

Mount Kenya



University

FIRST INTERNATIONAL RESEARCH AND INNOVATION CONFERENCE



TOWARDS ACHIEVING A KNOWLEDGE ECONOMY THROUGH RESEARCH AND INNOVATION

Book of Proceedings



Mount Kenya University is ISO 9001:2008 certified

FOREWORD

Message from the Vice-Chancellor

Central to inventing the future of Mount Kenya University is the goal to have a formidable premier research institution of higher learning. As a University we are aware that knowledge generation through research is a crucial element of any university's mission all over the world. We have intensified our investment in recruitment of highly qualified teaching staff as well as investing heavily in research infrastructure in order to position the University as a centre of excellence for teaching and research. The success of our first International Research & Innovation conference strongly suggests that these investments have started to bear fruit. This journal on conference proceedings is an important reference document that highlights several projects whose work was discussed at the conference. The University through its role of dissemination will strive to ensure that the papers discussed herein are available to students, people in academia as well as other stakeholders. In total, 28 manuscripts are published here though over 100 papers were presented at the conference. I take this opportunity to congratulate the 28 delegates whose work have been published after peer review.

Prof. Stanley W. Waudu, Vice-Chancellor

Message from the Deputy Vice-Chancellor, Research and Development

Mount Kenya University (MKU) through its Department of Research and Development prides itself in its ability and agility to respond to emerging issues in the field of Science, Technology and Innovation. The University believes that it is the duty of all stakeholders including academia, the industry and the policy makers to respond to the socio-economic needs of the society. With this in mind, MKU held its 1st international Research & Innovation conference that brought together researchers, the industry and policy makers to share their experiences and scholarly knowledge. This book of proceedings has put together some of the research findings that were presented during the conference. It is envisaged that this knowledge will go a long way to foster the sharing of information and spur motivation on developmental research, and Innovation.

Prof. John H. Nderitu, Deputy Vice-Chancellor, Research and Development

Message from the Director, Research and Development

The national socio-economic development aimed at achieving goals set out in Vision 2030 must be driven by technologies derived from research and innovation. Mount Kenya University held its First International Conference themed "**TOWARDS ACHIEVING A KNOWLEDGE ECONOMY THROUGH RESEARCH AND INNOVATIONS**". The Conference brought together over 300 researchers and innovators from the industry, academia, research institutions and policy makers to disseminate and exchange their scholarly knowledge. Thematic areas covered included Human health, Pure and applied sciences and Socio-economic. This Book of Proceedings is a collection of 28 manuscripts from some of the works presented in that forum, and will further aid in dissemination of scholarly knowledge. Mount Kenya University is committed to be a driver of change in socio-economic transformation of our society and the region through a knowledge-based economy.

Dr. Francis W. Muregi, Director Research & Development

Message from the Editor-in-Chief, Book of Proceedings

It gives me immense pleasure to present this Book of Proceedings from our inaugural biannual International Research and Innovation Conference held on August 28-30, 2013 in Nairobi, Kenya. The theme of the Conference was “Towards achieving a knowledge economy through research and innovation”. The high quality of the papers and the discussion represent the thinking and experience of men and women experts in their particular fields. Their contributions helped to make the Conference as outstanding and successful as it could be. The papers contributed the most recent scientific knowledge known in the fields of research ranging from forestry, human health to education, the social sciences, etc. We would like to thank all the contributors for their hard work in research and preparing the manuscripts for publication. We hope that these Proceedings will furnish scientific groups the world over with an excellent reference book. I trust also that this will be an impetus to stimulate further study and research in all these areas.

I would like to thank the members of the Conference Organizing Committee whose efforts were essential for the success of the Conference. I would also like to thank all Conference participants, exhibitors and sponsors whose contribution was invaluable to the success of the Conference.

Dr. Jonathan M. Mwangi, Editor-in-Chief, Book of Proceedings

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PUBLICATIONS

To Plant or Protect: Evaluating Forest Recovery Dynamics under Natural and Aided Regeneration in Western Kenya

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Abstract

Forest degradation remains a serious problem in Kenya, but opinion is divided on whether to protect degraded forests in order to facilitate natural regeneration or plant them to accelerate forest recovery. In situations where tree planting has been adopted, appropriate spacing has also been identified as a challenge. We used a replicated randomized block experiment to compare forest recovery under site protection and aided regeneration at 0.3 m, 1 m and 5 m spacing in order to identify the most appropriate forest rehabilitation technique in the Nandi Forest Ecosystem. Data was collected on tree species type, tree height and diameter at breast height (DBH). The data was analyzed using two-way analysis of variance in Genstat procedures. Under aided forest recovery, tree height and DBH were significantly higher at 0.3 m spacing than 1 m and 5 m, which gave fairly comparable results. There was no significant difference in tree height and DBH between natural regeneration and aided forest recovery at 0.3 m spacing. Findings of the study suggest that site protection and dense planting give fairly similar results, but the former is more appropriate in degraded forest sites with adequate sources of natural regeneration, such as a viable soil seed bank, remnant trees and stump sprouts. Aided forest recovery, particularly dense planting, is suitable in sites with insufficient sources of natural regeneration.

Key words: Forest degradation, natural regeneration, aided recovery

1. Introduction

Over the past century, Kenya's natural forests have been subjected to varying levels of degradation. The latest state of forests report indicates that the country's closed canopy forest cover decreased from about 12 % in 1960s to 1.9 % in 2010 as a result of over-exploitation of woody forest resources, forest fires and land use conversion to pasture and farmland (FAO, 2010; KFS, 2010). Areas that previously comprised pristine primary forest have been converted to disturbed primary forest, secondary forest, forest plantations and man-made glades (Tsingalia & Kassily, 2009). The situation has compromised the ability of these forests to sustain some of their key functions, such as biodiversity conservation, carbon sequestration and

provision of timber and non-timber forest products (Blanc et al., 2000). Ordinarily, degraded tropical forests recover naturally after a disturbance event (Smidt & Blinn, 1995; Turner et al., 1998). However, in Kenya and many other developing countries, the recovery of a majority of degraded natural forests has been observed to delay by well over two decades after initial disturbance (Duncan & Chapman, 2003; Sajise, 2003; Otuoma et al., 2010). The delay is characterized by the invasion of degraded forest sites with non-wood plants such as ferns, vines, grasses and shrubs at the expense of woody species (Capers et al., 2005).

The traditional view of secondary forest succession (Clements, 1916) suggests that the

delay in forest recovery may be due to poor habitat quality caused by forest degradation. Studies supporting this view suggest that habitat quality improves as the age of a degraded forest increases to the extent that the pH and base saturation of the topsoil decrease (Bossuyt et al., 1999), while shading, litter accumulation and topsoil organic matter content increase, which are useful for the recruitment and growth of woody species (Bawa & Ng, 1990; Muys et al., 1992; Verheyen et al., 1999). Other studies identify habitat quality as a minor factor regulating woody species regeneration in degraded forests and argue that seed dispersal limitations arising from site disturbance is the main impediment to post-disturbance forest recovery (Debussche & Lepart, 1992; Matlack, 1994; Brunet & Von Oheimb, 1998). They argue that forest disturbance, such as logging, affects tree fruiting pattern in forests by altering the microhabitat and distribution of trees species, consequently altering seed production and dispersal pattern. Recent studies on natural forest rehabilitation indicate that deterioration in habitat quality and seed dispersal limitations are important constraints to post-disturbance forest regeneration, but repeat site disturbance through grazing and trampling by herbivores and forest fires is perhaps the most important factor that delays post-disturbance forest recovery after initial disturbance (Otuoma et al., 2010).

In recognition of the delay in post-disturbance natural forest regeneration, attempts have been made to rehabilitate these forests, but these too have had little success (Catterall et al., 2008). Their failure has been attributed to inadequate understanding of suitable rehabilitation approaches to address the various constraints to natural forest regeneration (Smidt & Blinn, 1995; Turner et al., 1998). For instance, one of the greatest challenges to forest rehabilitation presently is the conflict of opinion on whether to protect degraded forests in order to facilitate natural regeneration or plant them to accelerate forest recovery (Lung, 2009). In situations where tree planting has been adopted, appropriate spacing has also been identified as a challenge. It is therefore important to identify techniques suitable for rehabilitating different levels of forest degradation, and also the procedures for implementing these techniques (Catterall & Kanowski, 2010).

The present delay in post-disturbance recovery of most degraded forests implies that Kenya will continue to receive sub-optimal levels of key forest goods and services for the foreseeable future. Moreover, in the event of further forest degradation, which is highly likely, the situation would not only worsen, but also make the country extremely vulnerable to climate change, weather-related disasters and food insecurity (Gregory & Ingram, 2000; Ludi, 2009; Sonwa et al., 2009). Kenya's South Nandi Forest Ecosystem is one of the degraded forest blocks where post-disturbance forest recovery has not only delayed, but rehabilitation interventions have also failed (Otuoma et al., 2010). Given the forest's unique attribute as one of the few forests with rainforest and afro-montane species, its degradation is likely to lead to loss of critical biodiversity and ecosystem services (Tsingalia & Kassily, 2009). The forest was gazetted in 1936 as a forest reserve with an area of about 20,200 ha. Over the past five decades, approximately 3,260 ha of its original primary forest have been clear-felled; 1,400 ha have been placed under exotic forest plantations; 2,200 ha have been excised for human settlement; while 340 ha have been converted to tea plantation. The present closed canopy forest cover is only 13,000 ha (BirdLife International, 2013). For the past two decades, efforts have been made by the Kenya Forest Service and non-governmental agencies, such as Nature Kenya to rehabilitate the degraded 3,260 ha, which presently comprises scrubby grassland, with very little success. In 2009, the Kenya Forestry Research Institute (KEFRI) initiated a study to evaluate forest recovery dynamics under natural and aided forest regeneration. Thus, the objective of this paper was to assess woody species growth performance under natural and aided forest recovery in research plots that were established by KEFRI. Findings of the study are expected to assist in identifying the most appropriate forest rehabilitation techniques to accelerate the recovery of degraded natural forests in Kenya.

2. Materials and methods

2.1 Study area

The study was carried out in Kobujoi Block of South Nandi Forest between March 2009 and April 2013. The forest is located west of Kapsabet Town and east of Kakamega Forest at 0° 00' & 0° 15' N and 34° 45' & 35° 07' E (Njunge & Mugo, 2011). It falls within a transition zone

between a tropical rainforest and tropical afro-montane forest. The transition is caused by the fact that the western part of the forest is an extension of the Kakamega rainforest at 1,700 m above sea level, while the eastern part extends into the Rift Valley at an elevation of about 2,000 m above sea level (Tsingalia & Kassily, 2009). The increase in altitude causes a gradual change in species characteristics from tropical rainforest to tropical afro-montane forest (BirdLife International, 2013). The area's mean annual rainfall ranges from 1,600 to 2,000 mm, while the mean temperature is 19° C (Jaetzold & Schmidt, 1983). The area has a gently undulating terrain underlain by granitic and basement rocks, which weather to give deep, well-drained soils (BirdLife International, 2013). The forest is the upper catchment of Kimondi

and Sirua rivers, which merge downstream to form River Yala that drains into Lake Victoria (Mitchell et al., 2006). It has over 86 indigenous woody species. The most dominant of these species are *Croton megalocarpus*, *Tabernaemontana stapfiana*, *Strombosia scheffleri*, *Macaranga kilimandscharicum* and *Celtis africana* (Njunge & Mugo, 2011). The Forest is classified as an Important Bird Area with over 60 species of birds (BirdLife International, 2013). According to the 1999 human population census, approximately 371 people per km² reside within 3 km from the forest boundary and depend on it for firewood, honey, pasture, construction materials, herbal medicine and indigenous fruits and vegetables (Kenya National Bureau of Statistics, 2011).

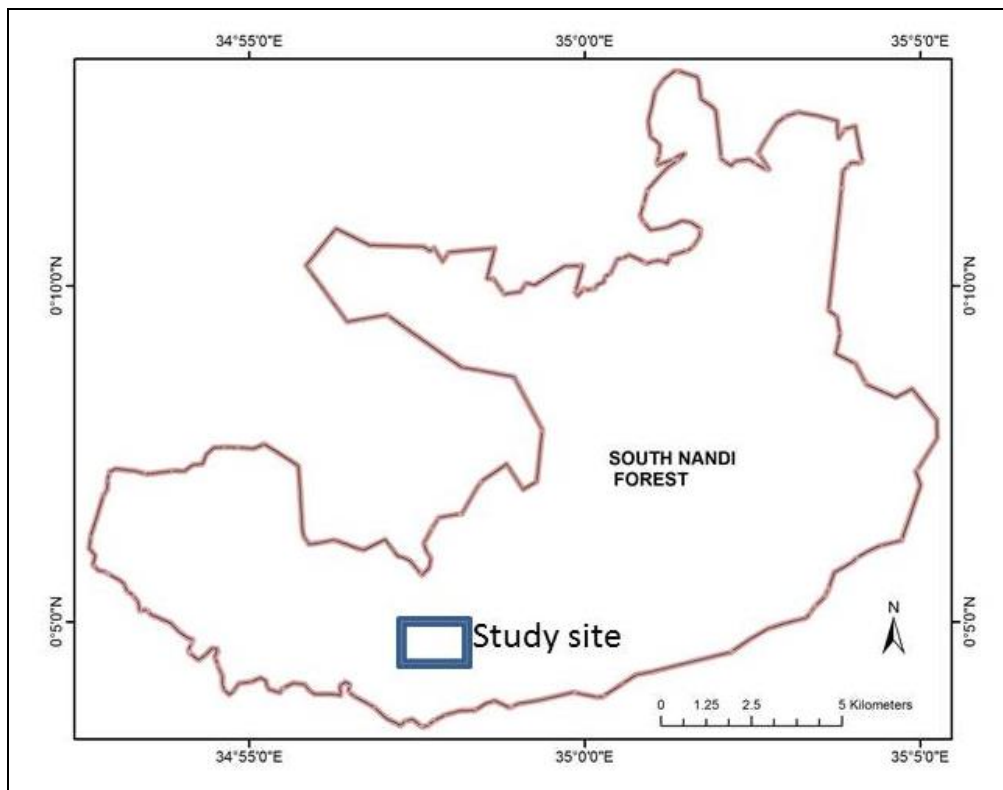


Figure 1: An illustration of the study site in South Nandi Forest. Map developed from topographic maps using geographic information techniques.

2.2 Study design

The study employed a randomized block design with three replicates to assess the recruitment and growth performance of woody species

under natural and aided forest regeneration. The replicates comprised three sample plots of approximately 100 m by 120 m located about 0.5 to 1 km away from each other. A sample plot was sub-divided into two equal parts: one part was protected from repeat site disturbance using an enclosure, while the other part was exposed to disturbance and served as the control. The enclosed plot was further sub-divided into four equal parts of 50 m by 30 m. One of the four

sub-plots was placed under natural regeneration, while the other three were placed under aided regeneration with mixed indigenous species planted at 5 m by 5 m, 1 m by 1 m and 0.3 m by 0.3 m spacing. Simple random sampling was employed to collect data in the three sample plots. Data were collected using three randomly located 10 m by 5 m sampling plots in each of the 50 m by 30 m sub-plots and the control plot.

2.3 Data collection

Data were collected on tree species, tree height and tree diameter at breast height (DBH) or root collar diameter (RCD) for saplings shorter than 1.5 m in height. Tree species were identified by their botanic names. Data on tree DBH were obtained by measuring tree diameter in centimeters at 1.3 m above the ground using a diameter tape. Tree height was measured in meters using a ranging rod. Data collection was carried out once every year over a period of three years.

2.4 Data analysis

The data set on tree species was used to analyze changes in woody species richness over time under site protection and aided forest regeneration using two-way analysis of variance (ANOVA) in Genstat at 95% confidence level (VSN International, 2009; Sokal & Rohlf, 2012). The data set on tree height was used to determine variation in mean tree height under site protection and aided forest regeneration. The data on tree stem diameter were used to

analyze variation in mean stem DBH under site protection and aided forest regeneration.

3. Results

3.1 Natural regeneration

There was a significant variation in the number of woody species, stem density, tree height and stem diameter between protected and unprotected sites that were placed under natural forest regeneration. The protected site had more woody recruits, greater tree height and stem DBH than the unprotected area.

3.1.1 Number of woody species. In the protected site, the number of woody species increased from four at the point of erection of enclosures to 23 three years later. During the same period, the number of woody species decreased from four to one in the unprotected area.

3.1.2 Stem density. The number of woody stems increased significantly in the protected site compared to the unprotected area ($F_{(1,1)} = 11.81$; $p < 0.001$). The variation became more pronounced over time with the number of recruits increasing from 40 stems ha^{-1} during the erection of enclosures to 107 stems ha^{-1} after one year, 167 stems ha^{-1} in the second year and 653 stems ha^{-1} by the third year (Figure 2). In the unprotected site, the number of recruits increased from 34 stems ha^{-1} to 47 stems ha^{-1} over the three year period.

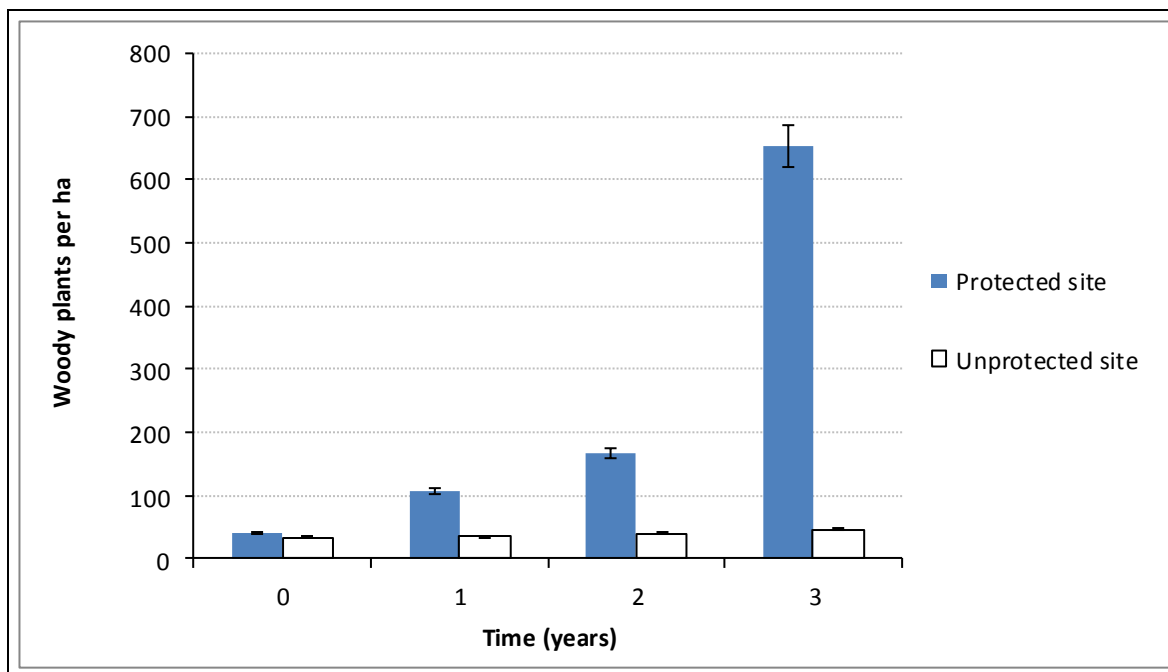


Figure 2: Changes in stand density over a three year period in protected and unprotected sites under natural forest regeneration in South Nandi Forest

3.1.3 Tree height. Tree height increased in both protected and unprotected sites, but the rate of increase was significantly higher in the former than in the latter ($F_{(1,1)} = 51.47$; $p < 0.001$). The highest rate of increase in tree height within the protected site was recorded in the first year of natural forest regeneration (Table 1).

Table 1: Changes in tree height over a three year period in protected and unprotected sites under natural forest regeneration in South Nandi Forest

Site status	Mean tree height (m)			
	Year 0	Year 1	Year 2	Year 3
Protected	0.364	2.137	2.800	3.738
	±	±	±	±
Unprotected	0.30	0.41	0.77	1.09
	±	±	±	±
	0.39	0.18	0.19	0.22

3.1.4 Tree DBH. The rate of increase in stem diameter was significantly higher in the protected area than in the unprotected site ($F_{(1,1)} = 21.06$; $p < 0.001$). The greatest increase in tree DBH within the protected site was recorded in the first year (Figure 3).

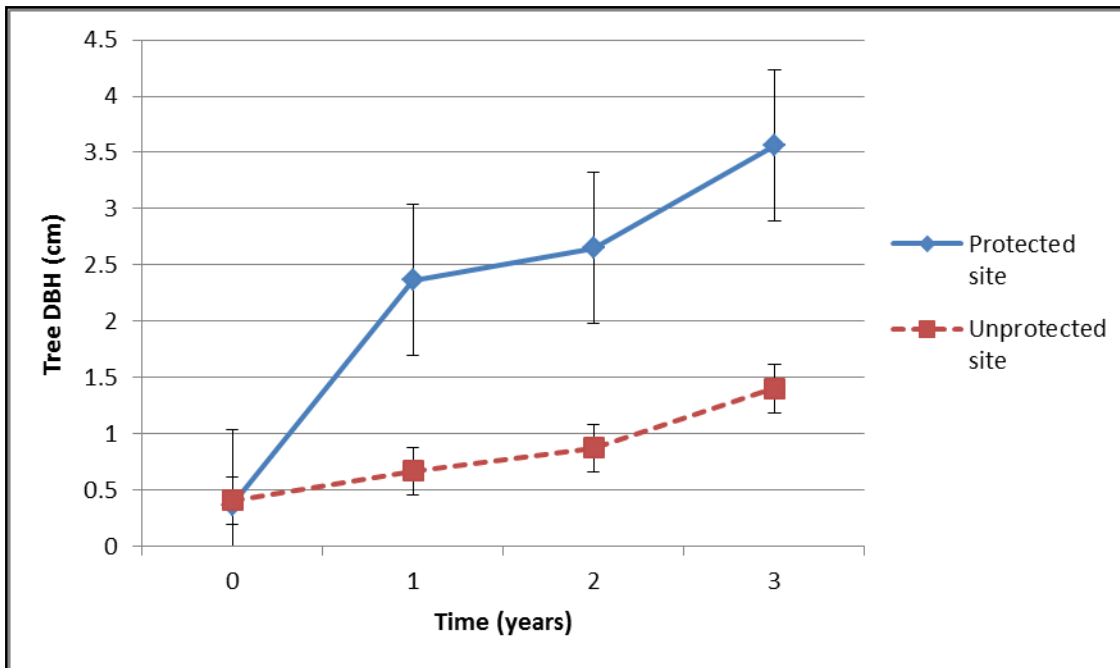


Figure 3: Changes in tree DBH over a three year period between protected and unprotected sites under natural forest regeneration in South Nandi Forest.

3.1.5 Key natural forest regeneration species. A comparison of the growth performance of the 23 tree species that recruited through natural regeneration indicated that *Albizia gummifera*, *Croton megalocarpus*, *Harungana madagascariensis* and *Psidium guajava* were the fastest growing (Figure 4).

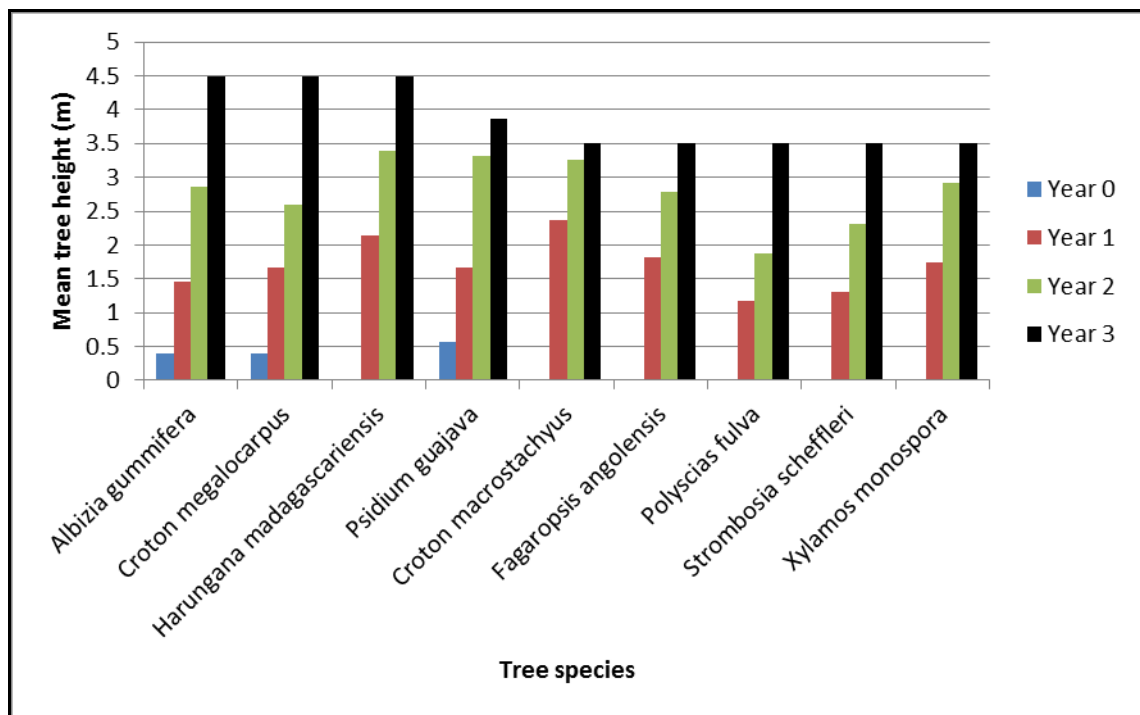


Figure 4: A comparison of tree growth rates among key natural forest regeneration species over a three year period in South Nandi Forest

3.2 Aided forest regeneration

There was a highly significant difference in tree growth performance between 0.3 m spacing on the one hand, and 1 m and 5 m spacing on the other hand. There was an observed difference in tree growth performance between 1 m and 5 m spacing, but it was not statistically significant.

3.2.1 Tree height. The rate of increase in tree height was much faster under 0.3 m spacing than 1 m and 5 m spacing, both of which were not significantly different from each other ($F_{(1,2)} = 22.57$; $p < 0.001$) (Table 2).

Table 2: Variation in mean tree height over a three year period under different aided forest regeneration spacing regimes in South Nandi Forest

Spacing (m)	Mean tree height (m)			
	Year 0	Year 1	Year 2	Year 3
0.3	0.351 ± 0.06	1.459 ± 0.09	2.528 ± 0.16	3.604 ± 0.25
1	0.349 ± 0.08	0.587 ± 0.10	1.246 ± 0.23	1.641 ± 0.05
5	0.356 ± 0.06	0.648 ± 0.13	1.279 ± 0.21	2.037 ± 0.08

3.2.2 Stem DBH. The rate of increase in mean tree DBH was significantly higher at 0.3 m spacing than 1 m and 5 m spacing ($F_{(1,3)} = 6.6$; $p = 0.002$). The

observed difference in stem diameter between 1 m and 5 m spacing was not statistically significant (Figure 5).

