66 (32.7%)	68 (33.7%)
There are many types of interviews that are normally carried out to determine the best candidate	Public	5 (3.4%)	26 (17.9%)	56 (38.6%)	25 (17.2%)	33 (22.8%)
	Private	6 (10.5%)	0 (00.0%)	6 (10.5%)	24 (42.1%)	21 (36.8%)
	Total	11 (5.4%)	26 (12.9%)	62 (30.7%)	49 (24.3%)	54 (26.7%)
The chair of the department has a say in who to be employed for their respective departments	Public	17 (11.7%)	21 (14.5%)	19 (13.1%)	63 (43.4%)	25 (17.2%)
	Private	27 (47.4%)	24 (42.1%)	6 (10.5%)	0 (0.0%)	0 (00.0%)
	Total	44 (21.8%)	45 (22.3%)	25 (12.4%)	63 (31.2%)	25 (12.4%)
The CoD normally orients new staff to the department and the university	Public	21 (14.5%)	46 (31.7%)	32 (22.1%)	36 (24.8%)	10 (6.9%)
	Private	39 (68.4%)	12 (21.1%)	6 (10.5%)	0 (0.0%)	0 (00.0%)
	Total	60 (29.7%)	58 (28.7%)	38 (18.8%)	36 (17.8%)	10 (5.0%)
When new staffs report they are normally oriented to the university by the HR department	Public	13 (9.0%)	28 (19.3%)	52 (35.9%)	32 (22.1%)	20 (13.8%)
	Private	27 (47.4%)	24 (42.1%)	0 (0.00%)	6 (10.5%)	0 (00.0%)
	Total	40 (19.8%)	52 (25.7%)	52 (25.7%)	38 (18.8%)	20 (9.9%)
Academic staff are normally placed correctly in the departments	Public	25 (17.2%)	33 (22.8%)	25 (17.2%)	30 (20.7%)	32 (22.1%)
	Private	27 (47.4%)	24 (42.1%)	0 (0.00%)	6 (10.5%)	0 (00.0%)
	Total	52 (25.7%)	57 (28.2%)	25 (12.4%)	36 (17.8%)	32 (15.8%)
Academic staff have offices in which they work from	Public	4 (2.8%)	23 (15.9%)	50 (34.5%)	39 (26.9%)	29 (20.0%)
	Private	27 (47.4%)	18 (31.6%)	6 (10.5%)	6 (10.5%)	0 (00.0%)
	Total	31 (15.3%)	41 (20.3%)	56 (27.7%)	45 (22.3%)	29 (14.4%)

Source: Research Data, 2016

Table 3.3 show results of the selection practices; the first question was on whether Academic departments are normally involved in the shortlisting exercise, the following were the responses from public and private universities respectively; 27 (18.6 %),17 (29.8 %) strongly agreed, 34 (23.4%),22 (38.6%) agreed, 29 (20.0%),12 (21.1%) neither agreed or disagreed, 29 (20.0%),6 (10.5%)

disagreed and 26 (17.9%),0 (00.0%) strongly disagreed. From these results majority of the respondents from public and private universities 61 (42.0%),39 (68.4%) agreed respectively. These findings reiterate the fact that since the recruitment exercise normally stems from the user department, then it follows that the CoD is involved in the selection exercise. Both public and private universities CoDs are normally involved in the academic staff shortlisting exercise in order to guide the rest of the members of the shortlisting committee on the relevant skills required by the job holder.On being asked whether the departments normally help the HR department in developing the shortlisting marking scheme, the following were the responses from public and private universities respectively; 22 (15.2 %),17 (29.8 %)strongly agreed, 47 (32.4%),28 (49.1%) agreed, 20 (13.8%),12 (21.1%) neither agreed or disagreed, 30 (20.7%),0 (00.0%) disagreed and 26 (17.9%),0 (00.0%) strongly disagreed. From these results majority of the respondents from public and private universities 69 (47.6%), 45 (78.9%) agreed respectively. The findings are in agreement with the fact that the CoDs were normally involved in the development of the shortlisting marking scheme since the marking scheme is normally developed as per the advertisement.