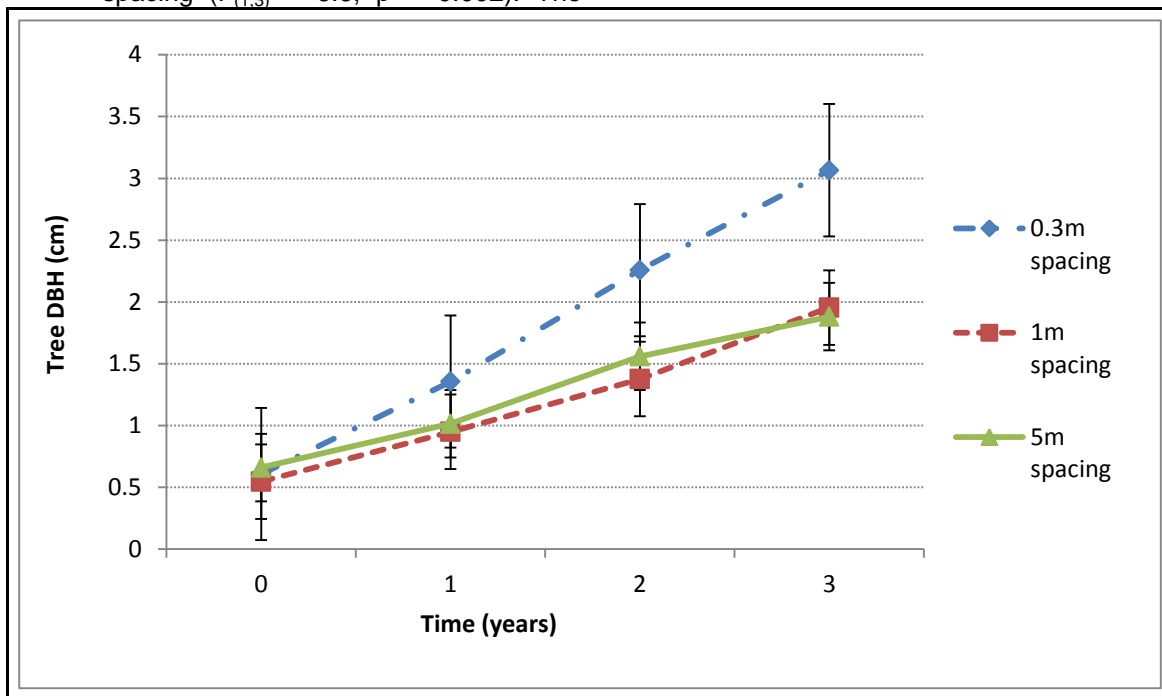


Figure 5: Variation in mean tree DBH over a three year period under different spacing regimes in aided forest regeneration in South Nandi Forest

3.2.3 Growth performance of key aided regeneration species. A comparison of the growth performance of the eleven tree species used for aided forest regeneration indicated that

Harungana madagascariensis, *Croton megalocarpus*, *Spathodea campanulata* and *Croton macrostachyus* were the fastest growing species (Figure 6).

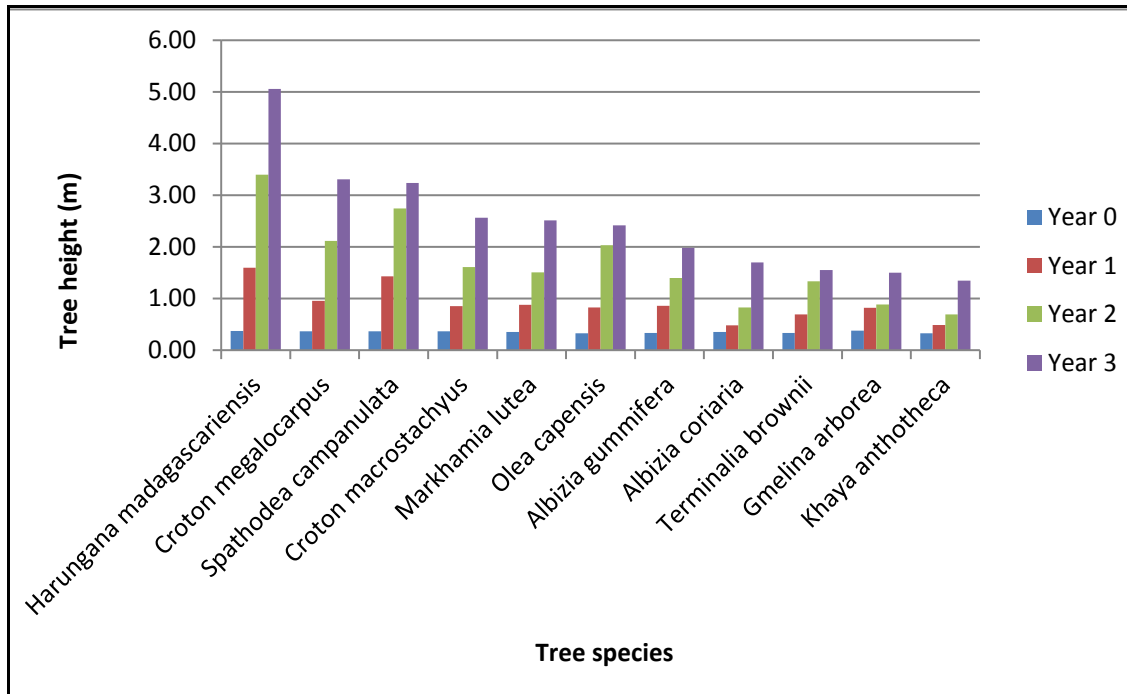


Figure 6: Variation in mean tree height over a three year period under aided forest regeneration in South Nandi Forest

3.3 Comparing tree growth under natural and aided forest regeneration

3.3.1 Tree height. The rate of increase in tree height under natural forest regeneration was slightly higher, but not significantly

different from that under 0.3 m spacing. It was, however, significantly higher than that under 1 m and 5 m spacing ($F_{(1,3)} = 23.45$; $p < 0.001$) (Table 3).

Table 3: A comparison of tree growth rates over a three year period under natural and aided forest regeneration in South Nandi Forest

Rehabilitation technique	Mean tree height (m)			
	Year 0	Year 1	Year 2	Year 3
0.3 m spacing	0.351 ± 0.06	1.459 ± 0.09	2.528 ± 0.16	3.604 ± 0.25
1.0 m spacing	0.349 ± 0.08	0.587 ± 0.10	1.246 ± 0.23	1.641 ± 0.05
5.0 m spacing	0.356 ± 0.06	0.648 ± 0.30	1.279 ± 0.30	2.037 ± 0.08
Natural regeneration	0.380 ± 0.25	1.889 ± 0.13	2.689 ± 0.21	3.634 ± 0.20

3.3.2 Stem DBH. The rate of increase in tree DBH was slightly higher under natural forest regeneration, but it was not significantly different from that under

aided regeneration at 0.3 m spacing. It was, however, significantly higher than that under 1 m and 5 m spacing ($F_{(1,3)} = 8.03$; $p < 0.001$) (Figure 7).

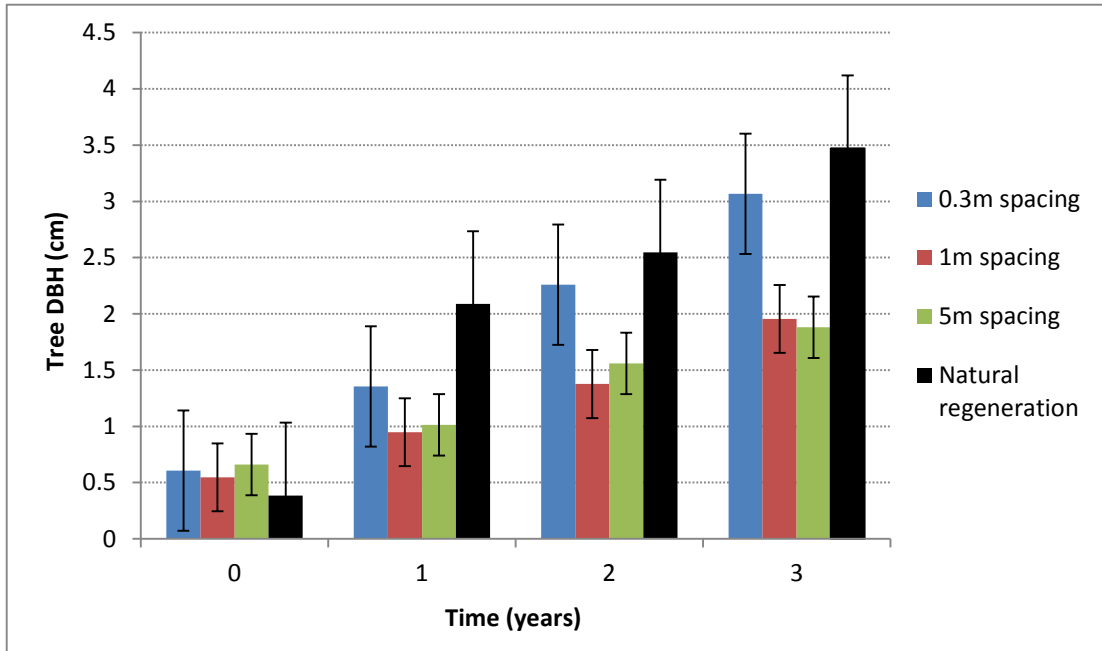


Figure 7: Variation in mean tree DBH over a three year period under both natural and aided forest regeneration in South Nandi Forest

4. Discussion

4.1 Role of site protection in forest regeneration

The results of this study indicate that site protection is a critical factor for both natural and aided forest recovery. They also explain the long standing controversy on whether delay in post-disturbance forest regeneration is caused by site quality limitations arising from initial site disturbance or repeat incidences of disturbance (Muys et al., 1992; Bossuyt et al., 1999; Honnay et al., 1999; Verheyen et al., 1999; Baeten et al., 2009). The spontaneous increase in woody recruits, tree height and stem diameter upon the erection of enclosures is a clear indication that the delay in post-disturbance forest recovery is caused mainly by repeat incidences of disturbance, such as grazing, logging, crop cultivation and forest fires. If the delay was caused by initial site disturbance, then site protection would not have an immediate effect on natural forest regeneration. However, it is important to note that site protection may not lead to immediate natural forest recovery in sites that have lost sources of regeneration, such as remnant trees, stump sprouts and a viable soil seed bank (Debussche & Lepart, 1992; Brunet & Von Oheimb, 1998; Singleton et al., 2001; De Keersmaecker et al., 2011). Nonetheless, unless

the initial disturbance constitutes clear-felling of a forest stand, most sources of regeneration are normally lost through repeat incidences of disturbance (Sajise, 2003).

Despite showing the merits of site protection in forest recovery, one of the limitations of the study is its failure to provide a practical and affordable remedy against repeat forest disturbance. The erection of enclosures that was applied in the study is both economically and ecologically unviable, particularly over large degraded forest areas. It is not only too costly, but it is also likely to hinder the free movement of animal biodiversity within a forest ecosystem. In an effort to protect disturbed forest sites in the future to facilitate natural forest recovery, forest managers may be compelled to identify forest protection strategies that are both affordable and ecologically sound. One such strategy is regulated resource use (Costanza & Neuman, 1997; Kissinger et al., 2012). For instance, grazing permits that are presently issued by the Kenya Forest Service to livestock owners may have to indicate clearly areas where such grazing is prohibited, as opposed to the current scenario where permit holders can graze their livestock in any part of the forest. Moreover, livestock carrying capacity should be a key consideration in the issuance of permits to

ensure that grazing does not convert designated grazing sites into degraded forest lands.

4.2 Natural or aided forest regeneration?

Although opinion tends to favour aided forest recovery over natural forest regeneration, the results of this study indicate that both forest rehabilitation techniques give fairly comparable outcome with regard to tree growth performance. Thus, in a situation where either of the two techniques is applicable, it would be advisable to employ natural forest regeneration. Nonetheless, the preference for any of the two techniques should be guided by the rehabilitation needs of a given degraded forest site because the two forest rehabilitation techniques work best under different site conditions (Lamb & Gilmour, 2003; Shono et al., 2007). For instance, natural forest regeneration works better in degraded forest sites with sources of regeneration, such as remnant trees, a viable soil seed bank and / or stump sprouts (9). It is often less successful in degraded sites where regeneration sources have been removed through prolonged cultivation or repeat forest fires. Aided regeneration, on the other hand, is ideal for degraded forest sites where seed sources have been removed by repeat disturbance events. It can also be applied to enhance woody species diversity in sites where forest degradation has reduced tree species richness (ITTO, 2002; Kigomo et al., 2010). Thus, aided forest recovery works best in sites that have been exposed to severe levels of forest degradation. However, it often presents the challenge of high cost of establishment and maintenance of planted seedlings. The challenge becomes more serious if planting is carried out in a site with high potential for natural regeneration because planted seedlings end up being swamped by natural growth.

4.3 Optimal spacing under aided forest regeneration

This study does not provide a conclusive finding on a spacing regime that can be considered most suitable under aided forest recovery. However, it provides important insight regarding spacing regimes that range between 1 m and 5 m, indicating that they do not provide impressive

outcome in the short term with regard to tree growth performance. The 0.3 m spacing, however, raises questions regarding its costs and whether its results can be achieved at a spacing that is less than 1 m but greater than 0.3 m. On this basis, it would be interesting to find out in a future study if tree growth performance is likely to vary significantly under 0.5 m and 0.3 m spacing.

Conclusion

The delay in post-disturbance forest recovery is caused mainly by repeat disturbance events, such as grazing, cultivation, logging and forest fires, which inhibit the recruitment and growth of woody species. The absence of woody recruits gives shrubs, ferns, vines and grasses an opportunity to colonize degraded forest sites. In such a situation, it is advisable to employ either natural or aided forest rehabilitation techniques to accelerate forest recovery. The two techniques are suitable for different levels of forest degradation, but they give a fairly similar outcome in terms of tree growth performance in degraded forest sites. Natural regeneration is suitable for degraded sites with sources of regeneration, such as remnant trees, stump sprouts and a viable soil seed bank. Aided forest recovery is suitable for degraded sites where repeat incidences of disturbance have destroyed sources of natural regeneration. It is also appropriate for enrichment planting in sites where forest degradation has severely reduced woody species diversity making it essential to introduce other species through planting. It is important to note that site protection is extremely important for a successful outcome in both natural and aided forest regeneration interventions.

Acknowledgement

This study was supported with funds, field equipment and laboratory facilities from the Kenya Forestry Research Institute (KEFRI). KEFRI's technical staff, particularly Fredrick Amollo and Joyce Oreta, participated in the establishment of research plots and data collection.

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Kenya-China Co-operation in the Textile and Clothing Industry for Kenyans' Socio-economic Empowerment

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Abstract

The global textile and clothing (T&C) industry is diverse and labour-intensive. The industry is involved in the cultivation of fibres, production of yarns, fabrics, apparel, bed-linen and geo-textiles. Kenya's T&C industry has operated in a liberalized economy since the 1980s and constitutes an important component of the economy in terms of employment, manufacturing and investment. The industry has continually faced several problems such as obsolete technology and the influx of cheap second-hand clothing. The problems occasioned the closure of key firms such as KICOMI Ltd and some in the Export Processing Zones (EPZs) leading to high unemployment, poverty and crime rates. Kenya's rural population is poor due to aridity, flooding and persistent cattle rustling and banditry. The population needs sustainable sources of income. This paper interrogates the potential of Kenya-China co-operation in silk production in achieving socio-economic empowerment of Kenyans especially in the rural areas. This study is guided by Michael E Porter's Competitive Advantage Theory (1990). The research design is literature reviews. Sericulture requires simple technology and extensive labour. Globally, China's T&C exports topped at US\$206 billion in 2010, occasioned by the firms enjoying economies of scale; advanced technology at low capital investment; resource development to ensure high quality and; water and energy conservation technology. China is renowned for extensive knowledge in sericulture and silk production. Kenya has an abundant supply of educated, skilled and inexpensive labour for the T&C industry. The Kenya government's incentives for direct foreign investment include permission to repatriate unlimited earnings, uncontrolled foreign exchange transactions and speedy processing of work and business permits. Kenya-China co-operation would transform the on-going small-scale sericulture to large-scale that would offer a steady supply of silk yarns and products to the industry and diverse consumers respectively. The effort shall lead to Kenyans' socio-economic empowerment through increased investment, income and employment.

Key words: Globalization; Sericulture; Silk; Socio-economic empowerment; Vision 2030

INTRODUCTION

The global textile and clothing (T&C) industry is diverse, heterogeneous and labour intensive. The industry is involved in the cultivation of fibres, production of yarns, fabrics, apparel, bed-linen, geo-textiles and industrial filters among others (European Union [EU], n.d). China's

relationship with Kenya started in 1963, when it became the fourth country to establish diplomatic relations with the then newly independent Kenya. President Kibaki's first official visit to China in 2005 heralded a new era of stronger Sino-Kenyan bilateral relations (Opondo, n.d). Chinese investors are among the

major foreign investors in the T&C industry in the Export Processing Zone [EPZ] (EPZA, 2005). The Kenyan government has focused primarily on the cotton sub-sector (Opondo, n.d) at the expense of silk and wool sub-sectors which are at cottage industry level. The industry has continually faced several problems such as obsolete technology, influx of cheap new and second-hand clothing, poor marketing by the relevant authorities, inferior cotton seed varieties and lack of affordable credit and market. Cotton growing has been left to smallholders thus reducing the country's production capacity (Maina, 2010). Silk, the "Queen of Textiles" is the only natural filament fibre that has significant commercial value. Since time immemorial, silk has been associated with the royalty and affluent in the society (Tortora, 1987). Apart from high income, sericulture (controlled growth of domesticated silkworms) provides employment potentials all year round (Gapuz & Gapuz Jr, 2012). Inter-ethnic violence in Kenya is often associated with cattle raiding and revenge raids in pastoralist communities, such as the Pokot, Samburu, Turkana and Marakwet who reside in the dry rangelands. The raids are fuelled by *moranism*, dowry payment, pastoralism and initiation involving young men (Young & Sing'Oei, 2011). The authors and Ogiek Peoples' Development Programme [OPDP] (2011) recommend holistic disarmament programmes that incorporate sustainable natural resource management and are linked to alternative livelihood programmes particularly targeting youth. Thus, silk production may be the option. This paper takes up the commitment by Mr Adan Mohammed to revive key labour-intensive sectors, specifically the T&C industry to provide jobs to the youth (Njagi, 2013).

STATEMENT OF THE PROBLEM

Since the liberalization of the Kenyan economy in 1980s, the T&C industry especially the cotton sector has continually faced several problems such as low quality and quantity of lint production; poor economies of scale; influx of cheap fabric, yarn and clothing and; lack of incentives from the government to stimulate investment among others. The problems occasioned the closure of key T&C firms such as KICOMI Ltd and some in the EPZs leading to a fall in investment, high unemployment, poverty and crime rates and negative impacts on other business activities. The industry thus calls for

revival, development or rehabilitation through diversification. Some parts of the country are arid and prone to persistent cattle raiding and banditry, practices used in the accumulation of wealth but are obstacles to socio-economic development. Many efforts have been taken to end inter-ethnic conflicts in arid and semi-arid areas, such as disarmament and the annual Tecla Lorupe Peace Race, but these have been in vain. The affected population requires alternative sources of livelihood of which silk production is a viable option.

THEORETICAL FRAMEWORK

The paper is guided by Michael E Porter's Competitive Advantage Theory, also known as the Diamond Model (1990). The theory states that the success of an industry such as T&C is based on four interrelated factors, namely factor conditions; demand conditions; related and supporting industries and; firms' strategy, structure and rivalry as well as chance and government role (Kumwenda & Peek, 2012).

The factor conditions are the drivers of production (Kumwenda & Peek, 2012) necessary to enter in competition. The factor conditions are human, natural, knowledge, capital and infrastructure resources (Fräsineanu, 2008). There is a positive relationship between advanced factor conditions and an industry's competitive advantage (Kumwenda & Peek, 2012). Kenya has an abundant supply of educated, skilled and inexpensive labour for the T&C industry such as fashion and textile design graduates from Maseno, Kenyatta and Egerton Universities, Baraton University of Eastern Africa, University of Eldoret and Technical University of Kenya; several local and international banks that facilitate local and foreign transactions; international airports and; advanced telecommunication (EPZA, 2005). Kenyan fashion designers for example Monica Kanari sources all her fabrics locally (Wanjala, 2013) and would thus inspire the consumption and acceptance of locally produced silk.

The demand conditions comprise the number and type of buyers in the domestic demand market (Kumwenda & Peek, 2012) which should be so strong that it forces the companies to innovate more rapidly than the foreign competitors in order to stay on the market (Fräsineanu, 2008). The theory stresses on the

role played by sophisticated, demanding and influential domestic consumers in promoting an industry (Kumwenda & Peek, 2012). Kenya's population currently is at about 40 million (GoK, 2010) with a rapidly growing young, extremely discerning and sophisticated middle income population that is sensitive to new and fashionable trends that would satisfy the demand conditions for silk products.

Related and supporting industries are determinants in obtaining the competitive advantage, if they have a strong position on the international market (Frăsineanu, 2008). The sustainability of an industry's competitiveness depends on availability of advanced textile industries, educational institutions and related research organizations in the country (Kumwenda & Peek, 2012). The International Centre of Insect Physiology and Ecology (ICIPE) in Kenya offers training and research in sericulture to reduce poverty (ICIPE, 2012). Nguku (2010) established that ICIPE I silkworm strain had the most economical traits and most suitable for field rearing in Kenya. ICIPE I had the highest cocoon and pupa weight, the longest silk filament at 1183.35m, weighed 0.355gms, the least winding breaks counts due to increased elasticity and, highest cleanliness and neatness percentages during the long and short rains at 96% and 93% respectively.

Firms' strategy, structure and rivalry focus on the conditions that govern the creation, organization and management of companies besides the nature of the domestic and international rivalry (Kumwenda & Peek, 2012). Essential for the competitive advantage is the coordination of the company's goals with those of the owners, shareholders and managers; professional training of employees; the existence of a real and strong competition on the domestic market from both domestic and foreign competition and; the adoption by the government of certain regulations that encourage the establishment of new companies (Frăsineanu, 2008). Firms in Kenya operate in a liberalized economy facing competition from local and foreign companies. Local T&C manufacturers include Bedi Investments Limited, Alpha Knits Limited and Spin Knit Limited among other. Foreign T&C producers in the EPZ are among others Alltex EPZ Limited, Protex EPZ Limited and Wild Life Works Limited

(EPZA, 2005). Foreign clothing retail stores include Mr. Price and Deacons and so forth. New T&C firms may employ various entry strategies such as acquisition of KICOMI, joint venture with Rivatex Ltd or direct entry in marginal areas such as Marakwet.

Chance and government role is that the former refers to events or circumstances that are largely outside the power of the firms to influence. For instance, political decisions, major changes on the international financial market and the costs of the production factors (Frăsineanu, 2008). The government can have both positive and negative influence on the industry (Kumwenda & Peek, 2012). In 2013, Kenya's President directed all government institutions to buy locally manufactured goods and award majority of the tenders to the youth and women as per Jubilee manifesto, so as to spur socio-economic growth. To cushion the economy from oil shocks, the government has facilitated the exploration of oil in Turkana and other areas.

RESEARCH METHODOLOGY

The research design is literature reviews, which provides an overview of scholarship in a certain discipline through analysis of trends and debates. The study used secondary data. The selection of sources was guided by the objective of the study and theoretical framework (Mouton, 2001). The data is presented in the form of a report.

DISCUSSION

The Global T&C Industry

The T&C industry involves the use of relatively modern technology which is available at low investment, thereby suiting industrialization in developing countries such as Kenya. At the same time, it is a high value added segment where research and development, and design are important factors for improving the competitiveness. The T&C industry has emerged as one of the most important sectors in the economies of countries such as China, Kenya and India in terms of investment, production and employment. Being a labour-intensive industry, it creates numerous jobs and helps in poverty reduction. Textile and clothing is the second largest export sector in value terms in India after engineering goods. The former contribute 15.56% in the total merchandise

exports which comprises of 7.51% and 8.15% textiles and readymade garments respectively (Aditya, 2008). The global market for silk is inexhaustible (Creevey, 1996).

The T&C Industry in China

China is renowned for extensive knowledge in sericulture and silk production. Globally, China's T&C exports topped at US\$206 billion in 2010, occasioned by, the firms enjoying economies of scale due to their massive sizes; e-commerce; few barriers to entry; advanced technology at low capital investment; in-company resource development to ensure high quality; manufacture clothing on behalf of brands namely Banana Republic, Tommy Hilfiger and Hugo Boss; tightly integrated units providing rapid design, manufacturing and logistics and; water and energy conservation technology among others (Plunkett Research Ltd [PRL], n.d). Further, the firms benefit from low cost and skilled manpower trained in modern technology; good and subsidized electricity; advanced production technology as they mass manufacture and locally consume low cost machinery (Aditya, 2008), such as for the T&C industry. China's Esquel Group of Companies, is one of the world's largest producers of premium men's and women's cotton wear, with an output of more than 60 million garments each year. The firm's vertically integrated operation starts in China where it oversees nearly 4,700 acres of cotton farms and ends at its luxury retail store in Beijing and sales offices in select locations worldwide such as New York City (PRL, n.d).

The T&C Industry in Kenya

Kenya's Vision 2030 aims to make the country a newly industrialized, middle-income economy through a diversified and competitive manufacturing sector to enhance efficiency. Consequently, provide a high quality life to all its citizens in a clean and secure environment by the year 2030 (Kenya Vision 2030, 2007). The T&C industry is an important component of the manufacturing sector and has been integral to the economic development of the country through employment creation (both direct and indirect), foreign exchange earning, income, poverty reduction, trade and investment (both local and foreign) (Frimpong, 2011; Omolo, 2006). The total sales and number of enterprises from the EPZs located in Nairobi, Athi River and Kipevu, which include T&C stood at Ksh

39.3billion and 79 respectively in 2011 (GoK, 2012). The industry is divided into four broad categories, namely cotton growing and ginning, yarn and thread production, fabric manufacture and apparel manufacture. Apparel products for the local market include trousers, uniforms, overalls, vests and inner garments, while for the export market are jeans, trousers/pants, shorts, shirts, nightwear, blouses and dresses. The wool industry is relatively small. Raw wool is mainly exported to Britain. All the synthetic raw materials namely dyes and polyester are imported. The latter is used for synthetic yarn production (EPZA, 2005). Kenyan apparel enjoys preferential treatment under the African Growth and Opportunity Act (AGOA), thus drawing major foreign investors to the EPZ from China, USA, Britain, India, Sri Lanka, Korea, Italy and South Africa among others, primarily to take advantage of these opportunities (Frimpong, 2011; EPZA, 2005).

Importance of Silk Production

Silk can be obtained either from cultivated silkworms (*Bombyx mori*) or wild species. By far the largest quantity of silk is obtained through sericulture (Tortora, 1987). According to the International Fund for Agricultural Development [IFAD] (n.d), sericulture can be undertaken as a rural micro-enterprise initiative by resource-poor farming communities, especially in harsh agro-ecosystems where food production is marginal. Such options have the potential to address income and household food security needs while having a positive impact on natural resource base. Silk production has proved to be an effective means to fight poverty especially in the rural areas in Kenya, China, India and Philippines. Mulberry sericulture involves growing of mulberry trees for the leaf (the only food for silk worms), leaf production, silkworm rearing and spinning of cocoon for the silk yarn, marketing of cocoons and post-cocoon processes namely twisting, weaving, dyeing and printing (Ali, n.d; Joshi, 2008). Sericulture is an agro-based industry that requires only a small investment of 0.1-0.60ha of land which produces 4-7 generations of silkworm annually; access to water and; very simple technology, the use of which is easy to teach even illiterate people. Sericulture conserves the environment as the drought resistant acacia trees native to tropical Africa used for silkworm rearing would otherwise be cut down to provide firewood and timber;

mulberry trees' carbon dioxide sequestration is higher than bamboo's; the deep rooted trees prevent soil erosion and; converts unutilized and underutilized lands to productive use by planting mulberry trees. Sericulture creates employment and generates income throughout the year; is labour-intensive, hence it is successful in countries where labour is cheap (Gapuz & Gapuz Jr, 2012; "Earning a living", 2007; Creevey, 1996; Ali, n.d) for example in Kenya. However, substantial knowledge and care is required to keep trees and silkworms free of disease (Creevey, 1996).

In Kenya, Mwingi, Rachuonyo, Homa Bay, Nyando, Mbita, Miwani and Thika areas where sericulture and silk production are practiced have benefited silk farmers and women groups. One meter of silk fabric retailed at between Ksh 700 and Ksh 1000, while dyed raw silk sold at about Ksh 1200. There are usually two seasons in a year for the cycle, and earnings from each season average Ksh 100,000 from a hectare of acacia ("Earning a living", 2007). Women in Tripura State in India under government sericulture schemes earn between Rs 20,000 to 25,000 yearly and the annual production of silk is little more than 6.00 metric ton worth six million rupees (Joshi, 2008). The income is three times what they earn from traditional cropping (Creevey, 1996) like sugarcane, pulses, oilseeds, rabi sorghum among others which are planted once in a year (Ali, n.d).

Silk is relatively expensive and is thus used to construct expensive apparel and fashion accessories such as scarves, blouses, lightweight suits, coats, slacks, jackets, shirts, neckties, cravat, cummerbund, robes, loungewear, underwear, hosiery and gloves. Silk is also used in fabricating high-priced lace, napery, draperies, linings, narrow fabrics, and handbags, in addition to printing screens (Tortora, 1987).

The superior properties of silk fibre include, natural colour of cultivated silk is off-white to cream; high lustre of de-gummed silk; soft texture thus the fabrics produced are smooth, have a luxurious hand, do not soil readily and are non-irritant to the skin; absorbent making it comfortable in hot weather and permits dyeing and printing thus increasing its aesthetic value; poor conductor of heat ensures products are

comfortably warm; one of the strongest natural fibres, with tenacity ranging from 2.8 to 5.0g/d when dry; good dimensional stability thus silk apparel and soft furnishings maintain their shape and size and; clean silk is resistant to attack by mildew and moths; burns and ceases to burn when placed in direct flame and when the flame is removed respectively thus silk is considered to be safe to wear (Tortora, 1987; Proctor & Lew, 1984).

Kenya-China Co-operation in Silk Production

Kenya and China offer each other diverse advantages in the T&C industry and specifically in silk production. Kenya is an ideal investment location for the T&C industry as supported by various investor friendly factors (EPZA, 2005) and policies that are aimed at increasing production, maintaining high quality, lowering production costs and enhancing efficiency (Omolo, 2006) in return creating and sustaining employment, income and security.

Incentives to Chinese investors include, work permit at US\$300 a year while other nationalities pay US\$4760, contract agreement with the government and maintaining a good relationship between the two governments. The investors in the EPZ have the opportunity to assess other manufacturers' international moves which spurs competition. However, because very few of the T&C products are sold locally, Kenyans are not aware of them, and of the business ventures and opportunities available in the EPZ (B. Mwangi, personal communication, January 20, 2013).

Rivatex Ltd (operated by Moi University) and KICOMI Ltd (if revived) can adopt China's Esquel Group of Companies' vertically integrated operation. The firms can collaborate with ICIPE to train a large number of Kenyans in sericulture especially in marginal rural areas. The firms can provide incentives such as start-up capital and credit to the sericulturalist and silk producers, in addition to paying promptly, paying good prices and registering them as out-growers. The funds should be given as a soft loan so as to eliminate donor dependency and a beggar mentality prevalent among rural people. By selling silk yarns or fabrics directly to the factories the entrepreneurs will be protected from exploitation by middlemen who are known to deny traders access to markets. The ready

market provided by the firms will ensure a steady flow of income, demand and supply of silk.

Rivatex Ltd and EPZ firms can move away from the predominant cotton fabric and apparel production, to silk fabrics, apparel, fashion accessories and soft furnishings which sell at higher prices. Rivatex Ltd, training, research and income generating facility, shall provide students with the opportunity to express their expertise and creativity. Only good quality Kenyan silk fibre will be released into the domestic and international markets as Nguku (2010) established a silk fibre quality control laboratory while the Kenya Bureau of Standards (KEBS) is a quality control body charged with maintaining high standards. Further, IFAD has established quality control laboratory in Kenya for testing silk and a moth egg production facility (grainage) for African silk farming communities and has removed cultural barriers for adoption of silk. The grainage provides significant production support to communities requiring inputs and raise silk production levels (IFAD, n.d). In addition, increase in the production of silk fibre can be occasioned by improved silkworm races and hybrids, better technologies in rearing and reeling and evolution of higher leaf yielding mulberry varieties (Ali, n.d) through research. Some of Kenya's top fashion houses and designers namely Kiko Romeo and Rialto may be encouraged to buy Kenyan silk thus providing revenue to the entrepreneurs and the country. Already Monica Kanari uses local silk in her designs.

Education is a key pillar for human development towards realization of Kenya's Vision 2030 (Kenya Vision 2030, 2007). China may offer scholarships to Kenyan graduates of textile and apparel to further their studies in Textiles University of Shanghai, as well as exchange programmes for academic staff in the same field. The effort will improve productivity, management and competitiveness of the firms as well as lead to production cost reduction as the experts will not be paid as highly as the expatriates. The two governments can facilitate exchange visits by academicians and industry stakeholders to some of China's leading T&C firms, such as Esquel Group of Companies, so that Kenyan silk fibre and products meet international quality and quantity standards.

Vocational training is crucial to impart people with the requisite knowledge, competencies and attitudes for socio-economic empowerment and livelihood transformation, especially in the rural areas. The graduates of the training can become resource persons at the grassroots level thereby realizing greater impact to the society (Jomo Kenyatta University of Science and Technology [JKUAT], 2012). In India, the youth sericulturists' income increased between Rs. 50,000/- to 100,000/- per annum after vocational training. Kenya has many middle-level colleges that offer vocational training, namely Siaya Institute of Technology, Buruburu Institute of Fine Arts and Evelyne College of Design among others.

The co-operation offers a chance for technology transfer, such as simple and advanced machines for sericulture and T&C firms respectively, water and energy conservation techniques for which China is well known. The co-operation will create auxiliary industries for the local production of appropriate equipment for silk production using locally available materials. For instance, troughs for boiling water used in reeling and de-gumming processes and looms for weaving fabrics. The women sericulturists in India were taught how to make bamboo equipment for the silk enterprise (Creevey, 1996).

The co-operation would transform the small-scale sericulture in the rural areas to large-scale that would offer a steady supply of silk yarns to the industry and silk fabric to fashion designers and apparel manufactures and eventually the consumers. Increased local silk production shall save the country foreign exchange that would otherwise be used to import silk. The money would then be used to enhance social infrastructure such as learning institutions and hospitals.

Introduction of large-scale sericulture in the dry rangelands of Pokot, Samburu, Turkana and Marakwet would transform them into productive land by planting mulberry trees, with immense benefits earlier mentioned. Further, the effort shall provide the people especially the youth, with an alternative livelihood to cattle raiding; thereby ensure security and economic development of the areas.

Any government has a role to play in the T&C industry. If an area lacks water the GoK can construct dams and water-pans, drill boreholes and wells thus enhance socio-economic development. Promotion of "Brand Kenya" for the T&C industry can be used to strengthen this industry. In India, the government imparts technical know-how on silk production and provides silk yarns to the weavers for producing sarees and fabric. China and India produce 70,000 and 14,200 metric tons of raw silk respectively (Joshi, 2008), thus Kenya can gain from the world producer of raw silk.

The affluent in the society value items with distinctive design qualities, hand-made and expressing a community's cultural and artistic heritage: a relief from mass-production characteristics (Dickerson, 1991). In addition, Kenya's rapidly growing young middle income sophisticated population offers local ready market for silk products. According to EPZA (2005), Kenya is a member of many regional and trading blocs whose large population would offer a huge market for Kenyan silk. The blocs include the East African Community (EAC) and Common Market for Eastern and Southern Africa (COMESA). Therefore, Kenyans can produce hand-woven and hand-decorated silk fabric with designs from diverse ethnic communities or the environment. The effort will satisfy Kenya's and China's affluent people's needs. In Kenya, the Handloom weavers association (HAWESA) members are local weavers and designers who use cotton yarns to fabricate *kikoi*, shirts, trousers and tablemats among other items. However, they face challenges namely un-competitiveness due to high cost of cotton, obsolete loom technology and lack of standardization in the market thus leading to undercutting by unscrupulous players (Maina, 2010). Sericulture and silk production may provide the answer to the problems.

CONCLUSION

The Kenya-China co-operation would transform the on-going small-scale sericulture and silk production to large-scale that would offer a steady supply of silk yarns to the industry and silk fabrics, apparel, fashion accessories and soft furnishings to diverse consumers. Higher employment and income generation can be derived from diversifying the T&C industry in Kenya, consequently creating an environment

for further investment. Thus, promotion of silk production should be supported. The effort shall lead to Kenyans' socio-economic empowerment and attainment of Kenya's Vision 2030.

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Effect of Clustering and Knowledge Spillover on Product Innovativeness among Small and Medium Enterprises (Smes) in Kisumu County, Kenya

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Abstract

The study sought to investigate whether clustering and knowledge spillover has any effect on product innovativeness (PI) of manufacturing SMEs. in Kisumu, Kenya. Using a cross sectional survey design with a sample size of 196, a standard multiple linear regression (MLR) was performed between product innovativeness as the dependent variable and the dimensions of Knowledge Spillover, as independent variables. The results of the regression indicated that the predictors explained 13.1% of the variance ($R^2 = .131$, Adj $R^2 = .087$), $F(6, 119) = 2.981$, $p < .05$; $t = 6.590$. Knowledge transfer through attending conferences significantly predicted PI ($B = -.746$, $p < .05$) $t = -2.021$ as did having adequate knowledge ($B = .1.091$, $p < .05$) $t = 2.736$. The study concludes that the clustering and knowledge spillover of manufacturing SMEs is closely related to product innovativeness and hence their competitiveness at the local and regional level. The study findings could inform efforts in designing different supportive actions for different cluster manufacturing SMEs based on their product knowledge gaps within the wider innovation policy initiatives in Kenya.

Keywords: Clusters, knowledge spillover, Product Innovativeness.

INTRODUCTION

The concept of 'clusters' is used relatively in the research literature. This may be due to the fact

that 'clusters' and 'clustering' encompass a wide range of dimensions and schools of thought. Due to the long history and the wide nature of the term, it goes by different names in the literature such as 'industrial districts', 'agglomerations' (Marshall, 1920; Martin & Sunley, 2003), 'knowledge communities' and 'dynamic knowledge systems' (Reve, 2009). Depending on the field of interest, scholars have offered competing definitions on the concept of clustering. Cortright (2006) argues that a cluster consists of firms and related economic actors and institutions that draw productive advantage from their mutual proximity and connections. This is a general definition drawing on ideas from geographic, social and competitive studies. Andersen (2010) uses the term cluster when referring to firms in a region with high levels of agglomeration or geographically proximate or co-located.

Clustering is generally characterized by the economic infrastructure of an industry, such as specialized business services, human resources and training institutions (Asia Pacific Economic Co-operation -APEC, 2006). According to Boja (2011), clustering entail co-operating at industry level but competing at firm level. Drawing on Moyi and Njiraini, (2005), the researcher is in agreement that clustering facilitates new ideas spreading and information flow critical to innovation capacity development. In this study, clustering is characterized by the collaborative relationships that exist between manufacturing Small and Medium Enterprises (SMEs) and their business partners as well as with research institutions/universities. Clustering is thus defined as the interconnection and association between manufacturing SMEs, research institutions/universities and its partner firms (institutions in a particular field) that facilitate development of novel, radical and exclusive products which fulfill unmet market needs.

1.2 The Problem

Despite the widely held view that clustering plays an important role in fostering incipient industrial development, especially in poor regions (Schmitz & Nadvi, 1999) and also enhance the ability to innovate (Frisillo, 2007) SMEs have continued to manufacture 'me-too' products, thus making them less competitive. Little is known of the effect clustering and knowledge spillover has on product

innovativeness among manufacturing SMEs in developing countries such as Kenya. In order to remain competitive, SMEs do need to continually improve and enhance their products innovativeness (Salavou & Avlonitis, 2008). Most of the manufacturing SMEs in Kisumu Town seem to be operating in clusters, manufacture similar products and that target the same market, thus their product innovativeness levels seem to be low. This has resulted in an increased inter-firm rivalry since firms are competing for not only customers but also skills supply in the labour market. This therefore underscores the importance of undertaking a study on the effect of clustering and knowledge spillover on product innovativeness among manufacturing SMEs in Kisumu Town, Kenya. The paper is organized as follows. Relevant literature is reviewed and synthesized, followed by research methodology. The results are then presented along with discussion. Finally, conclusions and implications are discussed.

The objective of the study

The general objective was to determine the effect of clustering on product innovativeness among manufacturing SMEs in Kenya. Specifically, the study sought to:

1. To find out whether product innovativeness differed between clustering and non-cluster SMEs.
2. To determine the effect of knowledge transfer on product innovativeness among cluster SMEs.
2. To determine the effect of knowledge spillovers on product innovativeness among cluster SMEs.

2. Introduction

2.1 Theory and Hypothesis Development

2.1.1 Product Innovativeness

Ali, Krapfel and LaBahn (1995) defined product innovativeness as the uniqueness or novelty of a new product to the customer. According to Van de Ven (1986) product innovation refers to the development and implementation of a new product in the adopting firm or markets. Similar to Rogers' (2003) innovation characteristics of a new product viz. relative advantage, compatibility, complexity, observability, and trialability, product innovativeness refers to the radicalness, uniqueness, and meaningfulness of a new product. Based on the review of existing literature, this study operationalizes product innovativeness as the propensity of a firm to

innovate or develop new products that meet and/or exceed customers' expectations or the extent of unmet market needs as reflected in its uniqueness in comparison to similar products offered in the market.

2.1.2 Cluster and Firm Innovativeness

Taylor and McRae-Williams (2005) posit that clustering simulates large firm behaviour, such as when small firms are not in a position to internalize externalities through economies of scale; they cluster to access resources, to reduce costs, to compete with larger firms, and to innovate. Thus by networking and sharing knowledge, small firms are able to compete for and access specialized resources and information systems as well as internalize competencies and assets that typically are internalized by large firms with economies of scale (Taylor & McRae-Williams, 2005). Hence, clustering provides SMEs benefits that would be unavailable or be available at a greater cost to non-clustering members (APEC, 2006; Knoblen et al., 2011). While activities such as R&D, access to a global client base and advanced business services/production are clearly major contributing factors for SMEs clustering, the need to access localized explicit and tacit knowledge networks has proven to be a central driver for clustering (Huggins & Johnston, 2010; Johansson et al., 2005; Keeble, 2000).

Studies have shown that firms in the cluster have better access to common knowledge than non-cluster firms (Almeida & Kogut, 1997; Dahl et al., 2003). Thus, they tend to search locally for information used in innovation. Additionally, the proximity of firms in the cluster enhances direct observation of competitors (Rogers, 1995). A firm that observes others may try to mimic them and inadvertently generate innovation. When the imitator cannot simply contact the other firm to learn more about an innovation, it will rely on cues from observing the other, increasing the likelihood of mutation and innovation. Firms outside the cluster would have no access to the cluster common knowledge or the ability to directly observe their rivals, and so would not be able to use these conduits for innovation. Thus:

Hypothesis 1: Locating in the Cluster enhances products innovativeness

2.1.3 Knowledge spillover in cluster SMEs

According to Webster's Dictionary, knowledge is "the body of facts accumulated by mankind." Yang et al. (2010) posit that the creation of new knowledge consists of the recombination of existing knowledge and the creation of new ways through which elements of knowledge are reconfigured. This means that firms use their existing knowledge as a boost of innovation (Kostov, 2010). One of the major drawbacks of firms using existing knowledge and competences is that they limit their innovations to incremental advancements but this problem could easily be overcome by the incorporation of external knowledge in the organization (Yang et al., 2010). One popular way of incorporating external knowledge in the firm is through knowledge spillovers.

Knowledge spillover has been widely discussed in research literature, and may be referred to as the positive externalities firms receive in terms of knowledge from the environment (Bougrain & Haudeville, 2002; Davenport, 2005); is a result of personal contact between individuals in a specific cluster (Aharonson et al., 2007; Andersen, 2010). Marshall (1920, p.225) argues that shared knowledge occurred in a type of "industrial atmosphere" and that "the mysteries of the trade become no mysteries; but are as it were in the air". Hence, clustering would enable easier sharing of product knowledge, production technology, production process, and market information. Such knowledge spillover in cluster SMEs to a great extent occurs either voluntarily or involuntarily when carrying out knowledge activities. The rationale behind the concept of knowledge spillovers is that the spillovers are only available to the actors within the boundaries of the cluster, and that stand-alone firms will have a disadvantage relative to the firms within the cluster. It is therefore often termed as *localized knowledge spillovers*, and may allow firms operating nearby the knowledge sources to introduce innovations at a faster rate than firms operating outside a cluster (Bell, 2005).

To promote innovativeness, the firm must possess the necessary human capital which is regarded as reflecting a firm's competence, skills, and intellectual ability to absorb, assimilate and develop new creative ideas, knowledge and technology (Bartel &

Lichtenberg, 1987; Cohen & Levinthal 1990; Rose, *et al.*, 2009). Several empirical studies found that technological change tends to be skill-based and changes the relative labour demand in favour of highly skilled and educated workers (Bougrain & Haudeville, 2002; Henard & McFadyen, 2012). Hence, the study hypothesizes that:

Hypothesis 2a: Knowledge transfer among cluster manufacturing SMEs has a positive effect on product innovativeness.

Hypothesis 2b: knowledge spillover among cluster manufacturing SMEs has a positive effect on product innovativeness.

3. RESEARCH METHODOLOGY

3.1 Sampling and data collection

This study adopted a cross-sectional survey design to provide a numeric description of the fraction of the population – the sample – through data collection process at one point in time, with the findings generalized to a population (Creswell, 2009).

3.2 Population and Sample

The focus of this study is at the firm level with the unit of analysis being the manufacturing SME. The sampling frame were all manufacturing SMEs registered and licensed within Kisumu town as contained in the Official Registry of SME Associations of Kisumu, (2011),

The sample size was determined according to Krejcie and Morgan (1970) survey table of samples that recommend a sample size of 196 for a population of 342, at 95% confidence with 5.0% margin of error. Purposive sampling was then used to select the 136 respondent owner-managers.

3.3 Data Analysis

Of all the 142 questionnaires returned, only 126 were found usable and included in the analysis. Descriptive analysis, means, independent t-test and multiple regression analyses were conducted to examine the various aspects and relationships among variables. In the current study, the dimensions of knowledge spillover measures were the predictor variables and the product innovativeness measures were the criterion variables.

4. RESULTS

4.1 Independent t-test for difference in product innovativeness of cluster and non-cluster manufacturing MSEs

To test hypothesis 1, independent-samples t-tests were conducted to compare the dimensions of PI, product newness and product uniqueness for clusters and non-clusters. The results are presented in Table 1.

Table 1: Mean Score differences in Product Innovativeness Dimensions between Cluster and-non-cluster Manufacturing SMEs

Variable	Cluster (n=82)		Non-cluster (n=44)		t	p
	Mean	SD	Mean	SD		
Product innovativeness	18.52	6.30	21.02	4.92	-2.456	.016
Product newness	.01	.99	-.02	1.02	.172	.001
Product uniqueness	-.19	1.10	35	4.92	-3.408	.864

The results showed that there was a significant difference in PI mean scores for clusters (M=18.52, SD=6.30), and non-clusters (M=21.02, SD=4.92), $t(107.71) = -2.46, p < .05$. The magnitude of the differences in the means was moderate (eta squared=.044). The results are consistent with those of Audretsch and Feldman (2004) who found that innovative firms are located in areas where there are clusters of firms with past innovation success. For product

newness, the results indicate a statistically significant difference in the mean scores, for clusters (M=.01, SD=1.09), and non-clusters (M=35, SD=4.92), $t(122) = -3.408, p < .001$. The magnitude of the differences in the means was small (eta squared= .0002), thus confirming the earlier findings.

Finally, there is an insignificant difference in the mean scores of product uniqueness between cluster (M=.01, SD=.09), and non-cluster firms

(M=-.02, SD=1.02), $t(124) = p = .172$. The magnitude of the differences in the means was large (eta squared= .006). Taken together, the results support hypothesis 1.

Regression Analysis

Variance inflation factor (VIF) was used to examine multicollinearity with no value going

beyond the critical level of 5 and none of the tolerance approached zero, implying no multicollinearity problem (Hair *et al.*, 2010). The results are shown in Table 2.

Table 2: Regression coefficients Results of Knowledge Transfer & Knowledge Spillover on Product Innovativeness

Variables	B	S.E. of B	β	t	p	Tolerance	VIF
(Constant)	17.375	2.637		6.590	.000		
Skills from competitors	-.070	.399	-.016	-.175	.862	.901	1.110
Role models	-.026	.416	-.006	-.062	.950	.865	1.156
Attend conferences	-.746	.369	-.178	-2.021	.045	.945	1.058
After sales services	.594	.381	.138	1.559	.122	.931	1.074
Adequate knowledge	1.091	.399	.245	2.736	.007	.914	1.094
Benchmarking	-.208	.395	-.048	-.528	.598	.875	1.143

$R = .361$; $R^2 = .131$; $R^2_{adj} = .087$; $p \leq 0.05$

The results of the regression indicated the predictors explained 13.1% of the variance ($R^2 = .131$, Adj $R^2 = .087$), $F(6, 119) = 2.981$, $p < .05$; $t = 6.590$.

H2a: It was found that knowledge transfer through attending conferences significantly predicted PI ($B = -.746$, $p < .05$) $t = -2.021$ as did having adequate knowledge ($B = 1.091$, $p < .05$) $t = 2.736$, supporting Hypothesis 2a.

H2b: The four predictors representing knowledge spillover exhibited insignificant effects on PI: acquiring skills from competitors ($B = -.070$, $p = .862$) $t = -.175$; learning from colleague-role models ($B = -.026$, $p = .950$) $t = .062$; offering after sales services ($B = .594$, $p = .122$) $t = 1.559$ and learning from benchmarking products ($B = -.208$, $p = .598$) $t = -.528$. Thus hypothesis 2b was rejected.

These results indicate that both external acquisition and sharing of product ideas/ information, do contribute to innovation and product innovativeness of SMEs. These findings would appear to be consistent with other research views that external knowledge is an essential determinant in SMEs products innovativeness new products development (Un *et al.* 2010).

5. DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

Interaction creates new knowledge when actors bring their knowledge to a shared platform. SMEs acquire explicit knowledge from participating in conferences/seminars/workshops, sharing of product ideas/ information/ knowledge and training. These results indicate that explicit knowledge creation and knowledge transfer are spiraling processes of interaction fusing explicit and tacit knowledge (Nonaka & Konno, 1998). Gao *et al.*, (2008) opine that university/research institutions play a lead role in product innovation, generating new knowledge and technologies, attracting

researchers, investments and research facilities, enhancing other firms R&D activities, stimulating demand for new knowledge and creating and capturing externalities. All these will contribute positively to innovation and product innovativeness of SMEs. Researchers are of the view that such interactions provides firms with some of the necessary conditions required for innovativeness, namely, product idea or information transfer (Walsh *et al.*, 2009), learning and coordination of production and product development activities (Walsh *et al.*, 2011).

Likewise, knowledge spillover, even though insignificant, does facilitate access to tacit

knowledge through acquisition of skills from competitors, learning from colleagues (role models), benchmarking products, and customers through offering after sales services. This may derive from the fact that a firm's absorptive capacity is crucial when it is exposed to an opportunity to assimilate innovative product technology/ knowledge from outside sources.

The insignificant relationship between knowledge spillover and PI may suggest that a firm can have access to complementary knowledge through collaborators but may not have adequate ability to absorb such knowledge. It may also imply that firms with higher absorptive capacity are likely to codify collaborators' product knowledge that can then be assimilated and distributed within (Shu, 2003).

This study investigated the effect of clustering and knowledge spillover on product innovativeness of manufacturing SMEs in Kisumu Town with a view to generating appropriate mix of cluster knowledge creation and knowledge transfer strategies for the improvement of their product innovativeness. This was in relation to SMEs lack of continual improvement and enhancement of their product innovativeness. The study concludes that clustering does enhance external acquisition and transfer of product information /knowledge thus contributing to SMEs product innovativeness.

Despite its limitations, this study contributes substantially to academic knowledge and practice, in addition to highlighting key areas warranting future investigation. At the national context, the study generates appropriate mix of learning and knowledge transfer strategies and contribute to policy efforts towards enhancing the cluster manufacturing SMEs' product innovativeness and hence competitiveness.

The researcher recommends the setting up of SMEs knowledge transfer policies that promote inter-firm interaction and alliances with university/research institutions for purposes of sharing information/ accessing the diverse knowledge base on new product design, development and production. Such alliances and the direct contact with entrepreneurs in the same field will reduce risks and durations of the innovation process because of direct or informal information transfer between firms and

university/ research institutions, hence enhanced product innovativeness.

Future studies replicating this study across multiple industries and sectors using a larger sample would increase the understanding of MSE Knowledge transfer and spillover concept. The study did not investigate firm-specific factors influencing product innovativeness in relation to knowledge spillover, such as absorptive capacity or similar firm-specific factors that may influence firm ability to translate information into innovative products. Therefore, this is a line of investigation that future research should embrace.

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An Investigation into the Factors that Influence Customers' Repurchase Intention in Super Market Stores

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Abstract

The purpose of the study was to investigate the factors that influence customers repurchase intentions in super market stores in Eldoret, five specific research objectives were addressed i.e. to: find out the influence of brand image awareness on customers repurchases intentions, determine the relationships between perceived quality and customers repurchase intentions, determine the influence of customer loyalty on customers repurchase intentions and to determine the influence of geographic proximity on customers repurchase intentions. The research tools for the study include questionnaire and interviews. The study employed descriptive and explanatory research design. The study targeted 295 respondents made up of customer in six selected retail stores. The data was analyzed using descriptive statistics and inferential statistics such as correlation and regression analysis. The findings of the study showed that majority of the consumers who patronize supermarkets and malls were young executives, married people with an income between 5,001 to 20,000 Kshs. The findings revealed that (70%) of the respondents were female. The research also indicated that majority of the respondents were aged between 20 to 34 years. Majority of the respondents, which is (33.8%), had college level of education. It was concluded that perceived quality, customer satisfactions, customer loyalty and geographic proximity has a strong positive correlation coefficient with customers repurchase intentions. Thus, all the hypotheses were verified to have significant relationship with customers repurchase intentions. This research provides useful information for corporate management to prioritize their resources in terms of human resources, investment, time, and budget allocation.