On being asked whether the interviewing exercise does not involve any member of the department, the following were the responses from public and private universities ; 12 (8.3 %),0 (00.0 %)strongly agreed, 15 (10.3%),0 (00.0%) agreed, 41 (28.3%),0 (00.0%) neither agreed or disagreed, 42 (29.0%),24 (42.1%) disagreed and 35 (24.1%), 33 (57.9%) strongly disagreed. From these results majority of the respondents from public and private universities 77 (53.1%),57 (100.0%) disagreed respectively. Since the CoD is normally involved in requisitioning of the required academic staff in his/her department then he/she must be involved in the interviewing exercise since he/she is the key determinant on the kind of academic staff required by the department.On being asked whether there are many types of interviews normally carried out to determine the best candidate, the following were the responses from public and private universities respectively ; 5 (3.4 %),6 (10.5 %)strongly agreed, 26 (17.9%),0 (00.0%) agreed, 56 (38.6%),6 (10.5%) neither agreed or disagreed, 25 (17.2%),24 (42.1%) disagreed and 33 (22.8%), 21 (36.8%) strongly disagreed. From these results majority of the respondents from public and private universities 58 (40.0%), 45 (78.9%) disagreed respectively. The findings showed that both public and private universities use only one type of interviewing method. This could be because the method has been used over time and proven to be the best for this cadre of staff.

On being asked whether the CoD has a say on who to be employed in their respective departments, the following were the responses from public and private universities respectively ; 17 (11.7 %),27 (47.4 %)strongly agreed, 21 (14.5%),24 (42.1%) agreed, 19 (13.1%),6 (10.5%) neither agreed or disagreed, 63 (43.4%),0 (0.00%) disagreed and 25 (17.2%), 0 (0.00%) strongly disagreed. From the results majority of the respondents 88 (60.6%) disagreed from public universities and 51 (89.5%) agreed from private universities. The findings from public universities were negative since the new entrants are employed as per the CUE guidelines, so if the views of the CoD are at variance then they will not be followed while in private universities, the CoD has a say since the CUE guidelines are normally customized to suit their needs as at the time of staff selection.Findings on whether the CoD normally orients the new staff to the department and the university as a whole from public and private universities were;21(14.5%),39 (68.4%) strongly agreed,46 (31.7%),12 (21.1%) agreed,32 (22.1%),6 (10.5%) neither agreed or disagreed,36 (24.8%),0 (0.00%) disagreed and 10 (6.9%),0 (00.0%) strongly disagreed respectively. Majority of the respondents from public and private universities 67 (46.2%), 51 (89.5%) agreed respectively. This practice is common in public and private universities. When the right people are hired, it is important that they work in a favorable work environment so that they are able to increase the

output of the organization. Gupta (2002) agrees with the findings of this study by asserting that, if workers are mentally assured that they are operating under safe working conditions, their morale will be high and they will work with more consideration and thus productivity will increase. Another way to increase productivity is when the staff is given a clear job description on the first day that he/she is hired. Stahl, *et.al.* (2007) says that institutions can improve productivity by giving employees clear and specific descriptions of their job, roles, responsibilities, performance, performance expectation and job requirements.