Key words: Repurchase intentions, super market stores, brand image, perceived quality, customer satisfactions, customer loyalty, geographic proximity

INTRODUCTION

Retaining customers is very important, and firms must deploy more resources for defensive marketing (Patterson, 2004). Thus, it is important for them to understand customer repurchase intentions. Behavioral intention can be defined as what customers intend to do specifically with respect to engaging in repurchase (Oliver, 1993).

This research studied the factors influencing repurchase intention of consumers in supermarket stores. In normal commercial transactions, the value from the loyal customers is far greater than the disloyal ones. Therefore, it is very important to make a first time visitor to become a regular customer so that customers could purchase regularly. Therefore, an effective understanding of the factors that influence customers' repurchase is imperative for the success of the business. It is against this

backdrop that this paper was considered timely to identify likely relationship between brand image awareness, perceived quality and customer's satisfactions, customer loyalty and geographic proximity, and re-purchase intention. This study was conducted based on gaps found in the literature concerning factors influencing repurchase intention of consumers in supermarkets shops, lack of empirical studies on the factors influencing purchase intention of consumers in supermarkets shops in the Kenya context. Also, there is a lack of explanatory models and theory building studies in the area of supermarket shops. . These are the prevailing conditions that form the background to the study.

Today more than ever customer orientation as the most important competitive advantage has gained an increasing importance. Consumer is the subject of market and the critical strength of

existence and development of enterprise. The consumer demand affects an enterprise's marketing decision fundamentally, which is the basic consideration for an enterprise choosing the marketing strategy and tactics. Today, the supermarket environment is gradually updating in Kenya. Supermarket in development must focus on the consumer.

Considering the above and many other studies (e.g. Olurunniwo *et al.*, 2006; Kuo *et al.* 2009; Qin & Prybutok, 2009), for instance, Parasuraman *et al.*, 1988), that investigate the effect of service quality and other factors like satisfaction and loyalty on behavioural intention, it could be argued that previous studies ignore other variables are equally important in affecting customer behavioural intention. Consequently, ignoring or omitting important variables could cause research problems. There has been very little research on repurchase intentions of consumers in supermarket shops in Kenya. As this research problem has not previously been investigated in Kenya. Several scholars investigate the effect of service quality and other factors like satisfaction and loyalty on behavioural intention (Parasuraman *et al.*, 1988; Bitner, 1990; Dodds *et al.*, 1991; Aaker and Kumar, 1998). To this end, in their various studies Ehigie (2006) and Saha (2009) recommend that other factors different from service quality that could affect customer repurchase intentions should be investigated.

In view of the above mentioned gaps and the suggestions for further studies by various scholars this study sought to investigate the influence of brand image awareness, perceived quality, customer loyalty, and geographic proximity on customer repurchase intentions. Despite extensive review of literature, there is limited research yet conducted specifically on the factors that influence customers repurchase intentions in the Kenyan super markets stores. Therefore, this study attempts to fill in this observed gap.

PURPOSE OF THE STUDY

The main objective is to investigate the factors that influence customers repurchase intentions in super market stores in Eldoret town.

HYPOTHESIS

H0₁: There is no significant relationship between brand image awareness and customers repurchase intentions in supermarkets stores

H0₂: There is no significant relationship between perceived quality and customers repurchase intentions in supermarkets stores

H0₃: There is no significant relationship between customer loyalty and customers repurchase intentions in supermarkets stores

H0₄: There is no significant relationship between geographic proximity and customers repurchase intentions in supermarkets stores

MATERIALS AND METHODS

The study was conducted in Eldoret Municipality of Kenya. This study is a descriptive study which has been conducted through a survey. The Questionnaire used in this study was designed based on the relevant literature, preliminary study, and experts' suggestions. The questionnaire used for the study was pre-tested by experts who were familiar with the supermarket store services. As a result, the respondents were asked to answer a formal survey question and the Content validity of the questionnaire was confirmed. All questions have been assessed on a five-point Likert scale: from item 1= strongly agree to item 5= strongly disagree was used.

In order to confirm the reliability of the Questionnaire Cronbach's alpha coefficient was used. In the first stage, 10 questionnaires were distributed and the Cronbach's alpha coefficient was calculated equal to 0.86. Results showed that Cronbach's alpha coefficient of the entire questionnaire was equal to 0.95. The results of this test indicated that Cronbach's α did include the necessary values and validity is verified. For internal reliability, Cronbach's alpha coefficients were calculated for all items of each construct. Results indicated all the scales were considered to be reliable (Cronbach's alpha). For determining reliability and validity of the questionnaire in this research Cronbach's alpha is used. So it could be claimed that the data collection tool's reliability is desirable.

RESULTS/DISCUSSION/CONCLUSIONS

This section discusses the results of the data analysis. Among the samples collected, women with 54 percent were in the majority. 38 percent of the respondents were between 25 to 35years of age, 26 percent were over 45, 25 percent were between 35 to 45 years of age, and 9 percent were under 25. With respect to their

educational levels, about 51 percent of respondents had a college diplomas and bachelors degree, about 39 percent were high school graduate, and about 9 percent had a graduate degree. In order to avoid wrong answers to the respondents' income, "family life spending per month" was asked. Considering the family living expenses 49 percent were spending between 20.000 and 40.000 Ksh per month, about 29 percent below 20.000 Ksh per month and about 21 percent above 40.000 Ksh per month. Considering the shopping experience standpoint, 34 percent had 3 to 6 years

experience with department store shopping, about 19 percent between 6 to 9 years, 15 percent 9 to 12 years, 14 percent below 3 years, and 13 percent over 12 years. About 5 percent left this question unanswered. Among the reasons presented for shopping from department stores, diversity and access to needed items with 43 percent were the main reasons followed by distance with 27 percent, service satisfaction with 14 percent, reasonable prices with 8 percent, and appropriate personnel behavior with 6 percent.

MEASURES OF ASSOCIATION BETWEEN VARIABLES

To establish the relationship between brand image awareness, perceived quality, customer satisfactions, customer loyalty and geographic proximity and customers repurchase intentions in supermarket, the average response for each sampled respondents was computed for each of the items on customers repurchase intentions on the one side and the items on factors that influence customers repurchase predictor variables on the other. Pearson correlation coefficient was used to investigate measures of association between the independent variable and the dependent variable. As shown in the table, there is no significant relationship between brand image awareness and repurchase intentions in supermarket ($r=0.059$, $p=0.435$).

The results however indicate significant positive correlations between perceived quality and customer repurchase intentions in supermarket ($r=0.342$, $p < 0.05$); customer loyalty and customer repurchase intentions in supermarket ($r= 0.320$, $p < 0.05$); and geographic proximity and customer repurchase intentions in supermarket ($r=0.346$, $p < 0.05$). These results clearly show that the brand image awareness may have little or no influence on customer repurchase intentions in supermarket. The results however point perceived quality, customer loyalty and geographic proximity has influencing customer repurchase intentions in supermarket directly.

The results of this test are presented in table 1 below.

		Brand image awareness	Perceived quality	Customer loyalty	Geographic proximity	Repurchase intentions
Brand image awareness	Pearson Correlation Sig. (2- tailed) N	1 177				
Perceived quality	Pearson Correlation Sig. (2-tailed) N	.184* .014 177	1 177			
Customer loyalty	Pearson Correlation Sig. (2 -tailed) N	.833** .000 177	.351** .000 177	1 177		
Geographic proximity	Pearson Correlation Sig. (2- tailed) N	.813** .000 177	.362** .000 177	.994** .000 177	1 177	
Repurchase intentions	Pearson Correlation Sig. (2-tailed) N	.059 .435 177	.342** .000 177	.320** .000 177	.346** .000 177	1 177

Table 1: Measures of association between variables

MULTIVARIATE ANALYSIS

Regression analysis was used to analyze the data and to measure the hypothesis. Regressions were also used to determine the best indicators of the independent variables. A

regression analysis was conducted for the 4 factors mentioned above as independent variables and the repurchase intention as a dependent variable. The results of the analysis are presented in tables 2, 3 and 4 below.

Table 2: Model Summary

Model	R	R Square	Adjusted R Square	Std Error of Estimate
1	0.848	0.719	0.702	0.02342

a. Predictors (Constant), brand image awareness, perceived quality, customer loyalty and geographic proximity. b. Dependent Variable: Repurchases intentions of customers

The results show that $R = 0.848$, $R^2 = 0.719$, adjusted $R^2 = 0.702$ and the $SE = 0.02342$ multiple correlation R coefficient indicates the degree of linear relationship of repurchases intentions of customers with all the predictor variables. The R^2 the coefficient of multiple determinations and which shows the proportion of the total variation in repurchases intentions of customers that is explained by the

influencing factors has a value of $.719$. The adjusted R^2 takes into account the number of variables in the model and is therefore adjusted to be a more reliable measure of total variation. The adjusted R^2 value of 0.702 implies that 70.2% of the total variation in repurchases intentions of customers is accounted for by the variation in the predictor variables.

TEST OF SIGNIFICANCE OF THE REGRESSION MODEL

Analysis of variance (ANOVA) was used to test for the significance of the regression model. This test was used to check if a linear statistical

relationship existed between repurchases intentions of customers and at least one of the predictor variables. Table 3 presents the results of this test.

Table 3: ANOVA analysis

Model	Sum of Square	Df	Mean Square	F	Sig
1					
Regression	62.513	5	12.503	10.936	.000
Residual	195.498	290	1.143	-	-
Total	258.011	295	-	-	

- a. Predictors (Constant), brand image awareness, perceived quality, customer loyalty and geographic proximity
- b. Dependent Variable: Repurchases intentions of customers

As shown from the table, $F = 10.936$, $P < 0.05$. The F-test provides an overall test of significance of the fitted regression model. The F-value of 10.936 indicates that all the variables in the equation are important and hence this overall regression is significant. Thus a regression model actually exists between Repurchases intentions of customers and at least one of the independent variables.

TEST OF INDIVIDUAL REGRESSION COEFFICIENTS

The test was used to check the significance of the individual regression coefficients. Table 4 shows the results of this test.

Table 4: Summary of regression results

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig
	B	Std. Error	Beta		
Constant	.855	.573	-	1.492	.137
Geographic proximity	.177	.071	.176	2.481	.014
Brand Image Awareness	.269	.123	.159	2.182	.030
Perceived Quality	.212	.116	.146	2.028	.054
Customer Loyalty	.290	.119	.174	2.437	.016

- a. Dependent Variable: Repurchases intentions of customers

The analysis shows that that brand image awareness, perceived quality, geographical proximity and customer loyalty were significant at the 0.05 level of significant since all the p-values fall below the significant level of $k=0.05$. The first hypothesis of the study was brand image awareness significantly influences the purchase intension. Regression analysis (table 4) showed that there was a significant influence of brand awareness on purchase intension with a beta value .146 showing the strength of the relationship. The study is in line with the findings of Macdonald & Sharp, (2000) who concluded that brand awareness plays a positive role on the purchase intensions. The second hypothesis of the study was perceived quality significantly influences the purchase intension. Regression analysis (table 4) showed that there was a significant influence of perceived quality on purchase intension with a beta value .159 showing the strength of the relationship. The study is in line with the findings of Garretson and Clow, (1999) who concluded that perceived quality plays a positive role on the purchase intensions. These results are similar to previous studies' findings (Kuo et al, 2009; Turel, & Serenko, 2006; Vilares & Coelho, 2003; Zins, 2001). So when customers receive the higher quality and value of supermarket stores' services, their satisfaction will be higher

The third hypothesis of the study was customer loyalty significantly influences the purchase intension. Regression analysis (table 4) showed that there was a significant influence of customer loyalty on purchase intension with a beta value .174 showing the strength of the relationship i.e. almost. The study is in line with the findings of Bloemer and Kasper (1995) who concluded the positive role of the customer loyalty to purchase intension. The fourth hypothesis of the study was perceived geographic proximity significantly influences the repurchases intentions of customers. Regression analysis (table 4) showed that there was a significant influence of geographic proximity on repurchases intentions of customers with a beta value .176 showing the strength of the relationship. The findings are in line with the study of Grewal, *et al.*, (1998) who concluded that geographic proximity is responsible for the increase in repurchases intentions of customers.

CONCLUSION

Essentially, the research indicated that the majority of the consumers who patronize the supermarkets were young people, married people with an income between 5,001 to 20,000 Kshs. The research findings revealed that (70%) of the respondents were female. The research also indicated that majority of the respondents were aged between 20 to 34 years old. Majority of the respondents had college diploma level of education. Regarding the occupations of the respondents, majority of them were staffs in private company followed by Government officer.

According to study results, we concluded that: perceived quality and customers repurchase intentions has significant relationship; further, customer satisfactions and customers repurchase has significant relationship. Customer loyalty and customers repurchase intentions has positive correlation coefficient. Thus, hypotheses H_{01} , H_{02} , H_{03} , H_{04} were verified to have significant relationship. However, the relationships between (H_{05}) brand image awareness and customers repurchase intentions in supermarket stores were tested and found not to be significant. Thus, hypothesis H_{05} has no significant relationship.

RECOMMENDATIONS

Based on the findings, analysis, discussions and conclusions of this study, the following recommendations were made:

There is need for supermarket shops to provide convenient shopping environment, guarantee the consistency of products' quality and information, and improve the satisfaction of consumers.

The supermarket shops should supply supportive services as soon as possible in order to help consumers to complete transactions easily, such as answering consumers' questions simultaneously, offering special information for each consumer, and providing interesting information for consumers, recommending relevant products, easy refund and returns.

The study also recommends that supermarket stores should emphasize product quality. Consumers will produce supermarket stores customers' loyalty because good product quality increases their repurchase behavior further. Moreover, supermarket stores should be aware that consumers will evaluate perceived quality of

a product from their purchase experience. A high evaluation indicates that consumers are satisfied. As a result, their customer loyalty and store brand name preference will increase and also repurchase behavior.

The study further recommends that supermarket stores operators should make their customers aware of their offerings. Advertising should be carefully developed based on the results of ongoing research. New customers will try the supermarket stores based on an initial notion of perceived quality and if they are satisfied that will enhance their further intention to revisit..

The service that the supermarket business shop provides is what makes the customers want to come back and enjoy the same nice experience. Today's customers are price-value oriented. Therefore, the offerings of added value features and highly quality service should live up to their expectations.

Front-line employees play an integral role in gaining loyalty because of high frequency contact between those employee and customers in the supermarket business shop. It is important to select those employees carefully and to train them well. Provide convenient shopping environment, guarantee the consistency of products' quality and information, and improve the satisfaction of consumers.

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SUGGESTIONS FOR FURTHER RESEARCH

1. The limitation of this study is location, as we analyzed a very particular area and it would be important to carry out research in other places to confirm the results obtained in this study. It is highly recommended for future research to expand the span of attributes that affects purchase intention, as well as to study more products and services in order to get an in depth and more clear picture about real relationship between the different product/service attributes purchase intention.
2. It is advisable that further research should be carried out in order to enhance the understanding of the concepts of service quality and customer satisfaction, how they are measured because they are very important for service organizations in terms of profitability and growth.
3. It is highly recommended for future research to expand the span of attributes that affects purchase intention, as well as to study more retail store in order to get an in depth and more clear picture about real relationship between the different supermarket store and attributes customer repurchase intention.

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Markov Transition Matrices for Cohorts of Students in BSc. Actuarial Science Programme (A Case Study of JKUAT)

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Abstract

Higher Education Institutions in Kenya have encountered rapid expansion of programs and departments in the recent years and this has profound impact on the entire society. This continues to demand a greater proportion of the country's financial resources and the cost is borne solely by the Government. As result of these factors, much of the attention centres on the lag between the time students are admitted and the time they are graduating. The purpose of this research is to investigate the flow of students in the BSc. Actuarial Science programme in JKUAT via Markov analysis. A sample of BSc. Actuarial Science

2005 and 2006 cohort was used. A transition model that is used here describes the stocks and flows of students through an education system in terms of transition ratios. The results show that under fairly general Markov chain model of the transitional determination, student flows do not display the random walk characteristics which may be interpreted as purely following a Markov process.

Key words: Fundamental matrix, Markov analysis, Recurrent state, Transition probabilities, Transient state.

1.0 Introduction

Education can be considered as a hierarchical organization in which a student stays in a given school stage for one academic year and then moves to the next stage or leaves the system as a graduate or drop out. In the study of a cohort, a transition model is used as an application of the more general Markov chain model in studying the flow of groups of students through an academic education system. The term cohort will be used to denote a group of students regardless of age or socio-economic background who enter first year in the same academic year. The students graduate from the system, transit from one grade year to the next higher grade, repeat the same grade or drop out of the system due to factors like lack of fees, sickness and poor academic performance. Thus students finally enter permanent states as graduates or drop outs. The student can either graduate at the final stage or drop out at any of its stages. The particular characteristics of interest are:

- i. The transition probability matrix
- ii. The estimates of the probabilities that a student will graduate from a system after spending (1,2,3,4) years of study respectively.

My interpretation, to be named Herbert Interpretation of Completion Rates (HICOR), allows for students joining a four year programme in year n , who eventually complete their programme successfully in year $n + 4, n + 5$ or $n + 6$, i.e. some may complete after maybe repeating a year of study or taking academic leave for one year. This differs from what I would name JAB Interpretation of Completion Rate (JICOR), in which the only successful completions are those of students, who joined in year n and completed their programme successfully in year $n + 4$.

1.1 Context of the problem:

The official policy outlining the program of study at Faculty of Science requires students that students attend continuously, realistically; however many students do not attend for 8 consecutive semesters. They may lack the intellectual or academic desire necessary to study. They may be academically dismissed for one semester until they are reinstated to the university system for one more chance. Because of these and other social and economic factors, it was decided that a study of student flow at the Faculty of Science was needed so that some objective basis would exist to understand and explain the nature of student progression, to evaluate the options available to admission policy and decision maker's and recommend appropriate adjustment to existing policies. The research paper answers the following questions:

- i. At any given time, what is the probability that a student who has been admitted will graduate?
- ii. At any given time, what is the probability that a student who has been admitted will withdraw from course at any one given stage?

1.2 Assumptions

- i. New enrolment in the education system is only through the first year. For students joining the University as mid entry students in second or third year it will be assumed that they passed all units of the previous year(s) at the first attempt.
- ii. A student cannot jump to a higher grade or be demoted to a lower grade of the system, so that

$$P_{ij}(t) = 0 \text{ for all } j = i + 2, i + 3 \text{ and for all } j < i$$

- iii. A student cannot repeat a given year more than once. However a student may be readmitted any number of

times after having difficulties of say fees or illness however the probability of infinite readmission is very small.

From the model it's clear that at the end of each academic year, some of the students pass and thus move to the next higher grade the following year, with probabilities $P_{i,i+1}, i > 1$ or fail to pass and thus repeat the same grade with probabilities $P_{i,i}, i = 1; 2; \dots$

The transition probability satisfy

$$p_{i,i} + p_{i,i+1} \leq 1, 0 \leq p_{ij} \leq 1, i \leq j$$

Let $n_i(t)$ be the number of students belonging to a given cohort, who are enrolled in school grade i in year t , and $n_{ij}(t+1)$ be the number of students who move to the next school grade j the following year. Then by the maximum likelihood principle, the transition probability P_{ij} may be estimated from

$$p_{ij}(t+1) = \frac{n_{ij}(t+1)}{n_i(t)}, j = i+1; \dots; S$$

Where, S is the maximum number of years that the student will spend in the program of study.

The problem of understanding and assessing the flows of the students through educational systems has long been dealt with using finite absorbing Markov chains. Early work by *Burke (1972) and Nicholls (1983)* analyzed the flow of student teachers at the undergraduate level and the flow of students at undergraduate and graduate level within a business faculty.

Subsequently there appears to have been little work undertaken in this specific area with the exception of *Shah and Burke (1999)*, who published an absorbing Markov chain analysis of undergraduate students in the Australian higher education system. At the graduate level, *Nicholls (1983) and (2007)* has investigated two types of graduate students systems using Markov chains both in Australia. It is worth noting that, as *Nicholls (2007)* points out, large numbers of application of absorbing Markov chains in allied areas, for example manpower planning models in academics (*Hopkins and Massey, 1981*), academic planning (*Bowan and Schuster, 1985*), assessing personnel practices in higher education (*Baker and Williams, 1986*), faculty structure (*Ling and Pen – Gouzhung, 1987*)

and again, manpower planning (*Hackett et. al. 1999*) have been undertaken.

2.0 Development of model

The Markov model is based on an underlying stochastic process in which a system in one state, s_i , moves to a subsequent state, s_j . The states are commonly referred to as the current state and the next state. The act of moving from one state to the next is referred to as a step or transition. It is possible to construct a transition matrix from one year of study to the following year of study based on the sequence f_{ij} , for the number of who had been in state j at the end of one year of study, and were in state i at the end of the year of study. On dividing f_{ij} by the sum of f_{ij} for a particular state j , the corresponding probability P_{ij} that a student who had been in state j at the end of one year of study, would be in state i at the end of the following year of study would be determined.

2.1 Initial Transition Matrix

Let the state of the system be denoted by integers $1, 2, \dots, N$ at times $t = 0; 1; 2, \dots$. Let P_{ij} denote the probability that a student in grade i at time $(t-1)$ will be in grade j at time t giving rise to transition matrix $P = ((P_{ij})); i, j = 1; 2, \dots, N$. Let $n_{ij}(t)$ represent the number of students in grade i at time $(t-1)$ who will be in grade j at time t , also, let $n_i(t-1)$ represent the number of students in grade i at time $(t-1)$, then assuming the multinomial distribution, the transition probabilities are estimated from $P_{ij} = n_{ij}(t) / n_i(t-1)$

Where $i, j = 1, 2, \dots, N$

This is the proportion of students who were in grade i at time $(t-1)$ who end up being in grade j at time t .

3.0 Construction of Markov Transition Matrices between Two Consecutive Years of Study.

For the Faculty of Science in JKUAT, the main point of interest was to examine whether students, who at the end of a year of study were in one of five states, i.e. clear pass, pass with one failed unit, pass after sitting supplementary examinations, pass after repeating the year of study, and discontinuation/deregistration, at the end of a year of study, called a stage in a Markov transition, would continue in the same state or go to a different state after sitting their examinations at the end of the following year of study. For each cohort, it was possible to construct a transition matrix from one year of study to the following year of study, based on the frequencies f_{ij} , for the number of students who had been in state j at the end of one year of study, and who were in state i at the end of the following year of study. On dividing f_{ij} by the sum of the f_{ij} for a particular state j , the corresponding probability P_{ij} that a student, who had been in state j at the end of one year of study, would be in state i at the end of the following year of study would be determined. Initially, the transition matrices were calculated for each cohort of each of the two programmes that were of interest in the study. Thereafter, a statistical test was conducted to determine whether there was evidence that the transition matrices for a particular programme of study provided evidence that the observed probabilities in each matrix could have come from a common population. In both programmes it was found that the observed probabilities in each matrix did come from a common population, and it is now proposed in a future

study to test these transition matrices on a different cohort of students for the programmes.

3.1.0 Students Admitted to B Sc Actuarial Science in JKUAT May 2005 (Progress from First to Second Year of Study)

The frequencies f_{ij} , for the number of students, in this cohort, who had been in state i at the end of the first year of study, and who were in state j at the end of the second year of study, is shown below.

From Table 1, it can be seen that, of the 68 students who passed all their units in year 1, 58 also passed all units in year 2, 5 passed with one failed unit in year 2, 4 passed after taking supplementary examinations in year 2, and 1 student was discontinued or deregistered in year 2. Of the 4 students who passed after taking supplementary examinations in year 1, 2 also passed after taking supplementary examination in year 2, 1 passed with one failed unit in year 2, and 1 had to repeat year 2, but passed during the repeat year.

Table 1: Students Admitted to B Sc Actuarial Science in JKUAT May 2005

Given Yr 1	Pass All	Pass fail	one	Pass Supp	Pass Repeat	Disc/Dereg	Total
Actual Yr 2							
Pass All	58	5	0	0	0	0	63
Pass one Fail	5	2	1	0	0	0	8
Pass on Supp	4	3	2	0	0	0	9
Pass on Repeat	0	0	1	0	0	0	1
Disc/Dereg	1	1	0	0	0	4	6
Total	68	11	4	0	0	4	87

The same data is now displayed as a 5X5 matrix.

58	5	0	0	0
5	2	1	0	0
4	3	2	0	0
0	0	1	0	0
1	1	0	0	4

From these frequencies, the transition matrix of probabilities can now be obtained by dividing each frequency f_{ij} by the sum of the f_{ij} for a

particular state j , to give the resulting transition probability p_{ij} .

Table 2: Probabilities on the Progress from First to Second Year of Study

	GIVEN Y1 >				
ACTUAL Y2	PASS ALL	PASS 1F	PASS SUP	PASS RP	DIS/DR
PASS ALL	0.853	0.455	0	0	0
PASS 1F	0.074	0.182	0.250	0	0
PASS SUP	0.059	0.273	0.500	0	0
PASS RP	0	0	0.250	0	0
DIS/DR	0.015	0.091	0	0	1
TOTAL	1	1	1	0	1

MATRIX

$$\begin{bmatrix} 0.853 & 0.455 & 0 & 0 & 0 \\ 0.074 & 0.182 & 0.250 & 0 & 0 \\ 0.059 & 0.273 & 0.500 & 0 & 0 \\ 0 & 0 & 0.250 & 0 & 0 \\ 0.015 & 0.091 & 0 & 0 & 1 \end{bmatrix}$$

Pre-multiplication by this transition matrix, on the probability vector for a student being in one of the five states achieved after the first year of study, will yield the corresponding probability vector for a student being in one of these five states after the second year of study. In the first

year of study, the probability of passing all units was 0.782, of passing with one failed unit 0.126, of passing after taking supplementary examinations 0.046, of passing after repeating 0, and of being discontinued or deregistered 0.046.

The resulting probability vector P_1 is as shown here

$$\begin{bmatrix} 0.782 \\ 0.126 \\ 0.046 \\ 0 \\ 0.046 \end{bmatrix}$$

The matrix multiplication then yields:

$$\begin{bmatrix} 0.853 & 0.455 & 0 & 0 & 0 \\ 0.074 & 0.182 & 0.250 & 0 & 0 \\ 0.059 & 0.273 & 0.500 & 0 & 0 \\ 0 & 0 & 0.250 & 0 & 0 \\ 0.015 & 0.091 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 0.782 \\ 0.126 \\ 0.046 \\ 0 \\ 0.046 \end{bmatrix} = \begin{bmatrix} 0.724 \\ 0.092 \\ 0.103 \\ 0.011 \\ 0.069 \end{bmatrix}$$

This means that in the second year of study, the probability of passing all units was 0.724, of passing with one failed unit 0.092, of passing after taking supplementary examinations 0.103, of passing after repeating 0.011, and of being discontinued or deregistered 0.069. These results are based on the resulting probability vector P_2 as shown above on them right hand side of the matrix equation.

A similar procedure was then applied for the progress (or lack of it) for students proceeding

from the second to the third year of study, and for students proceeding from the third to the fourth year of study, as shown below.