Findings on when new staff report are normally oriented to the university and to the departments by the HR department from public and private universities were;13(9.0%),27 (47.4%) strongly agreed,28 (19.3%),24 (42.1%) agreed,52 (35.9%),0 (0.00%) neither agreed or disagreed,32 (22.1%),6 (10.5%) disagreed and 20 (13.8%),0 (00.0%) strongly disagreed respectively. Majority of the respondents from public and private universities 52 (35.9%), 51 (89.5%) agreed respectively and 52 (35.9%) respondents from public universities neither agreed nor disagreed. The findings from public universities show that respondents were not sure whether the orientation was normally done by the HR department or not while respondents from private universities were sure that the HR department normally carried out the function. Communication of relevant information to one's job is very critical since they will be in a better position to understand the institution in which they work in and therefore increase their retention level.
Findings on whether academic staffs are normally placed correctly in the departments from public and private universities were;25(17.2%),27 (47.4%) strongly agreed,33 (22.8%),24 (42.1%) agreed,25 (17.2%),0 (0.00%) neither agreed or disagreed,30 (20.7%),6 (10.5%) disagreed and 32 (22.1%),0 (00.0%) strongly disagreed respectively. Majority of the respondents from both public and private universities 62 (42.8%), 51 (89.5%) agreed respectively. These results are in agreement that private and public universities follow the CUE guidelines on staff selection leading to the correct placement of the new hires'.

Findings on whether academic staffs are normally provided with offices from public and private universities were;4(2.8%),27 (47.4%) strongly agreed,23 (15.9%),18 (31.6%) agreed,50 (34.5%),6 (10.5%) neither agreed or disagreed,39 (26.9%),6 (10.5%) disagreed and 29 (20.0%),0 (00.0%) strongly disagreed respectively. Majority of the respondents from public universities 68 (46.9%), disagreed and majority of respondents from private universities 45 (79%) agreed. The findings show that most academic staffs in private universities are provided with offices while their counterparts from public universities do not have offices. Physical infrastructure in public universities is a major problem. Most academic staffs operate from their vehicles or common rooms within the universities making it difficult for students to access their lecturers for consultation. Lack of offices has also made most academic staffs to only report for duty when they have lectures thus reducing their commitment level in the institutions in which they work.
As evidenced in strategic plans and brochures, public universities have concentrated all their resources in catering for the student's welfare which includes construction of learning facilities forgetting the employee's needs. The rise of many universities to meet the need of the university education in Kenya has also affected the provision of offices for the academic staffs since students have been given priority in terms of catering for their physical infrastructure and equipment. The service provider (academic staff) has to find their own way of working in terms of finding where to work from and equipment for use within the public universities in Kenya.

From the qualitative data on whether failure to involve the CoD in the selection of academic staff to his/her department was one of the major reasons why academic staffs left universities for

employment elsewhere reiterated that that was one of the major reasons. The responses indicated that failure to regard the CoD as the key stakeholder would make them not to receive the new entrants well. Further, it was stated that CoDs should always be the source of the requisition for new staffs in their respective departments. In public universities, the respondents stated that that lack of involvement of the CoD in academic staff selection was one of the reasons why staffs left but it was not major. This was because CoDs in public universities engage more in academic oriented roles than administrative roles. This is because of the large numbers of students in comparison to the lean academic staff population in the public universities. The CoDs in public universities are involved more in curriculum development and review, course allocation, playing the roles of academic advisors and internal chief examiner, managing the staffs and students in their departments among other duties. These multiple roles culminate in work overload not commensurate to the remuneration paid thus demotivating the CoDs and thus reducing their intention to stay long in the university.

The development of a selection programme is a formidable task when dealing with the measurement issues. It becomes even more complex when the legal policies are added that must be considered. These policies influence the records that must be kept on all employment decisions, the determination of fair treatment of all applicants, and the methods for identifying the job relatedness of selection devices, Barrick et al. (2011). Conversely, if the organization does not attend to these legal policies in the development and use of selection programmes, it will be vulnerable to charges of discrimination. It is imperative that the HR specialist has a thorough understanding of the legal guidelines for selection decisions. Furthermore, every selection programme should have two objectives, firstly, maximizing the probability of making accurate selection decisions about applicants, and secondly, ensuring that these selection decisions are carried out in such a manner as to minimize the chance of a judgment of unfair discrimination being made against the organization, Barrick et al. (2011). The two are not mutually exclusive objectives and overlap considerably in necessary procedures and data. HR professionals are the key individuals within organizations who must develop and enforce policies and procedures that protect members of the diversified workforce against unfair discrimination. The various legislative acts that apply to recruitment and selection must be understood in detail by HR administrators and any other staff involved in the recruitment and selection exercise.