3.1.1 Progress from Second to Third Year of Study

The following table (Table 3) and matrix reflect the transition probabilities observed for students between their second and third years of study.

Table 3: Probabilities on the Progress from Second to Third Year of Study

	GIVENY2 >				
ACTUALY3	PASS ALL	PASS 1F	PASS SUP	PASS RP	DIS/DR
PASS ALL	0.857	0.375	0.111	0	0
PASS 1F	0.063	0.250	0.111	0	0
PASS SUP	0.0476	0	0.556	1	0
PASS RP	0.0159	0.125	0.222	0	0

MATRIX

$$\begin{bmatrix} 0.857 & 0.375 & 0.111 & 0 & 0 \\ 0.063 & 0.250 & 0.111 & 0 & 0 \\ 0.047 & 0 & 0.556 & 1 & 0 \\ 0.016 & 0.125 & 0.222 & 0 & 0 \\ 0.016 & 0.250 & 0 & 0 & 1 \end{bmatrix}$$

Pre-multiplication by this transition matrix, on the probability vector \underline{P}_2 for a student being in one of the five states achieved after the second year of study, will yield the corresponding probability

$$\begin{bmatrix} 0.857 & 0.375 & 0.111 & 0 & 0 \\ 0.063 & 0.250 & 0.111 & 0 & 0 \\ 0.047 & 0 & 0.556 & 1 & 0 \\ 0.016 & 0.125 & 0.222 & 0 & 0 \\ 0.016 & 0.250 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 0.724 \\ 0.092 \\ 0.103 \\ 0.011 \\ 0.069 \end{bmatrix} = \begin{bmatrix} 0.667 \\ 0.080 \\ 0.103 \\ 0.046 \\ 0.103 \end{bmatrix}$$

vector \underline{P}_3 for a student being in one of these five states after the third year of study. The matrix multiplication then yields:

This means that in the third year of study, the probability of passing all units was 0.667, of passing with one failed unit 0.080, of passing after taking supplementary examinations 0.103, of passing after repeating 0.046, and of being discontinued or deregistered 0.103. These

results are based on the resulting probability vector \underline{P}_3 as shown above on the right hand side of the matrix equation. Sadly, by the end of third year, over 10% of the cohort were now discontinued or deregistered.

3.1.2 Progress from Third to Fourth Year of Study

The following are the corresponding table (Table 4) and matrix reflecting the transition probabilities observed for students between their third and fourth years of study.

Table 4: Probabilities on the Progress from Third to Fourth Year of Study

ACTUALY4	GIVENY3 >				
	PASS ALL	PASS 1F	PASS SUP	PASS RP	DIS/DR
PASS ALL	0.966	0.571	0.667	0	0
PASS 1F	0	0.286	0	0.250	0
PASS SUP	0.017	0	0.222	0	0
PASS RP	0	0	0.111	0.500	0
DIS/DR	0.017	0.143	0	0.250	1
TOTAL	1	1	1	1	1

MATRIX

$$\begin{bmatrix} 0.966 & 0.571 & 0.667 & 0 & 0 \\ 0 & 0.286 & 0 & 0.250 & 0 \\ 0.017 & 0 & 0.222 & 0 & 0 \\ 0 & 0 & 0.111 & 0.500 & 0 \\ 0.017 & 0.143 & 0 & 0.250 & 1 \end{bmatrix}$$

Pre-multiplication by this transition matrix, on the probability vector \underline{P}_3 for a student being in one of the five states achieved after the third year of study, will yield the corresponding probability vector \underline{P}_4 for a student being in one of these five states after the fourth year of study.

The matrix multiplication then yields:

$$\begin{bmatrix} 0.966 & 0.571 & 0.667 & 0 & 0 \\ 0 & 0.286 & 0 & 0.250 & 0 \\ 0.017 & 0 & 0.222 & 0 & 0 \\ 0 & 0 & 0.111 & 0.500 & 0 \\ 0.017 & 0.143 & 0 & 0.250 & 1 \end{bmatrix} \begin{bmatrix} 0.667 \\ 0.080 \\ 0.103 \\ 0.046 \\ 0.103 \end{bmatrix} = \begin{bmatrix} 0.759 \\ 0.034 \\ 0.034 \\ 0.034 \\ 0.138 \end{bmatrix}$$

This means that in the fourth year of study, the probability of passing all units was 0.759, of passing with one failed unit 0.034, of passing after taking supplementary examinations 0.034, of passing after repeating 0.034, and of being discontinued or deregistered 0.138. These results are based on the resulting probability vector \underline{P}_4 as shown above on the right hand side of the matrix equation. Sadly, by the end of the final year, nearly 14% of the cohort were now discontinued or deregistered.

3.2.0 Students Admitted to B Sc Actuarial Science in JKUAT May 2006

Progress from First to Second Year of Study

The following are the corresponding table (Table 5) and matrix reflecting the transition probabilities observed for students between their first and second years of study.

Table 5: Probabilities on the Progress from first to second year of Study

		GIVENY2>				
ACTUALY2		PASS ALL	PASS 1F	PASS SUP	PASS RP	DIS/DR
PASS ALL		0.873016	0.5	0.285714	0	0
PASS 1F		0.063492	0.277778	0.428571	0	0
PASS SUP		0.015873	0.166667	0	0	0
PASS RP		0.015873	0	0	0	0
DIS/DR		0.031746	0.055556	0.285714	0	1
TOTAL		1	1	1	0	1

MATRIX

$$\begin{bmatrix} 0.873 & 0.500 & 0.286 & 0 & 0 \\ 0.063 & 0.278 & 0.429 & 0 & 0 \\ 0.016 & 0.167 & 0 & 0 & 0 \\ 0.016 & 0. & 0 & 0 & 0 \\ 0.031 & 0.056 & 0,286 & 0 & 1 \end{bmatrix}$$

In the first year of study, the probability of passing all units was 0.643, of passing with one failed unit 0.184, of passing after taking supplementary examinations 0.071, of passing

$$\begin{bmatrix} 0.643 \\ 0.184 \\ 0.071 \\ 0 \\ 0.102 \end{bmatrix}$$

Pre-multiplication by this transition matrix, on the probability vector P_1 for a student being in one of the five states achieved after the first year of study, will yield the corresponding probability

$$\begin{bmatrix} 0.873 & 0.500 & 0.286 & 0 & 0 \\ 0.063 & 0.278 & 0.429 & 0 & 0 \\ 0.016 & 0.167 & 0 & 0 & 0 \\ 0.016 & 0. & 0 & 0 & 0 \\ 0.031 & 0.056 & 0,286 & 0 & 1 \end{bmatrix} \begin{bmatrix} 0.643 \\ 0.184 \\ 0.071 \\ 0 \\ 0.102 \end{bmatrix} = \begin{bmatrix} 0.673 \\ 0.122 \\ 0.041 \\ 0.010 \\ 0.153 \end{bmatrix}$$

This means that in the second year of study, the probability of passing all units was 0.673, of passing with one failed unit 0.122, of passing after taking supplementary examinations 0.041, of passing after repeating 0.010, and of being discontinued or deregistered 0.153. These

after repeating 0, and of being discontinued or deregistered 0.102.

The resulting probability vector P_1 is as shown below.

vector P_2 for a student being in one of these five states after the second year of study.

The matrix multiplication then yields:

results are based on the resulting probability vector P_2 as shown above on the right hand side of the matrix equation. Sadly, by the end of second year, over 15% of the cohort were now discontinued or deregistered.

3.2.1 Progress from Second to Third Year of Study

The following are the corresponding table (Table 6) and matrix reflecting the transition probabilities observed for students between their second and third years of study.

Table 6: Probabilities on the Progress from second to third year of Study

		GIVENY2>				
ACTUALY3		PASS ALL	PASS 1F	PASS SUP	PASS RP	DIS/DR
PASS ALL	0.833333	0.25	0.25	1	0	
PASS 1F	0.106061	0	0.25	0	0	
PASS SUP	0.060606	0.333333	0.25	0	0	
PASS RP	0	0	0.25	0	0	
DIS/DR	0	0.416667	0	0	1	

MATRIX

$$\begin{bmatrix} 0.833 & 0.250 & 0.250 & 1 & 0 \\ 0.106 & 0 & 0.250 & 0 & 0 \\ 0.061 & 0.333 & 0.250 & 0 & 0 \\ 0 & 0 & 0.250 & 0 & 0 \\ 0 & 0.416 & 0.286 & 0 & 1 \end{bmatrix}$$

Pre-multiplication by this transition matrix, on the probability vector \underline{P}_2 for a student being in one of the five states achieved after the second year of

study, will yield the corresponding probability vector \underline{P}_3 for a student being in one of these five states after the third year of study.

The matrix multiplication then yields:

$$\begin{bmatrix} 0.833 & 0.250 & 0.250 & 1 & 0 \\ 0.106 & 0 & 0.250 & 0 & 0 \\ 0.061 & 0.333 & 0.250 & 0 & 0 \\ 0 & 0 & 0.250 & 0 & 0 \\ 0 & 0.416 & 0.286 & 0 & 1 \end{bmatrix} \begin{bmatrix} 0.673 \\ 0.122 \\ 0.041 \\ 0.010 \\ 0.153 \end{bmatrix} = \begin{bmatrix} 0.612 \\ 0.082 \\ 0.092 \\ 0.010 \\ 0.204 \end{bmatrix}$$

This means that in the third year of study, the probability of passing all units was 0.612, of passing with one failed unit 0.082, of passing after taking supplementary examinations 0.092, of passing after repeating 0.010, and of being discontinued or deregistered 0.204. These results are based on the resulting probability vector \underline{P}_3 as shown above on the right hand side of the matrix equation. Sadly, by the end of third

year, over 20% of the cohort were now discontinued or deregistered.

3.2.2 Progress from Third to Fourth Year of Study

The following are the corresponding table (Table 7) and matrix reflecting the transition

probabilities observed for students between their third and fourth years of study.

Table 7: Probabilities on the Progress from Third to Fourth Year of Study

GIVENY3 >

ACTUALY4

	PASS ALL	PASS 1F	PASS SUP	PASS RP	DIS/DR
PASS ALL	0.866667	0.625	0.333333	1	0
PASS 1F	0.066667	0	0.222222	0	0
PASS SUP	0.05	0.25	0.333333	0	0
PASS RP	0.016667	0	0.111111	0	0
DIS/DR	0	0.125	0	0	1

MATRIX

$$\begin{bmatrix} 0.867 & 0.625 & 0.333 & 1 & 0 \\ 0.067 & 0 & 0.222 & 0 & 0 \\ 0.050 & 0.250 & 0.333 & 0 & 0 \\ 0.017 & 0 & 0.111 & 0 & 0 \\ 0 & 0.125 & 0 & 0 & 1 \end{bmatrix}$$

Pre-multiplication by this transition matrix, on the probability vector \underline{P}_3 for a student being in one of the five states achieved after the third year of

study, will yield the corresponding probability vector \underline{P}_4 for a student being in one of these five states after the fourth year of study.

The matrix multiplication then yields:

$$\begin{bmatrix} 0.867 & 0.625 & 0.333 & 1 & 0 \\ 0.067 & 0 & 0.222 & 0 & 0 \\ 0.050 & 0.250 & 0.333 & 0 & 0 \\ 0.017 & 0 & 0.111 & 0 & 0 \\ 0 & 0.125 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 0.612 \\ 0.082 \\ 0.092 \\ 0.010 \\ 0.204 \end{bmatrix} = \begin{bmatrix} 0.622 \\ 0.061 \\ 0.082 \\ 0.020 \\ 0.214 \end{bmatrix}$$

This means that in the fourth year of study, the probability of passing all units was 0.622, of passing with one failed unit 0.061, of passing after taking supplementary examinations 0.082, of passing after repeating 0.020, and of being discontinued or deregistered 0.214. These

results are based on the resulting probability vector P_4 as shown above on the right hand side of the matrix equation. Sadly, by the end of the final year, over 21% of the cohort were now discontinued or deregistered.

3.2.3 Proposed Transition Matrices for B Sc Actuarial Science

The following are the corresponding table (Table 8) and matrix reflecting the proposed transition probabilities observed for actuarial science students in their second year of study.

Table 8: Transition Matrices for B Sc Actuarial Science in year 2

		GIVENY1 >				
ACTUALY2		PASS ALL	PASS 1F	PASS SUP	PASS RP	DIS/DR
PASS ALL	0.863	0.483	0.182	0	0	
PASS 1F	0.069	0.241	0.364	0	0	
PASS SUP	0.038	0.207	0.182	0	0	
PASS RP	0.008	0	0.091	0	0	
DIS/DR	0.023	0.069	0.182	0	1	
TOTAL	1	1	1	0	1	

MATRIX

$$\begin{bmatrix} 0.863 & 0.483 & 0.182 & 0 & 0 \\ 0.069 & 0.241 & 0.364 & 0 & 0 \\ 0.038 & 0.207 & 0.182 & 0 & 0 \\ 0.008 & 0 & 0.091 & 0 & 0 \\ 0.023 & 0.069 & 0.182 & 0 & 1 \end{bmatrix}$$

A negative implication of this matrix is seen in the last row, where there is a small probability of 0.023, that a student who has passed all units in first year, will be discontinued or deregistered

after second year, a probability of 0.069, that a student who has passed with one failed unit in first year, will be discontinued or deregistered after second year, and a disturbing probability of

0.182, that a student who has passed after taking supplementary examinations in first year, will be discontinued or deregistered after second year. On the positive side, there is a probability of 0.863 that a student who has passed all units at the first attempt in first year, will also pass all units at the first attempt in the second year.

3.2.4 Progress from Second to Third Year of Study

The following are the corresponding table (Table 9) and matrix reflecting the transition probabilities observed for actuarial science students in their third year of study

Table 9: Transition Matrices for B Sc Actuarial Science in year 3

GIVENY2 >

ACTUALY3

	PASS ALL	PASS 1F	PASS SUP	PASS RP	DIS/DR
PASS ALL	0.845	0.300	0.154	0.5	0
PASS 1F	0.085	0.100	0.154	0	0
PASS SUP	0.054	0.200	0.462	0.5	0
PASS RP	0.008	0.050	0.231	0	0
DIS/DR	0.008	0.350	0.000	0	1
TOTAL	1	1	1	1	1

MATRIX

$$\begin{bmatrix} 0.845 & 0.300 & 0.154 & 0.500 & 0 \\ 0.085 & 0.100 & 0.154 & 0 & 0 \\ 0.054 & 0.200 & 0.462 & 0.500 & 0 \\ 0.008 & 0.050 & 0.231 & 0 & 0 \\ 0.008 & 0.350 & 0 & 0 & 1 \end{bmatrix}$$

A negative implication of this matrix is seen in the last row, where there is a small probability of 0.008, that a student who has passed all units in second year, will be discontinued or deregistered after third year, a probability of 0.350, that a student who has passed with one

failed unit in second year, will be discontinued or deregistered after third year. On the positive side, there is a probability of zero, that a student, who had passed second year after taking supplementary examinations, would be discontinued or deregistered after third year, and

also a probability of zero, that a student who had passed second year after repeating the year, would be discontinued or deregistered after third year. There is a high probability (0.845) that a student who has passed all units at the first attempt in the second year, will also pass all units at the first attempt in the third year.

3.2.5 Progress from Third to Fourth Year of Study

The following are the corresponding table (Table 10) and matrix reflecting the transition probabilities observed for acturial science students in their fourth year of study.

Table 10: Transition Matrices for B Sc Actuarial Science in year 4

GIVEN Y3 >

ACTUAL Y4

	PASS ALL	PASS 1F	PASS SUP	PASS RP	DIS/DR
PASS ALL	0.915	0.600	0.500	0.2	0
PASS 1F	0.034	0.133	0.111	0.2	0
PASS SUP	0.034	0.133	0.278	0	0
PASS RP	0.008	0.000	0.111	0.4	0
DIS/DR	0.008	0.133	0.000	0.2	1
TOTAL	1	1	1	1	1

MATRIX

$$\begin{bmatrix} 0.915 & 0.600 & 0.500 & 0.200 & 0 \\ 0.034 & 0.133 & 0.111 & 0.200 & 0 \\ 0.034 & 0.133 & 0.278 & 0 & 0 \\ 0.008 & 0 & 0.111 & 0.400 & 0 \\ 0.008 & 0.133 & 0 & 0.200 & 1 \end{bmatrix}$$

A negative implication of this matrix is seen in the last row, where there is a small probability of 0.008, that a student who has passed all units in third year, will be discontinued or deregistered after fourth year, a probability of 0.133, that a student who has passed with one failed unit in third year, will be discontinued or deregistered after fourth year, and a probability of 0.200, that a student who had passed third year after

repeating the year, will be discontinued or deregistered after fourth year. On the positive side, there is a probability of zero, that a student, who had passed third year after taking supplementary examinations, would be discontinued or deregistered after fourth year, and a high probability of 0.915, that a student who has passed all units at the first attempt in

the third year, will also pass all units at the first attempt in the fourth year.

4.0 Conclusions from the Study

At present, it is difficult to feel optimistic regarding the way forward to reducing the number of casualties, i.e. students who have to be discontinued or deregistered from their programme. In the case of students being deregistered, in later years, from the Actuarial science programme, this is sometimes as a result of the student being offered lucrative employment, even before completing the degree. In a few cases, a student may be deregistered due to medical problems, which do not permit the student to continue with the studies. In most cases, the cause is academic failure or lack of interest in the programme. Probably it would be advisable for a student, finishing Form 4 in November of year n , and receiving the KCSE results in March of year $n + 1$, to have a longer period out of school

before embarking on a University programme in May of year $n + 1$. In some cases, it may be a case of a student being rushed into a programme, which with more time to think about it, the student did not really wish to pursue. If, of course, students are really set, in heart and mind, on the programme that they want, then there would be no harm in seeking admission for that programme in May of year $n + 1$. Possibly the proposal from the Ministry of Higher Education, that the intake for JAB (Government Sponsored) students in future be in September of year $n + 1$, for students finishing Form 4 in November of year n , would be the way forward, with the ADP intake at the JKUAT main campus also held back from May to September each year. A September intake would give students, who are uncertain about their future, adequate time to think about their options.

Perhaps some recommendations by Uppal and Humphreys (2011), in their section on 'The Way Forward' would be worth considering.

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English Language Literacy for Deaf Learners

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Abstract

This study looked at deaf learners English literacy in Kenya. Deaf learners, a category of persons living with disabilities popularly known as special needs Education (SNE), have continually performed poorly in national examinations which limits their access to institutions of higher learning and to successful employment opportunities later in life. With the enactment of the constitution that provides for integration of all persons in all social, political and economic activities irrespective of race, gender, religion or disability, this study sought to make an enquiry into English Language Literacy which is key to the education of deaf persons as education is an integration tool. The study specifically focused on reading for comprehension and writing for communication competences in deaf learners. The study utilized the descriptive survey design. Five schools for deaf learners, all in the central region of Kenya, were used. Eight deaf learners from each school were selected purposively. These gave a sample size of forty (40) respondents. The learners were subjected to written exercises, written composition to test writing for communication and a reading passage where learners were to respond to questions derived from the passage that tested reading for comprehension. The study settled on standard four learners because this is where reading for comprehension and writing for communication begins. Findings indicated that deaf learners at standard four cannot read for comprehension or write for communication. The study therefore recommended that strategies for teaching English language to deaf learners should be improved; like training special education teachers and providing technologically oriented programmes.

Key words: Special needs education, deaf learners, English language literacy, comprehension.

Introduction

What is English Language literacy?

English language literacy is the ability to read and understand and also communicate adequately both in spoken and written forms in English. English language teaching is essential especially in a country like Kenya where it is the official language. Njoroge (2009) observes that there is no effective education without language. Thus language is one of the essential ingredients for nationhood. English language in the curriculum of Kenya is important, not just as an international language, but for the various roles it plays, economic included (Barasa, 2005). The 8-4-4 syllabus for English language also states that English as a medium of instruction in Kenya schools is indeed a very important subject both in the curriculum and as a service subject (English Language Syllabus 8-4-4, 1984).

Deaf learners are a group of children who are deaf and dumb and belong to a category popularly known as children with educational special needs. According to the Kenya National Association of the Deaf (KNAD), in a survey conducted by Kenya National Survey for persons with disabilities in 2008, about 1.6% or around 600,000 Kenyans are deaf, of whom 230,000 are children. These children are placed in various schools for the deaf in the country. This study targeted these deaf children placed in special deaf schools in the central region of Kenya.

Education for people with disabilities is important because the skills provided by education, such as being able to read and write, are valuable in their own right as a fundamental outcome of development. UNESCO (2007) argues that there is no country in the world that will ever boast of development as long as a certain percentage of its population remains poor and uneducated. In line with the Millennium Development Goals

(MDGs), Kenya is trying to strengthen Special Needs Education (SNE). It has placed SNE as one of its investment programmes of the Kenya Education Sector Support Programme (GoK, 2005) which is the country's five year investment strategic plan for implementing policies on education, training and research (UNESCO, 2007). The government recognizes that SNE is important for human capital development as it prepares learners with special needs to be independent and participate in the economic and social development of the country.

The enrolment of children with special needs has been growing steadily in Kenya. According to Ndurumo (1993), there were 1,373 children enrolled in 26 special schools and units. The Koech Report (1999) reported an enrolment of 14,600 children and 479 programmes in 1998. UNESCO (2007) gives an enrolment of 161,825 in 2003 after the introduction of Free Primary Education (FPE). Currently, enrolment stands at 50,724 (MoE, 2009). These learners are just the lucky few that have been taken to school. There are so many more hidden at home due to the stigma associated with disability in African societies.

Rationale

English language is important in a country like Kenya where it is used as the official language, language of instructions and language of examinations in virtually all schools and by all learners. It is clear that in Kenya most deaf learners are disadvantaged as they lack a sound knowledge of English language which is a critical factor in their academic success and the attainment of gainful employment later in life (Berent et al, 2001).

The new Kenyan constitution emphasizes integration of all persons in all social, political and economic activities irrespective of race, gender, religion or disability. Education is one of the tools that enable such integration. The deaf, a category of persons with disability, have performed poorly in the Kenya Certificate of Education (K.C.P.E) examinations over the years. They, therefore, need to be empowered educationally if they are to be well integrated in society and become active participants in nation building. To achieve this, they need to be equipped with English language skills that are integral in the Kenyan education system which utilizes English language as the medium of

instruction and examination. All learners, with or without disabilities, sit the same examinations; and as such, deaf learners' English language skills need to be addressed to enable them be equal competitors in the national examinations and the job market.

English, like all other foreign languages that are official languages, is taught and learnt in Kenya to achieve several objectives (Barasa, 2005). These objectives include:

- i) Developing the learner's intellectual powers,
- ii) Increasing the learner's personal culture by reading literature and philosophy,
- iii) Increasing the learner's understanding about how language works,
- iv) Teaching the learner to learn a language so that he can do research and
- v) Bringing the learner to better understanding of international issues (Ministry of Education, 1984).

To enable deaf persons become active participants in national building, all hindrances to their literacy must be addressed. In this case, English language, and especially reading and writing skills, need to be addressed since deaf learners have lost listening and speaking due to their impaired organs of hearing and speaking. This study sought to investigate how these English language objectives can best be achieved by establishing whether deaf learners can read and comprehend and also communicate through writing.

Theory

The study was guided by the functional language theory which was proposed by Halliday (1970) and later improved by Cooter & Reutz (2004). The theory posits that children learn language out of the need to function in society. That babies acquire language in order to survive, have their needs met and express themselves. In the same way, deaf learners require English language in order to function comfortably in society. In order to do so, they need to communicate in writing and read for comprehension. This way, they will be able to survive, have their needs met and also express themselves.

Methodology

A qualitative research design was utilized where data was described in prose. Written exercises

collected data. A reading passage collected data that established comprehension while a composition was written by learners to check on communication. The study selected standard four class where reading for comprehension and writing for communication begins. Five schools for the deaf in central region of Kenya served as the data collection sites. Eight learners, four boys and four girls from each school were selected purposively giving a total of forty learners. Learners were coded in Roman numbers from I-VIII while schools were coded A-E.

Learners in every school were requested to read a passage obtained from the Primary English course book and then respond to ten questions derived from the passage. The questions were marked to establish comprehension. The learners were also requested to write a composition on 'the food I like most'. The composition was marked to establish communication.

Data Analysis

Reading for comprehension

The following were comprehension mistakes made by learners.

1. Copying of the questions before responding to the question.

'Why do Njeri and her brother go to school by bus? School 3km from school 3km from home' (AI), (AIII).

2. Responses not matching with the questions. Pupils just picking any word from the passage to serve as the answer. This is shown below;

Question two:

What is the name of Njeri's brother?

Expected answer:

The name of Njeri's brother is Kamau.

Given answer:

'Njeri to herself' (BII)

Question ten:

What did she resolve on herself?

Expected answer:

I mustn't allow this to happen again.

Given answer:

'Morning' (BVII)

3. Others copied any statement from the passage that is not related to the question like;

'What is the name of Njeri's brother? I'm sorry" she said I got up to late his morning' (AII)

'What did Njeri resolve on herself? I got up too late this morning' (AVII).

4. Short answers that are not capturing the whole questions. For instance;

Question two: 'what is the name of Njeri's brother?

Answer:

'School 3km from Kamau' (AVI)

Question nine: 'what was happening when Njeri came back?

Answer:

'Njeri said to herself' (AVII)

Question nine:

'What was happening when Njeri came back?

Answer:

'She said' (A VIII)

Question ten:

'What did she resolve on herself?

Answer:

'Njeri said to herself' (AVIII)

5. Incomplete answers were common with a number of the pupils like;

Question two:

'What is the name of Njeri's brother?

Answer:

'Is Kamau' (AII)

Question three:

'Why had Njeri to walk to school?

Answer:

'Too late she had to walk to school' (AIII)

Others just copied anything to fill the paper as seen here;

Question five:

'Where was she when the children were in their classrooms?

Answer:

'Was she when the children were in thire classroom' (AIV).

Question eight:

'For how long did Njeri cut the grass?'

Answer:

'School 3km fom thirty minutes' (AVI)

5. Others just copied questions and did not provide answers as seen in the following;

Question nine:

'What was happening when Njeri came back?' (C IV).

Question ten:

'Which did she resolve on herself' (CII)

6. One pupil just gave incomplete statements. This is seen in this work below;

Question one:

'Why do Njeri and her brother go to school by bus?

Answer:

'Because the school is' (CVIII)

Question six:

'What was the teacher doing when she got to the classroom?

Answer:

'Said' (CVIII)

7. Most learners did not understand the questions. They just picked any statement from the passage and provided it for an answer. This is seen in the following work;

Question two:

'What is the name of Njeri's brother?'

Answer:

'Kilometers from their school' (DI)

'Usually go to school by bus' (DII)

'Three kilometer from their house' (DIII)

'Is Kamau she asked' (DIV)

'Njeri woke up very tate' (DVII)

Question three:

Why had Njeri to walk to school?

Answer:

'Kamau asked where' (DI)

'One day, Njeri woke up very late' (DII)

'Whre is Kamau she asked' (DIII); (DV)

'Children in their' (DIV)

'Up very late where is Kamau she asked' (DVI)

'Mother He didn't want to miss the bus' (DVII)

'Want to miss the bus Njeri drank hear thea quickly and' (DVIII)

8. Rewriting the question without providing an answer. Some learners just copied the questions as they were without providing any answer. This is seen in the following work;

Question three:

Why had Njeri to walk to school?

Answer:

'Why had Njeri to walk to school?' (EIII), (EVII)

9. Writing illegible things. Some learners wrote illegible things. This is evident in the following work;

Question four:

Where were the children when she got near the school?

Answer:

'Where Bysoho' (EVI)

'TOOldte she 8t nedts' (EVII)

Written composition for communication

The following are grammatical mistakes elicited from pupils' written compositions.

1. Mixture of small and capital letters. Below are a few of the statements found;

'MOST the Food use' Crop (All).

'Pawpaw TomaToLemon BUTTER MEAT Maize Peas Rice BAnAn.'(BIV)

2. Lack of punctuation. There are no full stops, commas or capital letters at the beginning of the sentence. For instance;

a) No capital letters at the beginning of sentences as seen in these sentences;

'You Most CorrtY THE MOTHER' (AI)

b) No full stops or commas as seen below;

'Cooking things eat orange ovals hen chicken egg eating' (AVIII). *Beans Meat cup Maize ugali rice*

c) No paragraphs. The composition is written in sentences as in;

'The FooD I Like MOST FISH' (AV)

'THE beans I LIKE MOST' (AVI)

d) Distorted paragraphing. Here, the paragraph is noted but this is what is presented;

'The Food I Like Most Cook flour hen Meats Nice Food I Will good eat FiSh.

The Tea use Tea and Bread or

Cake Juice Nice good' (All).

e) Poor sentence construction. This is noted in the following sentences;

'The eggs good I Like us NiCe MOST FooD us' (AVII), (AV)

3. Repetition of statements. Like;

'THE Fish I LIKE MOST'

'THE Cake I LIKE MOST' (AVI)

And this form also;

'The FooD I LIKE MOST Bread'

'The FooD I LIKE MOST rice' (AV)

4. Spelling mistakes. This is evidenced in the following respondents;

'Father protective foods rice maiz and cabbag and tomatoe ...' (BVII) (BIV) (CI)

5. Lack of capital letters at the beginning of sentences as seen below;

'Chicken avocado PineaPPle carrot' (BIV) (BII) (BVI) (BVIII)

6. Use of words that are not food. This is seen in the following constructions.

'THE FOOD STEEP I LiKE MOST' (CI)

'KALE WASH KNIFE.....BEARD' (CIV)

7. Use of capital letters throughout. It was observed that some pupils used capital

letters throughout their work except for maybe one letter. This is seen in the following learners;

'THE FOOD KALE I LIKE MOST' (CI)
(CIV)

8. Inappropriate pluralizing. One pupil repeatedly pluralized the word meat wrongly this way,

'The food use meats.....hen eat meat' (All).

9. Illegible work. There were pupils whose work could not be read. This is seen in the following;

'MS HaqAwsolb WAS ThEGo FGon
ORam...' (EIII) (EIV) (EVI) (EVII)

10. Use of small letters throughout as seen in the following work;

'Milk water and flour 2 why I love the
food- help me

Wheat suga clean nice road found do do
work talk who

.....' (DVI)

11. Listing a word in every line. The word's meaning is not necessarily food. Words like, 'cup, hungry, house' are included in the list

12. Inappropriate punctuation as seen in the above work where full-stops appear anywhere. There is also inappropriate use of commas as seen in the following work;

'chaPati, bean, chicken, rice, Peas, mik,
Why I Love, the, most, Happy, food,
Banana, orange, meat, cook, mother,
father.....' (DV)

12. Wrong spellings as evidenced in the following work;

'calss, standerd' (DIV); 'mik, sisther, borther
, chant, paen' (DVII); 'paernt, pest, 'beant' (D
VII)

Incoherent work. Most of the work lacks coherence and logical flow. This is seen in the following work;

'mik the ban chicken rond end' (DI);
(DII); (DIII); (DIV)

Findings

Findings established that deaf learners at standard four cannot read for comprehension nor write for communication. This concurs with Emerson, (2010); de Villiers & Pomerantz, (1992); and Paul & Gustafson (1991) that writing is a complex activity that requires an in-depth knowledge of words. This helps in vocabulary development which in turn helps in the integration of concepts, meanings, nuances, examples, uses, associations and figurative usage. The great number of grammatical

mistakes indicate that deaf children have not developed enough vocabulary to enable them accomplish writing tasks. This could be attributed to their lack of speech as observed by the Deaf Literacy Researchers (via internet) that deaf student's lack of exposure to spoken language makes teaching traditional sound-letter correspondence difficult, if not impossible. The researchers also assert that for those deaf students whose first language is signing, learning to read and write English constitutes learning a second language with a different grammar, lexicon and syntax. The current study established that hardly any child was able to communicate through writing. In conclusion, this section depicted Ndurumo's (1986), Traxler's (2000) observations, that deaf learners are usually several years behind their regular peers in terms of literacy.

Recommendations

The findings of this study are worrying because at this level and age, most regular learners can comprehend and communicate through writing. This poses a challenge as these are their competitors in the job market and in life once they get out of school. The study therefore recommends that English language literacy for deaf learners should be taken seriously. Strategies of teaching English language to the deaf should be improved. Enough specially trained teachers in the area of the deaf should be posted to the deaf schools so as to step up English language teaching. Technologically designed methods should be used to meet the deaf learners' needs. There are so many computer programs for the deaf designed to enable deaf learners read and write with ease. The learning materials should be designed to meet the needs of the deaf learners.

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Effective Teacher Performance Appraisal Practices for Achievement of Knowledge Economy in Uasin-Gishu County

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Abstract

The primary objective of teacher performance appraisal is to evaluate the effectiveness of delivery of relevant knowledge by teachers to learners with a view to achieving the best outcomes in the learning processes. This study involving a sample of 228 teachers, 21 school principals and 3 Quality Assurance and Standard Officers, sought to investigate the effectiveness of teacher appraisal practices employed in Day Mixed Secondary schools in Uasin-Gishu County and the effect on the achievement of knowledge economy. The researcher used the cross-sectional survey and the naturalistic (phenomenological) designs to collect both quantitative and qualitative information. The questionnaires from the teachers yielded both quantifiable and qualitative data that was analyzed using descriptive statistics and reported in frequency tables and percentages. The in-depth interviews with the school principals and DQASOs yielded qualitative data which was reported using narrative form. The study was significant in demonstrating that the appraisal practices for teachers in mixed day schools in Uasin-Gishu County may not be effective in recognizing and nurturing talents to meet the socio-economic needs of Kenya. Further, these factors do not significantly contribute to the achievement of knowledge economy in the county. To that end, it is recommended that, in order to achieve the purposes of education in the modern global economy, it is necessary to embrace teacher appraisal practices incorporating research and innovation.

Keywords: **Teacher, Appraisal, Practices, Knowledge, Economy**

INTRODUCTION

Appraisal Systems

Appraisal systems are intended to enable raters to measure the employee's performance and provide the motivation to assign the most accurate ratings. A comprehensive appraisal system may provide a basis for key managerial decisions relating to allocation of duties and responsibility Mullins (2005). The current appraisal method used in the organizations is that of 360 degrees feedback or Multi-rate assessment. With this method, managers, peers, customers, suppliers or colleagues are asked to complete questionnaires on the employee being assessed. The person assessed also completes a questionnaire. This method recognizes that the manager is no longer the sole source of performance information (Armstrong, 2009). It is postulated that 360 degrees rating method covers various performance dimensions giving an individual the advantage of having a broader perspective of how they are perceived by others and therefore obtain a more rounded view of their performance.

Teachers' Performance Appraisal

In the teaching profession, performance appraisal refers to the process of observing and evaluating a teacher's performance in order to help the teacher identify their strengths and weaknesses and assess their potential for promotion, career development and professional growth for better output. The correct and effective methods for teacher performance appraisal are critical for both student character formation and excellent academic performance since quality of teachers depends to some extent on the quality of their professional development. Fairness of the appraisal system and the clarity of appraisal criteria are important for increasing the job satisfaction. It is imperative therefore, that an effective appraisal system and mechanism be established and maintained to assure quality and relevance in education.

This view is affirmed by Nyakwana, (2008) that the modern world requires a rich, highly qualified and educated human resource capable of understanding the challenges of life and providing practical solutions for them. Therefore

teacher effectiveness is central in the promotion of quality and relevant education that is critical to the achievement of a knowledge economy in the globalised world.

An effective teacher performance appraisal system discovers and addresses the strengths and weaknesses of teachers and provides necessary guidance and support to bring about efficiency and effectiveness (Stronge, 1997). Performance appraisal methods should help create a cadre of highly motivated teachers that are effective, efficient and productive in delivering quality education that is critical in social-economic development of a country (Harris, 2011). The concept of knowledge economy is that knowledge and education can be treated as tradable capital assets. Thriving knowledge economy requires an environment that supports research, invention and innovations to create innovative industry, wealth and prosperity. The environment ought to identify and nurture talents for this purpose.

Performance Appraisal in Perspective

During the colonial period, most schools in Kenya were managed by missionaries who were responsible for assessing and appraising their teachers. The teachers perceived the exercise as intimidating, punitive and retributive since they were not actively involved in it. After independence, the role was assumed by the school inspectors who perpetuated the disciplinarian tradition of fault-finding and non involvement of teachers in their own appraisal. Just as in the colonial days, the performance appraisal methods were largely, top-down and non participatory and were resented by teachers. Subsequently, there were reforms that abolished the inspectorate system in quality assurance and performance appraisal and replaced with Directorate of Quality Assurance and Standards (DQAS) in the education sector.

To date, the role of ensuring quality and standards in education in Kenya is performed by Quality Assurance and Standards Officers who are expected to help improve and maintain quality and standards and ensure relevance in education (Milcah, Aoko, Indosi and Agak, 2010). The officers are expected to collaborate with the head teachers and teachers in schools to enhance curriculum delivery effectiveness and efficiency. They are also expected to

observe the teachers in their teaching, appraise them, and support them in making changes necessary in addressing the areas of weakness with a view of promoting teacher efficiency and improving education standards. Despite these changes, the practice of teacher appraisal in Kenyan secondary schools is still being seen as a fault finding exercise and a continuation of the previous inspectorate practice. It is further reported that The Teachers Service Commission (TSC) will appoint practicing teachers and head teachers to serve as Quality and Standards Officers. They will, in that capacity, undertake peer standards assessment on fellow educators and will be vested with powers to enter any educational institution with or without notice and carry out impromptu inspection. They have been granted sweeping powers, reminiscent of the former school inspectors, to summon a teacher and demand the production of any teaching document and material and the teachers who don't comply will not be considered for promotion (Education Newspaper, July.3 2013). Mullins (2005) strongly contends that the main objective of performance appraisal is to improve the performance of the individual leading to the improvement of the organization or institution and consequently to the growth and development of the economy. The correct and effective methods for teacher performance appraisal are hence very critical in this aspect. Stronge (1997) explains that teachers are likely to be more satisfied and experience less stress and enjoy higher levels of job satisfaction where the appraisal criteria used to appraise their performance involves their active participation. This study, therefore, sought to find out whether appraisal practices and methods used in mixed day secondary schools in Uasin Gishu County were effective in helping to improve the delivery of quality education and significantly contributing in the achievement of knowledge economy. It also sought to find out the perception of teachers on these appraisal practices and methods.

Significance of the Study

The study was significant in disclosing that the teacher appraisal practices employed in the mixed day secondary schools in Uasin Gishu County could not be significantly contributing in the achievement of knowledge economy. It also demonstrated that the appraisal practices might not be relevant in recognizing and nurturing

talents to meet the socio-economic needs of the County. The policy makers will use the information from this study to improve the current appraisal practices and consequently address the challenges that face teacher development in secondary schools. Through this research, new knowledge was generated especially on how to come up with the appraisal scheme that incorporates research and innovations.

The study Area

This study was carried out in Uasin Gishu County which is situated in the Rift Valley and covers 3218 km². It borders Nandi and Kericho Counties to the south, Marakwet and Baringo Counties to the east Trans-Nzoia to the north and Kakamega to the west. The schools and the teachers that participated in the study were randomly selected using simple random sampling. The study consisted of 254 participants who included 228 teachers from the population of about 2280 teachers, 23 principals and 3 DQASOs from the County.

Research Design and Methodology

The researcher used the cross-sectional survey and naturalistic (phenomenological) designs to collect both quantitative and qualitative data from the study participants. Questionnaires with both closed and open ended items on the practices of teacher performance appraisal were administered to the teachers that yielded quantifiable information which was analyzed using descriptive statistics and reported in frequencies tables and percentages. Qualitative data from the in-depth interviews with the school principals and the Quality Assurance and Standards officers on the same were reported using thick descriptions (narration and direct quotations). In some instances, the responses from the interviews were coded and categorized into themes and presented in frequencies and tables using Statistical Package for Social Sciences (SPSS) version 11.5.

The researcher used a test-retest to establish the reliability of the instrument twice in a span of two weeks. The correlation coefficient was 0.83 for the teachers and 0.75 for the school principals. The high coefficient meant that the instruments were reliable to be used in the actual study. The researcher then proceeded to administer the questionnaires and conduct interviews.

This approach enabled the researcher in generalizing the results to all the mixed day secondary schools within Uasin Gishu County.

RESULTS AND DISCUSSION

Practices and Methods used to appraise and assess teachers' performance

The study found that some of the teacher performance appraisal practices and methods employed by the Directorate of Quality Assurance and Standards and the principals in the mixed secondary schools in Uasin Gishu County are; verbal praises, rewarding good performance, bench-marking, checking students work, classroom visits and teacher self appraisal among others. The researcher found that appraisals for reward are normally conducted after the K.C.S.E results are out. In the event of good performance, hardly do Quality Officers visit the schools to bench mark but the schools concerned usually have a

reward system to motivate both the students and teachers. The Performance appraisal for good performing schools would be beneficial for the quality of knowledge acquired and delivery mechanism thereof.

A bench mark is a standard against which to measure present performance. The responses of the participants on bench marking exercise yielded an average percentage of 28 with the highest coming from the DQASO. Interview from the head teachers revealed that very few take the teachers for the bench marking. Majority 14 (76%) of the principals argued that the bench marking exercise is expensive. It is through bench marking that new and relevant approaches can be adopted that can lead to research and innovation. There should be sufficient funds availed through budgetary allocations to schools for this important appraisal exercise. The findings are reflected in Table 1 below.

Table 1 Responses of participants on performance appraisal practices N=224

Appraisal practices	Principal		DQASO		Teachers		Average	
	F	%	F	%	f	%	f	%
Give verbal praise	20	92	3	100	112	56	135	60.26
Reward good performance	21	100	3	100	107	53.3	131	58.48
Checking student work	10	47.6	-	-	116	58	126	56.25
Takes teacher for benchmarking	4	19	2	66.6	56	28	62	27.6
Classroom Observation	5	23.8	3	100	36	18	44	19.6
Ask teachers to do self appraisal	7	33.3	-	-	34	17	41	18.3
Hold discussion after class observation	3	14.3	3	100	22	11	28	12.5
Uses sample survey of students work	3	14.3	-	-	22	11	25	11.1
Appraisal Interview	5	23.8	1	33.3	14	7	20	8.9

The Teachers Service Commission and the Ministry of Education have entrusted the work of

appraising the teachers to the Directorate of Quality and Standards Officers. The Handbook

for Inspection of Educational Institutions spells out the objectives and duties of the DQUAS. Some of the objectives are; to identify educational institutional needs for improvement, ensure that quality teaching is going on well, advise on the provision of proper and adequate physical facilities in educational institutions etc. The handbook also contains the guidelines that are followed during the inspection. The officers make the first interface with the teachers through the principal whom they require to avail to them any information about the progress of the school.

During the inspection the officers inspect on areas such as; lesson plans and development, language skills, classroom communication/interaction, curriculum knowledge and interpretation, organization of classroom resource teachers' record books, students' participation and reason for wastage, examination performance data, the quality of learning environment, educational experience and learning outcomes among others and thereafter make overall quality of the lesson and the teacher assessment. The guidelines do not require information such as the teachers' use of or learners' introduction to technology, innovation and research that may make them transfer or better utilize acquired knowledge. It also does not require evidence of any collaborative arrangements between the teachers and their learning institutions with industry/business and or government which could yield new ideas innovations and inventions.

In the light of the globalized world economy, knowledge economy incorporating the latest technology is critical. An effective teacher performance appraisal system should therefore help the teachers to incorporate the latest technology and develop and produce learners with ability to help Kenya to achieve its vision 2030. Knowledge is an asset that can be leveraged to create the next generation of technology and prosperity. A strong sustainable knowledge economy can stimulate growth for both individual and organizations in the community. It should support in the creation and commercialization of innovations. The teachers and learners should develop and enhance their intellectual capacity to yield new and innovative ideas.

Classroom observation and checking students work are key tools in testing the students' ideas,

understanding and innovativeness in the progress towards the achievement of knowledge economy. From the researcher's findings about 23% of the school principals and 18% of teachers confirmed that there was direct classroom observation. This is a very low percentage from the principals given the importance of observing the teachers in the classroom.

Classroom observation and student checking include the interpretation of all forms of class marks, standardized tests and absence patterns. In this way, the head teacher can see if it varies from the norm of the year and if so the question this raises for the appraisal of the teacher concerned. It is the responsibility of the head teacher to ensure that teaching and learning is taking place by checking students' work (Teachers Service Commission, 2005). This is done through supervisory evaluation that include adherence to schemes of work, lesson notes, record of work and pupils notebooks. It is through class observations that the school principals can determine in a concrete way the skills of the teacher in curriculum delivery. The head teachers are mandated by the TSC Code of Regulations to visit a classroom while teaching is taking place. They are expected to make assessment of the teachers and be able to use the assessment in appraising the teachers objectively.

In regards to self appraisal, the low percentages observed from both the school principals and the teachers show that teachers are not actively involved in this exercise and may probably not be guided and encouraged to evaluate themselves. The low percentages in Sample survey and interview as methods of teacher performance appraisal shows that the majority of the head teachers do not take time to sample the students work and compare against other subjects or other classes.

The researcher's interview with the school principals and the DQASOs established that most principals under study did not have their own school teacher performance appraisal systems. However because the TSC does not regularly carry out the appraisals most schools do not have their teachers appraised, therefore, acquisition of knowledge may not be ascertained. The reasons given by the principals and the teachers for submitting to appraisal are even more revealing as shown in Table 2 below.

Table 2 Perceptions of teachers on why principals administer performance appraisal (N=200)

Responses	F	%
a) In order to meet the TSC requirement	120	60
b) To improve performance in school	89	44.5
c) To provide guiding and counseling	29	14.5
d) To facilitate teachers transfer	29	14.5
e) To put the teachers performance categories	18	9
f) To punish the teachers	11	5.5

The TSC Code of Regulation (2005) requires that head teachers appraise the teachers annually and send to them the appraisal reports. On meeting TSC requirement, majority of the teachers 120 (60%) indicated that the main reason for administering teacher performance appraisal was to meet the TSC requirement. This can be taken to mean that teachers view the appraisal practices as a procedural duty that the head teachers have to fulfill to meet the demands of the TSC. Teacher performance appraisals cannot be effective if they are only administered to fulfill the TSC requirements. It is to be noted that a bigger percentage (55%) does not perceive appraisals as a means of advancing knowledge economy.

Guiding and counseling offers professional support for career development and professional growth. This small percentage is an indicator that the provision of guiding and counseling is inadequate. Teachers in mixed day public and private secondary schools in Uasin Gishu County need a lot of professional guidance to help them grow in the teaching profession. On the item of putting the teachers' in performance categories yielded 9% while punishing the teachers yielded 5.5% respectively. The small percentages are taken to mean that teachers do not perceive appraisal practices as a means of putting them in performance categories or punishing them. Majority of teachers (55%) indicated that the appraisal practices did not facilitate their promotion.

The researcher further asked the teachers to show whether the appraisals were highly

regarded. Majority of the teachers (50%) indicated that the appraisals are not highly regarded in mixed day public and private schools in Uasin Gishu County. This is because the appraisals are largely carried out to reward good performance in K.C.S.E exams and do not capture all the teachers' progress. Furthermore, the head teachers do not discuss the appraisal reports with teachers concerned before they send to the TSC for fear of demoralizing the teachers concerned. The principals need to establish a review audit system to prevent bias or personal feelings from impacting on the appraisal as well as documenting performance of teachers and the rating systems.

CONCLUSION

School principals and the DQASOs are the principal appraisers on behalf of the Ministry of Education and the Teachers Service Commission. However, the appraisal system is not well structured and coordinated. The appraisers adopt different methods and practices in appraising the performance of teachers in the schools studied with little benchmarking if any. The DQASOs usually go to schools to carry out an appraisal where there is a crisis or when called upon. On the other hand, school principals largely conduct appraisal once a year upon the receipt of National examination results. At this time, the intention is basically to reward teachers and students according to subject performance through a reward system. Most times school principals are reluctant to make teacher appraisal through direct class

room observation on the pretext that this practice is intimidating. There is little involvement of teachers and learners in the appraisal and if any such involvement comes at the tail-end of the process. Basing on the research findings, the researcher concluded that appraisal practices were inadequate and ineffective in helping to bring about the desired teacher effectiveness and learning outcomes for the improvement and promotion of knowledge economy.

RECOMMENDATIONS

The researcher recommends that modern technology be utilized in the process of teacher performance appraisal to stimulate and promote research and innovation by both teachers and learners. The Ministry of Education Science and

Technology and the Teachers Service Commission should conduct a nationwide study and develop appropriate appraisal tools to achieve this. The Ministry of Education Science and Technology and the Teachers Service Commission do restructure and regulate the system for teacher performance appraisal and make the same more participatory and predictable to involve both the teachers and the learners. Self evaluation by individual teachers, peer review through discussion should be encouraged. Bench marking be incorporated in and considered a critical aspect in the process of teacher performances appraisal. The researcher recommends that the head teachers consider creating time to observe the teachers in class to determine the teaching and learning processes.

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The Analysis of Impact of Vocational Training for Rural Development

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Abstract

This study analysed the impact of vocational training for rural development. It sought to answer questions on the youth polytechnics (YPs) responsiveness towards meeting the aspirations and needs of the trainees. It determined how graduates of YPs fared in the world of work and evaluated extent to which the community was involved by YPs in facing rural development challenges. The study was carried out in the four YPs of Nyambene District by use of questionnaires, interview schedules and check lists as study

instruments. The study adopted a case study design involving 144 respondents. The study targeted YP managers, instructors, parents/ Board of Governors, second year trainees and the adult YP leavers serving within the host community. The main study findings included inadequate: training tools, equipment and infrastructures, number of instructors, finances, utilization of information communication technology; community poor attitude towards YP vocational training, unutilized physical resources, poor income generating projects, and low enrolment. Practically, the study enlightened the need for YP programme designers on redesigning the existing curriculum to suit the dynamic work of today's technology so as to address present and future challenges of vocational training. The parent ministry in charge of YPs would find the study useful in the formulation of future plans aimed at strengthening YP training in imparting relevant skills to trainees in readiness for self-employment in rural areas. The study is important theoretically in that it contributes to the advancement of knowledge about vocational programme development in YPs in Nyambene District in particular and in Kenya at large. The findings are key factors influencing trainees vocational training in various courses at youth polytechnics aimed at developing the local community economically. Finally, the study forms a basis on which other scholars could develop their studies in future in pursuant of unresolved developmental issues in vocational training.

Key words: Training, Development, and Needs

Background to the Problem

Formalized education in Africa started with the arrival of the missionaries in the late 18th century. They built churches and schools which were used to train children in teaching, evangelism, agriculture, vocational and technical skills to meet the social needs of a community. However, with time changes, the educational emphasis was shifted to producing manpower for clerical jobs to serve the colonial administration's personnel requirements (Mureithi, 2008).

In the long run, grammar secondary education was given prominence at the expense of technical and vocational education. By this prioritization, the best performers in pre-secondary institutions were attracted into the grammar-type secondary schools. Owigar, (2003) observes that Students who were found to be academically weak were directed to enter vocational and technical institutions or trade centres. This was the type of educational system Kenya, like many other countries which emerged from colonization, inherited on the attainment of independence.

Moreover, the process of planning and expanding education has encountered various problems in many developing countries. For an example, although the Kenyan government spends over 40% of its total budget on education (Development plan 1993–1997, 1998-2002 and 2003-2007: Kenya Government), the economic worth of education has not been realized to a big extent.

The above illustrates national preference for academic education as opposed to Technical and Vocational Education as was explained by the Philips Foster Vocational Education Fallacy findings on vocational education training in Ghana and Nigeria which contend that sampled respondents “viewed academic education as the gateway for their children to gain access to prestigious professions” (Foster, 1965 and 1979).

Chi-Yuen Wu (2005:57) observes that Chinese government believes that modernization of education by applying information technology referred to as '*informationization*' is essential in order to transform the heavy population burden into valuable human resource. This echoes the fact that education is the key driver of economic growth, competitiveness and human welfare. Poor education, “raw”, reduces the value of human capital by impending growth. This in turn slows down the adoption of new technologies. Most importantly, the accumulated technical organizational innovations of human kind can through training in principle enable poor countries catch up fairly fast with economic giants of the world.

Latin-American countries face serious difficulties in maintaining their adolescents from disadvantaged background in secondary schools and training institutions. Many strategies are being employed to retain them in regular schools and also to create alternative avenues that would give them vocational training which would improve their employment opportunities. Mostly these initiatives are linked with vocational

training and social programs to facilitate and improve the transition of trainees to the world of work. A comparative review of programs that give youngsters an opportunity to reintegrate to secondary education in more flexible alternatives involving public and private partnerships, often linked with vocational training programmes and other strategies to facilitate the transition to work has been enforced in many Latin American countries such as Brazil, Argentina and Peru (Jacinto, 2002a).

However, the utilization and allocation of skills in a dynamic, expanding economy are fundamentally different from macroeconomic situations in which there is no growth, and poor governance. For instance, In South Korea and China, there has been employment for TVSD graduates of almost all institutions; while in a stagnant economy like Sri Lanka, there may only be jobs for some of the very best students (Adams, 2006).

King and Palmer, (2006) contend that one-sided prioritization of education in Africa remained unchanged even long after independence although manpower requirements have drastically changed over the years. This inadvertently led to admission culture which gave prominence to students who offered the so-called 'academic programmes and underrated applicants who offered technical, vocational and agricultural subjects at the secondary school level and who aspired to enter the university to pursue these courses at the degree level.

This trend was borne out of the persistent traditional belief that vocational and technical courses were for the academically less endowed students and their place was in technical education like Youth Polytechnics. No doubt there is a school of thought that believes that the YPs of today have generally been too theoretical in the approach to their courses and have virtually ignored to give any training to their students in innovation and entrepreneurship to the extent that students who graduates from YPs are not in any way equipped for self-employment, but rather "employment". However, this study endeavoured to determine how vocational training in YPs has impacted on Socio-economic development of rural areas of Nyambene region. However, this paper addressed the questions:

- 1 What are the views of the youth polytechnic community about responsibility of youth polytechnics in meeting training needs and aspirations of the trainees?
- 2 What occupational activities are the youth polytechnic leavers doing in the world of work?
- 3 What are the problems which hinder youth polytechnic leavers from initiating businesses related to vocational skills they acquired at YPs?