Contrarily, results from interviews on whether or not involving the CoD in the academic staff selection exercise contributed to the staff leaving, showed that CoDs were always involved in the selection process but since the job requirements are as stipulated by CUE it compels CoDs to comply. On promotion, teaching experience is not regarded as key before an academic staff is promoted but possessing a PhD, publications in refereed journals and attraction of funds to the institution are the major requirements that an academic staff should meet before being considered for promotion to a higher level. The interview results reiterated that CUE requirements on employment of staff had made it difficult for the academic staffs to be selected and retained within the same universities for a long time. This was because some universities customize the CUE requirements to meet their specific needs. Therefore, it is at the jurisdiction of an individual university to determine how they select their staffs in the various academic positions therefore contributing to reduced or increased academic staff retention.

3.3 Multiple Regression Analysis

Table 3.4: Regression Results for Selection Practices

Model Summary

type of university	Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
public	1	.343[a]	.117	.111	4.314
private	1	.613[a]	.376	.365	1.806

a. Predictors: (Constant), Staff selection

ANOVA[a]

type of university	Model		Sum of Squares	df	Mean Square	F	Sig.
public	1	Regression	354.096	1	354.096	19.024	.000[b]
		Residual	2661.669	143	18.613		
		Total	3015.766	144			
private	1	Regression	108.169	1	108.169	33.180	.000[b]
		Residual	179.304	55	3.260		
		Total	287.474	56			

a. Dependent Variable: staff retention

b. Predictors: (Constant), Staff selection

Coefficients[a]

type of university	Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
			B	Std. Error	Beta		
public	1	(Constant)	7.423	1.400		5.303	.000
		Staff selection	.206	.047	.343	4.362	.000
private	1	(Constant)	25.068	1.214		20.645	.000
		Staff selection	-.328	.057	-.613	-5.760	.000

a. Dependent Variable: staff retention

Source: Research data, 2016

From the results presented in Table 3.4, staff selection accounts for 11.7% of the unit staff retention in public universities and 37.6% of staff retention in private universities. The increase is statistically significant ($p<0.05$) with $p=0.000$ for both public and private universities.

From the table of coefficients, the regression equation is:

Staff Retention= 7.423 + (0.206 x Staff Selection_Public) + (25.068 x Staff Selection_Private) + (-0.328 x Staff Selection_Private)

In the hypothesis criteria, the study was to reject H_{01} if $\beta_2 \neq 0$. From the results in Table 3.4, the correlation between the mean of Selection Practices and the mean of Staff retention had a beta term $\beta_2 = .343$ at $p=0.00$ for public universities. For public universities, the study therefore rejects the null hypothesis and concludes that selection practices have a statistically significant positive influence on academic staff retention in universities in Kenya. However, for private universities the correlation between the mean of Staff Selection Practices and the mean of Staff retention had a beta term $\beta_2 = -0.613$ at $p=0.000$. The study therefore accepted the H_{a2} and concluded that Staff Selection Practices significantly influence academic staff retention in private universities in Kenya.

4.0 Conclusions

The study purposed to determine the influence of selection practices on academic staff retention in universities in Kenya. From the findings of this study, it was observed that public universities have only one method of interviewing unlike private universities that have several methods. Selection exercise should be taken seriously by public universities and due diligence be done on the candidates who qualify to ascertain that the best candidate has been selected. On testing the

hypothesis, the correlation between the mean of Selection Practices and the mean of Staff retention had a beta term β_2= .343 at p=0.00 for public universities. However, for private universities the correlation between the mean of Staff Selection Practices and the mean of Staff retention had a beta term β_2= -.613 at p=0.000. The study rejected the null hypothesis and concluded that selection practices significantly influence academic staff retention in universities in Kenya.

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