Relevant Vocational job Skills

From the international perspective, the skills to prepare students for the 21st Century have been classified into four components as outlined by Swarts (2009):

- a) Digital-Age Literacy: these include basic scientific, economic and technological literacy; visual and information literacy and multicultural literacy and global awareness.
- b) Effective Communication. These are personal, social and civic responsibility; training, collaboration and interpersonal skills; and interactive communication.
- c) Inventive Thinking. These include risk taking, high order thinking and sound reasoning; self-direction, curiosity and creativity and adaptability, managing and complexity.
- d) High Productivity. These are: prioritizing, planning and managing for results, effective use of real-world tools, and ability to produce relevant and high quality products.

In this respect, studies by various scholars suggest that appropriate national human capital specificity does not come by chance but through rigorous research and documentation of labour market information, (Marger and Beach (1967)) and Maxim and Robinson, (2008)). These studies continue to claim that in some countries particularly in the US, critical workforce skills that are required for moving the economy forward have been identified and documented in the 'Dictionary Of Occupational Titles' (DOT). The DOT serves as a mirror for educational institutions in developing curricula to ensure that graduates from the education system meet the

demands of the jobs they were likely to engage in.

In curriculum development, information from the DOT was used as a frame and community labour market information was sought to update information from the DOT in making training programs meet current job market expectations, (William 1982). It was necessary to find out the preparations made by YPs in Nyambene region in terms of identifying critical jobs and skills for the development of the region.

Vocational Skills Training Curriculum

According to Loubser (1983), the YP training program are to be determined on the basis of a survey of which skills are locally needed and should be kept flexible to respond to changing community needs as times and technology change. Thus, trainees would acquire a range of elementary skills that would enable one to be versatile in the services they offer. Ogula (2003:35) observes that: 'Without a training needs assessment, it is not possible to design courses that are relevant to the needs and concerns of children. These studies point out that education and training has strong bearing on the nature of economic activities that exist in a country, particularly those of the formal sector and industrial set up.

Research findings on role of vocational education in economic development in Malaysia by Ramlee, Mustapha and James, Greenan (2002:11) found out that employers perceived that vocational curricula had questionable relevance to the contemporary needs of business and industry and that employers' participation in school-business partnerships was minimal. They suggested that vocational education and training institutions should conduct continuous needs assessments to create relevant curriculum.

From research article entitled "Partnerships with Industry for Efficient and Effective Implementation of VET" specifically in African countries by Jeongwoo, (2010) claims that communication with the industry is critical in VET practices on many levels to identify and anticipate skill needs in the future. The communication enables VET providers to learn what skills are in demand and to train for jobs that change regularly and allow employers to have input into the curriculum of VET and often gives them a recruiting tool to attract skilled

workers. The industry should be brought into the design of partnership programs from the beginning. These studies concur that VET curricula be made in consultation with local industries. However, studies on local surveys by YPs in Nyambene to determine local vocational training requirements are not there. Hence this study examined the basis on which YPs in Nyambene undertook their VET curricula innovations so as to satisfy the local community vocational skills training needs.

Owigar, (2003:86) lamented that the curricula of YPs lack focus and are not flexible in content. Indeed training programs are not adequately adapted to the labor market needs. The fact that rapid technological developments render skills obsolete quietly, then vocational training institutions must demand higher level of initiative, innovativeness and more frequent retraining. Further Owigar, (2003:88) claims that feedback information about labour market outcome is an important step towards orienting the training system to output rather than input and the provision of labour market information to trainees not only influence occupational choices but also directs them to employment opportunities. The study further emphasized on the need of flexible curriculum providing short courses that would prepare the youths for employment in informal sector. The study concluded that, the vocational training programs in vocational training institutions in Kenya are based on fixed and predetermined criteria, which at times have no bearing on the labour market realities. How well YPs in EPK are preparing their trainees in their respective areas of specific vocational skills training in regard to information related to local labour market realities was one of the concerns for the current study.

Studies carried by Victor,(2009:146) entitled "Addressing Youth Unemployment and Poverty in Nigeria: A Call for Action, Not Rhetoric" as cited from (Hamel & Prahalad, July 1994) claims that for any person to compete effectively in the rapidly evolving knowledge-driven global economy he or she must possess relevant job competencies, including technical, business, cultural, interpersonal and intellectual competencies. These could be obtained in well-equipped technical and vocational colleges. These studies continue to observe that to ensure standards, the graduates of technical institutions should be thoroughly tested, certified

and registered before permitted to work as technicians in their chosen fields. These arguments are valid in that technology keeps on changing and advancing as society and environment demand new products and services. In this regard, did these attributes of vocational education and training exist among youth polytechnics in Nyambene region as recommended by the ministry servicing vocational skills training in Kenya?

The report of NVCET examinations released in March 2010 by the ministry of Youth Affairs and Sports indicated that 58% of students who sat national carpentry test in 63 YPs failed; while 6% were given referrals (fwangari@ke.nationmedia.com). The report added that the total number of trainees in the republic YPs who sat NVCET examinations dropped by 20% compared to 2009 candidates. The report lamented that this was mostly caused by a negative perception by class eight and four leavers about YP vocational training. While it is generally agreed that poor performance in any national examinations cannot be pegged to a single factor, it is widely accepted that poor performance can be improved on the positive if all the causative factors are adequately addressed. Indeed, this study examined the instructional training requirements available in YPs in Nyambene region against the requirements of NVCET examining body and hence closed this gap in literature.

According to studies carried in Kenya on education and sustainable development in selected model YPs by Kelemba (2010) and published by UNESCO-UNIVOC (2010:33), points that when managers and instructors were asked to state knowledge, skills and attitudes that the trainees needed to live in a sustainable way reported the following. Both managers and instructors said that the trainees needed exchange programmes, practical application of education and sustainable development, life-skills and collaboration with stakeholders, parents and guardians. However, the researcher observes that one instructor reported that:

'The trainees need exchange programmes to enable them see how other people practice sustainable development and that their parents and guardians should also be involved'.

While the researcher sought this information using a case study design, the same information is useful in predicting what may happen in future in similar circumstances but cannot be generalized to other institutions of vocational education because they operate under different training environment. However, these findings fell short of providing solutions to critical issues like; how exchange programmes, practical applications of vocational education, life skills and collaboration with stake holders could be implemented in order to mitigate problems barring adequate acquisition of vocational skills by YP trainees, which the current study sought answers to.

In similar studies on integrating education for sustainable development in centres of excellence in TVET in Kenya by Simiyu (2010) and published by UNESCO-UNIVOC (2010: 49-50) show that the vocational curricula need to be revisited and remodeled so as to allow a compatible orientation and smooth connectivity of sustainable development with TVET. It is clear that this study found the curricula weak in several aspects that need to be overhauled in order to address training challenges. These studies, having adopted descriptive research design fell short of describing certain aspects of the curricula that needed to be addressed. Thus, several links between interrelated trades in terms of knowledge and skills interconnectivity that would allow sustainable development within vocational education ought to have been brought to the surface, which was a contention of this study.

Vocational job Competences and Work Practices

Okoro, (1993) as cited in the Journal of Career and Technical Education, Vol. 23, No. 1, (2007:58) interviewed teachers, young school leavers and students of pre-vocational subjects in Nigeria on the problems militating against proper imparting of vocational skills in schools and revealed that lack of funds, lack of facilities, mismanagement of resources, lack of qualified personnel, and lack of cooperation from principals, among others were the key challenges facing vocational education in Bauchi Metropolis of Nigeria. He further points out most of the employers require certain skills from school leavers before being employed. These studies further contend that some of these basic skills include; communication, image, and

employability skills. Hence the current study ascertained how well these basic skills were developed and later utilized in the world of work in Nyambene region.

Research study conducted by Bello, et al. (2007) on Vocational Training Needs of 15 – 25 Years Old Out-of-School Youths in Bauchi Metropolis of Nigeria agree with findings of (Okoro, 1993) that general education provides the society with values, communicative and manipulative skills on which effective vocational education is based. Thus, vocational education builds on a foundation of good general education.

The same studies indicated that a Survey of “Vocational Training Needs of 15 – 25 Years Old Out-of-School Youths in Bauchi Metropolis of Nigeria” showed percentages of the responses of the respondents when requested to identify a vocational training area in which they were interested in pursuing from a list of options provided. The youths chose Computer Maintenance and Operation Works (18.75%), followed by Tailoring (9.38%), then Electrical Installation and Maintenance work (8.59%), Furniture Making (6.25%), Further Education (5.47%), Hair Dresser/Barbing (4.69%), and Carpentry and Joinery (3.91 %). Other training needs options attracted percentages from 3.13% and below, indicating that they were not very popular among the youth.

Akubudike (2003) as cited by Journal of Career and Technical Education, Vol. 23, No. 1, (2007:58) also reports other hindrances facing VET as; inadequate staffing, poor attitude of students, lack of proper guidance and counselling, un-coordination of career-oriented school clubs or association, lack of exposure to public lectures as some of the problems militating against vocational education offered the youths. However, these studies did not explore the extent to which these problems were addressed through vocational instructions which would form the basis for molding the youths into the world of work by introducing them to theoretical concepts leading to actual practice at the workshop floor. Moreover, different training environments encounter varied challenges, hence the current study need found out specific hindrances that affected adequate VET programs in YPs in Nyambene.

According to Mureithi, (2008:4) on studies entitled “challenges facing vocational training

centers in human resource development: the case of Youth Polytechnics in Rift Valley Province, Kenya”, argues that the informal sector has a lot of potential to create jobs, develop future entrepreneurs and to produce quality and attractively priced products. Unfortunately, there is consistent lack of adequate and appropriate technical and vocational skills in this sector. This limits its ability to contribute in the creation of jobs and income generating activities and also affects the quality of goods and services produced reducing their competitiveness in a global market. Besides, these studies continued to claim that vocational education has the potential to curb high rates of unemployment especially among the youth and women. By offering hands-on skills, VET has the potential to offer the much needed skills to develop the informal sector by enabling individuals to develop self employment. In this regard, how YPs in Nyambene region managed to offer VET programs whose with relevant skills documented by the current study

Theoretical Framework

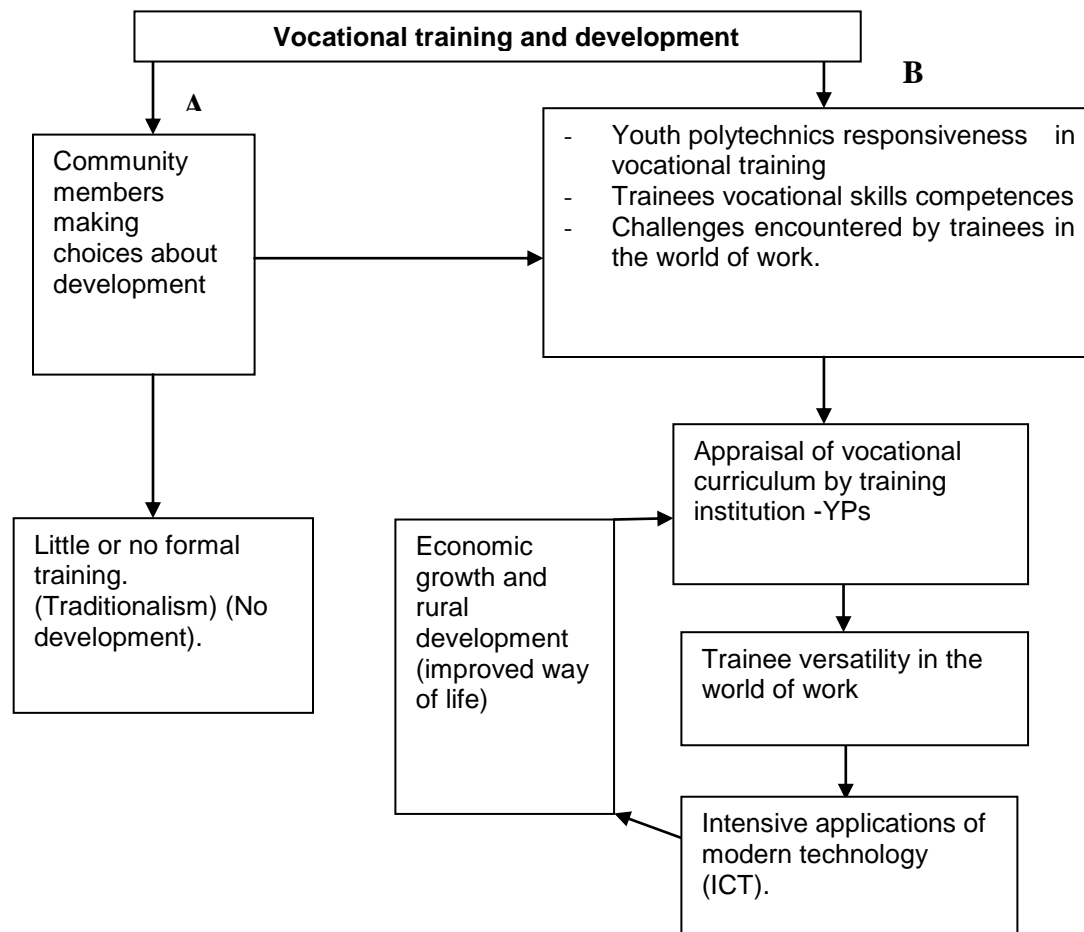
This study investigated into the impact of vocational training for rural developments. Therefore, the theory of agrarian transformation and socio-cultural change guided the study, especially the dimension of the theory touching on agrarian transformation laid more emphasis (Todoro, 1982) as cited by Orodho (2003). The theory concretizes transition from ‘traditionalism’ to ‘modernity’ leading to societal transformation in developments. When modernization of agriculture takes place, old practices are abandoned in favour of new and more viable technologically oriented practices. Thus, change in vocational training mechanism by giving trainees hands on experiences, provision of modern training tools and techniques as well as following leavers to identify how they are doing in the field of work results to good training outputs. Thus, when these changes are realized, they would form the basis for ensuring training environment that are adequately equipped for trainees’ acquisition of specific skills competencies.

Conceptual Framework

The initial conceptualization is that community members have a choice to make between development in modern technology and stagnation in the tradition way of life. Training

on vocational skills is the springboard to development, and the community people (youth) are the necessary human resource for manpower in economic growth. The framework conceptualizes that the core problems of wide spread poverty, raising unemployment and rapid population growth are as a result of stagnation and often retrogressions of economic life in rural areas characterized by tradition methods of farming, craft, poor shelter among others as shown in figure 1, (A–Conservative path – retrogression).

On the contrary, the framework conceptualizes development to individual’s acquisition of vocational training skills that leads to a more complex, technologically advanced and rapidly changing style of life as shown in figure 1 by path B – dynamic path of development. The vocationally acquired skills are manipulated by trainees to be versatile in the world of work within the community and the rest of the world.



Key

A-conservative path -Retrogressive

B-Dynamic path –Development

Figure 1: Organisational framework

Study Design

This study used case study approach in exploring ways vocational training at YPs was conducted; and to what extent it had impacted on socio-economic development of rural communities. In view of Robson (2002:178) case studies have the strength of bring out rich understanding of the salient features and characteristics of a given event such as vocational training at YPs. Similarly, a case study had considerable ability to generate answers to questions such as 'why?', 'how?' and 'what?' by use of variety of questionnaires, interview schedules, focused group discussions and check lists as advocated by (Kumar, 2005).

Study Population and Sample size

Cohen and Manion, (1995) states that the specification of the population to which the inquiry is addressed affects decisions that a researcher must make both about sampling procedures and resources. Since this study was descriptive in nature adopting case study design, it involved the 4 out of 6 YPs of Maua, Muthara Kianjai and Athwana that were government supported from Nyambene region. The population for the study comprised of the following YP community informant resource persons shown in table 3.1 below.

Table 3.1 Study Target Population

S/No	Target informants	Population	Sample size
1	YP manager	4	4
2	Second year trainees	$3 \times 4 \times 20 = 240$	$6 \times 3 \times 4 = 72$
3	Instructors	$1 \times 3 \times 4 = 12$	12
4	YP leavers	160	$5 \times 4 = 20$
5	Parents of second year trainees	240	$9 \times 4 = 36$
Total		652	144

Gay, (1992) observes that for small and big populations 20% and 10% of the population and above respectively may be adequate. Thus, a reasonable sample size 22.08% equal to 144 of 652 target informant resource persons was picked. Moreover, purposive sampling technique was used to pick 4 YP managers and 12 trade instructors. Lottery form of simple random sampling was used to sample a total of 72 second year trainees in the trades of masonry, tailoring and carpentry and 20 YP leavers who left between 2006 and 2009 using snow ball sampling.

Instruments for Data Collection

The study triangulated different instruments which entailed the use of more than two instruments in data collection. According to Saunders, Lewis and Thornhill, (2003:117) triangulation of study instruments in a study ensures that the data are telling the researcher what he thinks they are telling him in that each study instrument has its unique strengths and weaknesses. Thus, four key instruments used in data collection were: questionnaire, interview schedules, focused group discussions and checklists.

Interview Schedules

One major advantage of an interview is that it allows for greater depth of data collection and has a higher response rate because respondents are more involved and motivated and understand more about research problems than usually explained in a covering letter as adopted by (Cohen et al., 2000). Besides Walker, (1985:91) asserts that interviews rely on the assumption that people account of their behaviour, practices and actions to those who ask them questions. Hence, interview schedules enabled participants to discuss their interpretations of vocational training at YP in which they lived and to express their opinion.

Interview schedule for Youth Polytechnic Managers and Instructors

The first in-depth interview schedule was administered to YP managers and instructors instructing second year trainees in the trades of, agriculture, tailoring and masonry were the key informants to these instruments. The instrument sought trainees training needs that occurred within the YP on day to day basis. The subject matter of discussion centred the following aspects: teaching curriculum, training processes, adequacy of facilities and tools in preparation for GTT III examinations as recommended by DIT examining body. The YP

instructor's and manager's interview schedules are appendices A and B respectively.

Second Year Trainees Questionnaire

Trainee's questionnaire was administered to all sampled second year trainees in the trades of agriculture, masonry and carpentry as made use of by (Robson, 2002). For flexibility purposes, this instrument was designed to have both closed-ended and open-ended questions because of its strength to preserve the possibility of easy computation whilst providing respondents with the space to develop their own ideas. The instrument sought from trainees the availability and unavailability of requisite training tools, consumable materials, and challenges they encountered during practice and theory lessons, their entry behaviour and career prospects, their view on attachment matters and how they perceived vocational training in their trades to the acquisition of vocational knowledge and skills. Because of big number of trades involved (agriculture, carpentry and masonry) and high number of trainee respondents, the researcher engaged services of one research assistant in administering trainees' questionnaire so as to adequately manage the whole process within required time limits. The instrument is annex C.

Check lists for Tools, Training Manuals, Equipment, Workshops and Classrooms

A check list in research provides rich, objective and relatively accurate descriptive data on a situation as it exists in a research setting as employed by (Williamson, Karp, Dalphin & Gray, 1982). The check lists contained specific items such as YP institutional physical, status of existing buildings, classrooms and workshops learning environment (desks, tables, seats, and blackboards); availability of workshop material for sewing machines, artificial incubators, spraying cans, planes, training manuals, and consumable materials like sand, manure, fertilizer, clothes, nails, and adhesive among others. Availability of workshop inventory records, servicing of equipment and tools were ascertained. This was annexing D.

Parents of Second year Trainees Focused Group Discussions (FGD)

The researcher organized a natural group for focused group discussions consisting of

sampled 9 parent members of second year trainees in the trades of agriculture, masonry and carpentry. Focused group discussions have a more specific purpose and links to the explanation of a known theme or topic as explained by (Saunders, et al. (2003). The discussions clarified information captured in questionnaires and interview schedules. Finally the informants were asked to suggest appropriate strategies that would help improve instructional delivery mechanisms in their youth polytechnics (annex E).

YP Leavers Questionnaire

This questionnaire sought information from YP leavers of between 2006-2009 on; training profile of leavers at YP, job opportunities and economic activities one engaged in to earn a living as well as one's contributions to the economic development of the community. Besides, leavers were requested to explain the challenges they encountered when initiating and running their businesses and also suggest possible remedies to these challenges (annex F).

RESULT ANALYSIS and DISCUSSIONS

Vocational Trades Offered Trainees

In order to capture a holistic picture of the training at YPs, the researcher documented and ranked all trades offered at YPs in terms of enrolments. During the interview schedules, the managers were asked to rank the trades offered in terms of popularity. Table 4.1 below shows the ranking of trades offered at sampled YPs in terms of trainees' enrolments.

The table illustrates that the most popular trade in all sampled YPs was tailoring followed by hair dressing and beauty therapy with 86 and 66 trainees respectively. Electrical installations and motor vehicle mechanics were ranked 5th and 6th with 22 and 17 total trainees respectively.

However, motor vehicle mechanics was done at Kianjai YP only. During trainees conversation interviews it was revealed that: *'the land rover used for driving practice had broken down and trainees had to book for driving practice at nearby driving school in Meru town' (motor vehicle trainee, June 2010).*

Table 4.1: Ranking of Trades Offered by Enrolment rates

Trade offered	First year trainees	Second year trainees	Total trainees	Rank
Tailoring	42	44	86	1
Hair dressing and beauty therapy	36	30	66	2
Carpentry	30	26	56	3
Masonry	20	25	45	4
Electrical installation	12	10	22	5
Motor vehicle mechanics	8	9	17	6

Moreover, these findings contrasted sharply by study findings on a survey of “Vocational Training Needs of 15 – 25 Years Old Out-of-School Youths in Bauchi Metropolis of Nigeria”. These studies showed percentages of the responses of the respondents who were requested to identify a vocational training area in which they were interested in pursuing from a list of options provided. The youths chose Computer Maintenance and Operation Works (18.75%), followed by Tailoring (9.38%), then Electrical Installation and Maintenance work (8.59%), Furniture Making (6.25%), Further Education (5.47%), Hair Dresser/Barbing (4.69%), and Carpentry and Joinery (3.91 %). Other training needs options attracted percentages from 3.13% and below, indicating that they were not very popular among the youth. It was observed that YP in Nyambene region were not offering a wide range of vocational trades as compare to YP in Nigeria. Most notable missing course from list of those offered in Nyambene was information communication technology. On the other hand studies by Squire, (2004) about vocational training needs of 10 - 18 years-old out-of-school rural youth in the north-east district of Botswana, found out that, when the respondents were

requested to identify a vocational career in which they were interested in pursuing training from a list of options provided; majority of the youth (51%) chose careers in farm trades, 16% in building and construction trades, 8% in metal trades and 5% wanted to become football players. While these studies found out 51% of trainee wanted careers in farm related trades, the researcher found out that YPs in Nyambene offered agriculture only as a support subject and was not given any weight at all.

Training Facilities at YPs

The first research question was: What are the views of the youth polytechnic community about responsibility of youth polytechnics in meeting the training needs and aspirations of the trainees?

For the purpose of meeting research objectives the researcher felt a need to probe into the nature of existing facilities in Youth polytechnics with a view of establishing their relevance to training. The respondents were asked to state their opinion on the nature of training facilities in their YPs based on the ratings appended in the table. Table 4.2 below summaries their responses.

Table 4.2: Adequacy of Training Facilities Available in YPs

Respondents	highly satisfactory	satisfactory	un-satisfactory	highly un-satisfactory
YP Managers	0	35%	65%	0
Parents	0	30%	70%	0
Instructors	0	25%	75%	0
Trainees	0	35%	65%	0
Leavers (2006-2009)	0	42%	58%	0

75% of the instructor respondents thought that the existing facilities in their institutions were unsatisfactory, while 25% reported that the facilities were satisfactory. None of the respondents were neutral, nor found the facilities to be highly unsatisfactory. On the other hand 65% and 35% of trainees felt the training facilities were unsatisfactory and satisfactory respectively. These observations reinforce finding by (Mureithi, 2008) findings that when YPs fail to offer hands-on skills, vocational technical training has no potential to offer the much needed skills to develop the informal sector by enabling individuals to develop self employment. This is made impossible by

unavailability of adequate training facilities, trainees and instructors.

Effects of lack of Facilities on Fulfilling Institutional Objectives

The consequences of lack of facilities or their inadequacy cannot be over emphasized. The researcher was interested in knowing how lack of facilities hampered vocational training for rural development. The respondents were asked to give their views on how lack of adequate facilities affected trainees’ acquisition of vocational skills on the provided ratings in the table below. The research findings are summarized in the table 4.3 below:

Table 4.3: Effects of lack of Facilities on Attaining Institutional Objectives

Respondents	Low	High	Neutral	Total
YP managers	20%	80%	0	100%
Trainees	17.5%	70%	1%	88.5%
Leavers (2006-2009)	7.5%	82.5%	0	90%
Instructors	7.5%	85.5%	0	94%
Parents	30%	70%	0	100%

Majority of the informants thought that Inadequacy of teaching/training materials had high effects on attaining institutional objectives with scores: 80%, 70%, 82.5%, 85.5% and 70% managers, trainees, leavers, instructors and parents respectively. Only 1% of the trainee respondents were neutral on the effects of lack of facilities on Youth polytechnics training objectives. These findings agreed with (Okoro, 2007) findings on problems militating against proper imparting of vocational skills among the youth in Nigeria which revealed that lack of

funds, lack of facilities, mismanagement of resources and lack of qualified personnel among others seriously affected quality of training.

Sources of Finances for Youth Polytechnics

Further, the study sought from respondents how the YPs financed their training. From questionnaires responses of trainees, parents’ focused group discussion, manager and instructors interview schedules; the researcher obtained the data in histogram below about sources of financing YP vocational training.

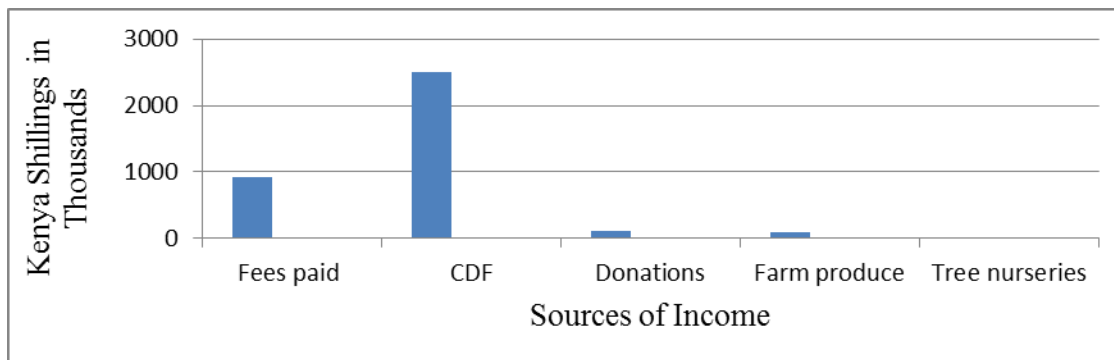


Figure 4.1: Sources of Finances for Youth Polytechnics.

From figure 4.1 it is clear that constituency development fund (CDF 2.5 million) was the

main source of financing the YPs followed by fees paid by trainees 0.924 million. Otherwise and farm produce sales contributed to 40000 and 80000 shillings respectively.

Most of the respondents said that: *CDF money was used to put up workshops and buy training facilities though they were never enough. Otherwise, fees paid by trainees was supplemented by income generating projects to meet recurrent training expenditures like buying of stationery and paying YP board of governors' employees. Parents' have turned away from raising funds through harambee which had proved very unpopular with the local people (female parent participating FGD, June 2013).*

From the study findings, the informants noted their income generating projects were limited because they lacked capital to procure materials to initiate projects at trade levels. For an example on instructor said: *YP did not make goods like carpentry products for sale due to lack of finances to buy timber. The projects for income generating activities were not taken seriously due to inadequate financing systems available to Youth Polytechnics (Carpentry instructor Muthara YP, June 2010).* These shows a need of the community and government to come in strongly and assist revamp YPs.

income generating projects like tree nurseries

Youth Polytechnic instructing staff

From the checklist schedules, the research assistant documented YPs members of trades instructing staff in the sampled YPs against their institution and professional qualifications. Table 4.4 below summarizes the instructors' qualifications as well as their areas of specializations as obtained during document analysis. Majority of instructors fall below the academic and pedagogical required qualifications of instructors to instruct at YPs. According to YP managers interviewed, they observed that:

The least qualification for an instructor to instruct at YPs is GTT 1(Maua YP Manager, June2010). Therefore, majority 17 out of 24 (70.8%) instructors fell below this threshold requirement.

Meeting Needs and Aspirations of Trainees

Fulfilling needs and interests of learners adequately determine how they perform in their courses. The researcher intended to find the perceived opinion of the respondents as appertains to the role of YPs in meeting needs and aspiration of trainees in order to produce qualified artisans versatile in their immediate community. Figure 4.2 below presents the respondents opinions about YPs meeting needs and interests of trainees based on the rating provided in the graph.

Table 4.4: Instructors levels of Qualifications

S/No	Number present	Gender	Qualification	Course/trade
1	3	Female	Untrained technical teacher	Secretarial/business education
2	2	Female	Untrained technical teacher	Hair dressing/beauty therapy
3	2	Male	GTT (1)	Electrical installations
4	4	Male	GTT (1)	Tailoring and dressmaking
5	3	Male	GTT (2)	Carpentry and joinery
6	4	Male	GTT (2)	Masonry and building
7	3	Male	GTT (2)	Metal work
8	1	Male	GTT (1)	Motor vehicle mechanics
9	2	females	Untrained instructors	Agriculture/ computer
Total	24			

Key:

GTT- Government Trade Test

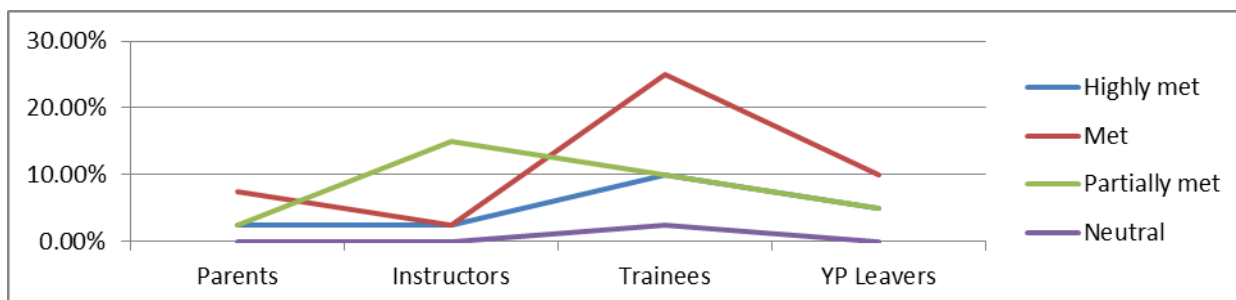


Figure 4.2 Responses of Informants about YPs Meeting Aspirations of Trainees.

It is clear from the graph (Fig 4.2) that (25%) of the trainee respondents felt that trainees' needs and aspirations were met. Equally, 10% of the informant trainees said their aspirations on vocational training were highly met by the YPs. Proportionally, majority of the instructors (15%) said trainees' needs were partially met. Moreover, 10% of the leavers said trainees' aspirations and needs were met. However, one instructor reported that: *'The trainees needed exchange programmes between YPs and the local industries to enable trainees see how other people practice sustainable development'* (Male instructor Muthara YP, 2010).

However, these findings showed that trainees' needs and aspirations were not adequately met by the respective YPs. Moreover, these study findings complimented research findings by UNESCO-UNEVOC (2010) that when managers and instructors were asked to state knowledge, skills and attitudes that the trainees needed to live in a sustainable way reported the following: "Trainees needed exchange programmes,

practical application of education and sustainable development, life-skills and collaboration with stakeholders, parents and guardians".

YP Leavers in the World of Work (2006 – 2009) Groups

The second research question was: *What occupational activities are the youth polytechnic leavers doing in the world of work?*

The primary purpose of a youth polytechnic is to train artisans who eventually get absorbed into the neighbouring community either into self-employment or gainful employment. In this study, the researcher intended to find out how the leavers of Youth polytechnics of between 2006– 2009 were doing in the world of work within their community. Table 4.7 below summarizes the respondents' findings of marketability of the Youth Polytechnic leavers of between the periods 2006 – 2009 based on the provided ratings.

Table 4.5: Youth Polytechnic Leavers in the World of Work

Respondents	Very marketable	Marketable	Fairly marketable	Neutral
Parents	10%	53%	28%	9%
Instructors	7.5%	60%	30%	2.5%
Trainees	5%	37.5%	56.5%	2%
Leavers(2006-2009)	0	20%	60%	20%

From table 4.7, 60% of the instructor respondents concurred that Youth polytechnics graduates were marketable while 7.5% said they were very marketable. However, 56.5% of the leavers' informants had the opinion that YP

leavers are fairly marketable within their communities. This analysis agrees with the observation schedules carried out by the researcher in various workshops manned by Youth polytechnics leavers. Majority of YP

leavers (60%) were running their own shops and metal workshops/welding shops. Others have opened up other related businesses like buying and selling of cereals. Some, like those running carpentry workshops had opened two workshops in different places. One mason leaver had the following to say: *'The masonry artisans are getting awarded some of the construction works in schools, dispensaries and individual homes. However, they are unable to secure big contracts due to financial handicaps'* (YP leaver, June 2010). When asked whether his YP knew what business he was engaged in, he reported that: *'The Youth Polytechnic does not follow up their graduates to find out how they fair in the world of work. On the other hand, none of the respondents who had left YP said they wanted go back to Youth Polytechnic to upgrade their skills. Therefore, there was no linkage between leavers and YPs'* (YP leaver, June 2010). Thus, YPs should endeavour to keep links and contacts with her leavers.

Community Involvement by YP in Facing Rural Development Challenges

The researcher inquired from the respondents how far Youth polytechnics involved her neighbouring community in facing rural development challenges. The question attracted multi responses from informants. Table 4.6 below depicts the opinion of respondents regarding the contribution of Youth polytechnics by involving their respective neighbouring community in facing rural development challenges on the ratings provided in the table. 17.5% of the parents said YP involved community ordinarily in facing rural developments. During focused group discussions, one parent said that: *I don't see youth polytechnics advertising their courses or involving us- the community members in ways of raising standards of doing economic activities we do. For an example, I expect youth polytechnics to mount training and*

businesses, that is, tailoring shops, carpentry *demonstration canters like agriculture farms, bee keeping among others for us to visit and learn. They should also avail their finished goods in agricultural shows for us to see* (Parent Maua YP, 2010). However, 60% of the parents lamented that YPs do not involve host community members in facing economic challenges. Further, 74.5% and 48% of instructors and trainees allayed fears that YPs hardly involves host community in facing development challenges within their locality. Majority of the respondents during interviews were of the opinion that the YP institutions should regularly hold exhibition shows of her finished products to public and even open a stand at the local Nyambene District Agricultural Society Show of Kenya. The researcher during an interview with the managers found out that: *Youth polytechnics do not have demonstration farms for agricultural practices while the institution serves a community that is both potential in crop farming and dairy keeping* (MutharaYP manager, June 2010). Thus, YPs need to go beyond theoretical training to practical and hands on training by doing projects. These could serve as sources of motivating and inspiring trainees to be innovative in their trades.

Hindrances to Implementation of Vocational Training Programmes

The third study question was: *What are the problems which hinder youth polytechnic leavers from initiating businesses related to vocational skills they acquired at YPs?*

Based on the findings of options to boost adequate learning and training by YPs the researcher intended to highlight barriers to proper implementation of vocational training programmes for rural development. In a multiple response question, the respondents listed the problems encountered as summarized in table 4.7 below.

Table 4.6: Community Involvements by YP

Respondents	Highly involved	Ordinarily involved	Partly involved	Not involved	Neutral	Total
YP managers	5%	15%	25%	55%	0	100%
Parents	2.5%	17.5%	12.5%	60%	5%	97.5%
Instructors	0	7.5%	15.5%	74.5%	2.5%	100%
Trainees	2%	20%	30%	48%	0	100%

Leavers(2006-2009)	2.5%	10%	7.5%	78%	2%	100%
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Table 4.7: Hindrances to Implementation of Vocational Programmes

Respondents	Financial handicaps	In-adequate resources	Poor super Vision	In-adequate human personnel	Neutral
YP managers	95%	85%	15%	75%	0
Leavers(2006-2009)	75%	77.5%	2.5%	62.5%	2.5%
Trainees	67.5%	87.5%	10%	60%	0%
Instructors	80%	92.5%	30%	68%	0
Parents	80%	82.5%	55%	65%	0

The instructor informants reported inadequate resources 92.5% and financial handicap 80% as the greatest hindrances to adequate implementation of vocations training programmes in Youth polytechnics. 82.5% and 80% of the parent informants said inadequate resources and financial handicaps were the greatest hindrances to vocational training. Inadequate resources 87.5% and financial handicaps 67.5% were cited by trainees as the greatest hindrances to proper implementation of vocational education. Majority of the leavers 77.5% and 75% said inadequate resources and financial handicaps respectively were the critical factors hindering implementation of vocational education. On the other hand 95% and 85% of the managers said financial handicaps and inadequate resources respectively affected implementation of vocational training. One of the instructors during interview lamented that: *'The current poor state of vocational training*

here has been attributed to withdrawal of government funding to Youth polytechnics. These institutions run on fees charged trainees and harambee which are unpopular with the local community'. Only a small grant is given each year, and sometimes it's not there (Instructor at Athwana YP, 2010). This has worsened the dream of realization of benefits from adequate vocational training by the community.

Suggested Solutions to Problems of Smooth Implementation of Vocational Training Programmes

In light of varied hindrances raised by respondents, the researcher wanted suggested solutions that could overcome the highlighted problems. Many and varied suggestions were listed in a multi response question. Table 4.8 summarizes the suggested solutions by the respondents.

Table 4.8: Suggested Solutions to Problems of Smooth Implementation of Vocational Training Programmes

Suggested solutions	Government grants	Income generating activities	Donor funding	Modern training facilities
Managers	70%	15%	10%	50%
Instructors	80.5%	55%	32.5%	75%
Trainees	90%	60%	22.5%	65%
Leavers(2006-2009)	70%	45%	30%	80%

Government grants (80.5% and 90%) were the most commonly suggested solutions by instructors and trainees respectively. This has a bearing to the introduction of the famous Constituency Development Fund (CDF) in the year 2003. These funds would solve numerous

problems hindering smooth implementation of vocational training programmes. On the other hand income generating activities (55% and 60%) were viewed by instructors and trainees respectively as second possible ways of minimizing vocational training.

Future of YPs in Light of Socio economic Development

The researcher sought the opinion of respondents as to the future of Youth

polytechnics vocational training programmes in light of socio-economic development. The study findings of respondents are summarized in table 4.9 below:

Table 4.9: Future of Vocational Training on Economic Development

Respondents	Government policy on YP	Revitalize programmes	Involve community
Managers	44%	63%	42%
Parents	37.5%	72.5%	32.5%
Instructors	25%	82.5%	42.5%
Trainees	37.5%	80%	40%
Leavers (2006-2009)	40%	50%	45%

The future of Youth polytechnics vocational training programmes appear depending on revitalizing of YP programmes according to 72.5%, 82.5%, 80% and 50% parents, instructors, trainees and leavers respectively. However, 37.5%, 25%, and 44% of the trainees /parents, instructors and managers respectively view it as depending on government policy on Youth Polytechnics. They said it should be streamlined to suit the dynamic world of today's

training needs. Moreover, one parent during focused group discussion said: *That Youth Polytechnics should reach out more to her neighbouring community in order to sustain her training activities for economic growth. This would have the effect of marketing YP to the community youths in need of sharpening vocational skills* (Parents of Kinajai YP, 2013). This could have a positive effect of attracting more youths to train at YP institutions.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This research was about the impact of vocational training for rural development, a case study of Youth polytechnics-Nyambene District. The essence of youth polytechnic ideal is that YPs exist for the services and enrichment of the immediate community. The indicators of the strength of relationship with the local communities are firstly whether the catchments area of the trainees is from the surrounding locality and more importantly whether the leavers working places are within the same local catchments area. This study was guided by three research question. The first question was: What are the views of the youth polytechnic community about responsibility of youth polytechnics in meeting training needs and aspirations of the trainees?

facilities in the institution affected vocational training resulting in time wastage and teacher frustrations among others. The YPs had roughly seventy percent (70%) of her training staff unqualified without pedagogical skills. However, it was realized that during training hardly do instructors send their trainees for supervised attachment. The YP offers training courses in carpentry, masonry, tailoring/ dress making and plumbing. The institution suffers lack of requisite resources like piped water therefore failure to initiate courses like agriculture with demonstration farms and making good use of farms.

The second research question was: What occupational activities are the youth polytechnic leavers (2006-2009) doing in the world of work? The findings of the research revealed that majority of the leavers had settled to work with masonry artisans getting awarded some construction works at the construction sites. They expressed optimism that their businesses were doing well. It was noted that none of the

leavers said went back to YP to upgrade their skills. However, the leavers pointed out that YP should effectively train and motivate her training staff to enhance supervision, and consider introducing loan schemes to leavers if possible in order to market aggressively.

The third research question was: What are the problems which hinder youth polytechnic leavers from initiating businesses related to vocational skills they acquired at YPs? The finding generated via this questions reveled inadequate resources for initiating own businesses while direct from college. This was the greatest hindrance to implementations of vocational training. It was also observed that most of the potential employers were asking applicants of certain job to have had a number of years of experience which leavers did not have initially.

Recommendations

In view of the discussions in the proceeding chapters, the following recommendations were offered. Although facilities are rather satisfactory, there is need to upgrade and enhance existing ones as well as add modern ones. The YP should ensure that adequate teaching materials are availed and provided in order to enhance overall student performance. Apart from the fees levied on students, Youth polytechnics should develop and exploit alternative sources of finance in order to effectively meet her budgetary requirements. This can be done by the management committee, and Parent Teachers Association (PTA) should be allowed to participate in decision making and monitoring of income generating activities carried out by the YP. The relevant mother ministry in charge of YPs should develop an act that enhances community support needed in running income-generating activities. Parents and community will have a sense of ownership. BOG and YP managers should discourage "free use" of institution's facilities and other resources so that it can earn needed revenue from the user of such facilities. This will create diversified sources of income-

generating activities in the institutions and so better their contributions towards the community for socio-economic development.

Feasibility study should be carried out before income-generating activities are set up. The BOG should give priority to income-generating activities by including them in the Youth polytechnics development plan. Youth polytechnics should develop and maintain both agricultural demonstration farms and dairy cows (zero grazing) in her vast land. This is so because the institution serves a community that is both pastoral and agricultural oriented. This shall go a long way to boost the economic status of the Nyambene community. The institution should introduce new courses like computer training, painting, mechanic and driving among others to cater for youths who are seeking these services elsewhere. Apart from introducing new courses, Youth polytechnics management should ensure her trainees are attached and supervised once or twice before graduating in order to enhance their vocational skills and competency. The government policy on YPs should be developed in the light of dynamic economic changes in economy and need for modern training. The instructors' motivation in servicing into modern technology should be given preference so as to change from old to modern craft.

Recommendations for Further Research

The researcher recommends that:

1. A study to establish the role of management of YPs in the efficient implementation of vocational training for rural development.
2. A comparative study of how public YPs versus private YPs have impacted on socio-economic development of their communities.
3. A similar study should be carried out in a different geographical region to investigate the impact of vocational training unique to those areas and establish their sustainability.

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Relationship Between Headteacher’s Leadership Experience, Teacher Supervision, School Location, and Pupils’ Performance in KCPE Examination in Ol’ Kalou Division, Kenya

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Abstract

Formal Education is a critical determinant of a country’s development process. Consequently, Kenya’s government places high premium on education and training. At the primary cycle of education, major focus has been on enhancing access and transition of pupils to secondary schools since the country attained independence in 1963. However, level of pupils’ performance in exit examination, specifically Kenya Certificate of Primary Education (KCPE) examination has over the years been rather low. Although examination performance is dependent on many factors, this study selected three factors, namely headteacher’s leadership experience, teacher supervision and school location with a view to determining the extent to which they could be related to pupils’ performance in KCPE examination. Data were self-collected from 59 primary schools in Ol Kalou Division, Nyandarua County, Kenya. Nominal scale data were analysed through frequency counts and percentages while hypotheses were tested using chi-square (χ^2) at .05 alpha level. Pupils’ performance in KCPE examination was insignificantly related to headteachers’ leadership experience ($p > .05$) and teacher supervision ($p > .05$). However, a statistically significant relationship ($p < .05$) was established between KCPE examination performance and school location. The study offers useful insights on ways in which the Ministry of Education (MoE), Teachers

Service Commission (TSC) and school managers can enhance pupils' performance in KCPE examination.

Key words: *Headteachers' Leadership Experience, Teacher Supervision, School Location, Pupils Performance, KCPE Examination.*

Introduction

At independence in 1963, Kenya was faced with challenges relating to the supply of trained human resources and access to educational opportunities at all levels of education. To address these challenges, the government set the first education commission (popularly known as Ominde Commission) in 1964. The commission inter alia recommended that primary education in the country should be made free (Republic of Kenya, 1964). This recommendation was consistent with the 1964 Kenya African National Union (KANU) party manifesto. Having formed the government in 1963, KANU put a proposal to the government on the need to offer seven years of free primary education (FPE) whose curriculum was to be geared towards the production of citizens inspired by the need to serve the nation (Otiende, et al., 1992). The FPE programme was subsequently implemented in three phases: grade 1-4, 1974; grade 1-6, 1976, and grade 1-7, 1979 (Sifuna & Otiende, 1994).

In 1988 the government introduced cost-sharing in the provision of primary education following a World Bank recommendation on the need for parents to cost share financing of education in the county (World Bank, 1988). The cost-sharing financing strategy led to dropout by pupils from the low-income households, thereby reversing the earlier enrolment gains made in the primary sub-sector of education. To address this challenge, the government re-introduced the FPE programme in 2003. This initiative pushed up enrolment from 5.9 million pupils to 7.6 million pupils, representing 29% enrolment increase between 2002 and 2003 (UNESCO, 2005). By 2011, enrolment had shot up to 9.6 million pupils representing a 63% increase in nine years (Republic of Kenya, 2011).

In spite of the noted enrolment gains, pupils' performance in the terminal examination, specifically Kenya Certificate of Primary Education (KCPE) examination has been rather low. This is not a far fetched observation if it is realized that the national mean score in KCPE examination averaged at 245.5 marks out of a possible maximum of 500 marks between 2005

and 2007 (Ministry of Education, 2007). It is also notable that out of 77,614 pupils who sat for the KCPE examination in 2011, only 48.28% attained 250 marks and above (the cut off mark for secondary school admission) and only 5,806 (0.75%) scored over 400 marks (Kiumi, 2013). Pupils' performance in KCPE examination in the study area (OI' Kalou Division) has been even worse if it is noted that performance averaged at 227 marks between 2003 and 2010 (Nyandarua District Education Office, 2011).

Kenya's primary cycle of education is expected to provide children with basic reading, writing and mathematical skills along with an elementary understanding of the social sciences (KIE, 2002). Therefore, this level of education sets the foundation for learning more difficult academic materials in secondary schools. However, Kumba (2011) has observed that majority of the FPE graduates lack the capacity to read critically, express ideas clearly in written English, and solve problems in mathematics and sciences. Based on this observation, it can be reasoned that most of the KCPE examination graduates encounter challenges relating to securing places in secondary schools, handling secondary education curriculum, and by implication rising up the social ladder.

The low level of pupils' performance in KCPE examination has been largely attributed to low budgetary allocation to the primary education subsector (Muindi, 2012). This scenario, it has been argued is the major cause of teacher shortage and inadequate supply of learning materials in the system (Siringi, 2012). It needs to be mentioned that teachers play a critical role in curriculum implementation while learning materials are the medium through which learners acquire the intended learning experiences (University of Zimbabwe, 1995; Ogott & Odera, 2012). Therefore, teacher shortfall and inadequate learning materials could be undermining the goals envisaged in the FPE initiative (Republic of Kenya, 2005).

Although challenges relating to the supply of teachers and learning materials cannot be

underrated, there is a need to realize that headteachers' leadership experience (Aubrey, 1998; Sisungu, 2002), teacher supervision (Earley, 1998), and school location (Bickel & Lange, 1995; Sheldon, 2012) have an appreciable influence on learning outcomes.

The foregoing brings to the fore the following question; to what extent could headteachers' leadership experience, teacher supervision and school location be influencing pupils' performance in KCPE examination?

It needs to be noted that the most widely used measure of success in formal schooling is learners' cognitive gains. This refers to knowledge and skills gained by a learner as measured through formal examination (Earley, 1998; Clarkson, 1991). In Kenya, learners' academic achievement at the primary education cycle is assessed through the KCPE examination.

Achievement in formal schooling should, however not be pegged solely on academic gains. This is in view of the fact that any education system worth its name should also emphasize on non-cognitive aspect of learning, specifically character training, nurturing of talents and preparing learners to become responsible citizens (World Bank, 1988).

School quality is often inferred from learner's achievement (i.e. quality of output) at the end of the learning cycle. However, this measure in most cases fails to control for the influence of headteacher's leadership experience, teacher supervision and school location. The latter in this context refers to whether the school is in a rural or urban setting.

For all intents and purposes, schools are social organisations whose principal participants are teachers, students and parents. Their (schools) primary objective is to equip learners with requisite competencies either for further education and training or gainful employment (Kiumi, 2012). Organizational members, however, do not act in a social vacuum. On the contrary, their actions are integrally related to the leadership climate created by the leader (Huczynski & Buchanan, 2001). This implies that the extent to which organizational members will direct their efforts towards the preset goals depends on whether or not the leader has

created an enabling environment for members to play their role expectations effectively.

In a school setting, the person who determines the nature of leadership environment (or school climate for that matter) and hence the amount of teachers, pupils and parental input on the school's academic and non-academic spheres of learning is the head-teacher (Strivens, 1985; Reynolds, 1989). This observation is based on the fact that as the school's chief executive, the headteacher is expected to offer enlightened direction in regard to management of the day to day affairs of the school. In particular, a school head should adopt inclusive leadership behaviour so that other actors in the school may feel to be part of the team (Kiumi, Wanyoike, & Kibe, 2013). Such a leadership environment has a high likelihood of drawing more support from teachers and parents to the benefit of pupils learning gains.

Literature (research based and otherwise) nonetheless shows that leadership experience has a bearing on headteacher's willingness to incorporate other players in his/her endeavour to move the school in the desired direction. However research on the relationship between leadership experience and headteachers' leadership behaviour, has generated contradictory results. For example, studies by Fagan (2001), and Aubrey (1992) did not reveal any relationship between experience and headteacher's level of inclusiveness.

Other studies (e.g., Koehler, 1992; Herndon, 2002; Muchiri, 1998) have, however indicated that experienced school heads were more likely to enlist the support of teachers and parents compared to their less experienced counterparts. This revelation seems to render support to Perkey & Hall's (1992) observation that unlike their younger counterparts who have to go through the five stages of survival, stability, educational leadership and professional actualization, experienced head teachers have already stabilized in their career. Consequently, they have gained confidence, in their co-workers, a factor that may motivate them to bring teachers and parents on board. Cuban (1982), and Tyack & Cuban (1997) have, however opined that more experienced headteachers (basing their judgement on years of trial-and-error) may offer passive resistance to externally driven school reforms in order to

protect their professional domain. Less experienced heads may by contrast embrace such reforms.

Teacher supervision is that dimension of educational management which aims at improving instructional effectiveness (Okumbe, 1998). There is a consensus that while other inputs (e.g., learning materials and physical facilities) play a passive role in a learning system, teachers are the active agents through which curriculum design is translated into classroom activities. To help teachers successfully fulfil their role in this endeavour, effective supervision and evaluation of teachers is necessary (Ofuafo, 2005).

The value of teacher supervision cannot be over emphasized. This is because, it is imperative for both professional growth of teachers and quality control in an educational system (Nwaka, 2009). It is important to note that due to technological development, education delivery faces many changes and challenges. Consequently, teacher supervision should as a matter of fact focus on improving quality of instruction and quality of learning outcomes in addition to ensuring that schools enhance learners' capacity to master the curriculum (Earley, 1998).

A well managed supervision programme has a high likelihood of enhancing teachers' confidence in the classroom, instruction skills and commitment to duty (Middlewood & Lumby, 1998). This may impact positively on pupils academic performances (Sisungu, 2002). Productive teacher supervision, however is dependent on the extent to which the supervisor possesses requisite supervisory skills, which according to Ogidigbo (2006) include human relations skills, enlightened leadership, objectivity, creativity and capacity to offer workable solutions to weaknesses noted in the teaching process. Lack of such competencies often leads to conflict between teachers and supervisors. In such a supervisory scenario, teachers may resent supervision thereby inhibiting their capacity to willingly contribute to the solution of education and instructional problems, and creation of a favourable setting for pupils learning (Nwaka, 2009). This may inturn undermine learners ability to move successfully through the curriculum.

Generally speaking, learners in rural areas are educationally disadvantaged compared to their urban counterparts. This observation is reinforced by views gleaned from literature-research based and otherwise. For instance, it has been observed that rural schools face challenges relating to isolation, poverty and limited job opportunities for school leavers. Isolation denies rural schools the advantages of urban based resources (e.g., libraries, electricity, technology etc.) that might enhance learning gains (Capper, 1993). The poverty of many rural communities, on the other hand limits parents ability to provide for their children and to augment their children education with resources at home that can spark and sustain interest in leaning in the absence of the teacher. Bickel & Lange (1995) have further averred that because of limited employment opportunities, learners in rural areas do not see any financial benefits to attend or succeed in school. Consequently, most rural based learners end up performing poorly in the exit examination which limits their chances of moving up the education ladder.

Sheldon (2012) has also noted that rural schools tend to harbour (this is particularly so in the less developed countries) untrained or unqualified teachers, which is a great disservice to learners. Furthermore, due to distance factor, most rural schools rarely get visited by school inspectors or quality assurance officers for that matter. This implies that teachers in rural schools are less likely to get the much needed supervisory advise from their professional seniors. Moreover, due to lack of attractive amenities (e.g., good houses, clean water, electricity and so on) a significant proportion of teachers posted to rural schools either apply for transfer immediately or become habitual absentees. This makes it difficult for rural schools to keep classrooms staffed. Added to that is lack of facilities in most rural schools. For instance, Chiuri and Kiumi (2005) have observed that most rural schools in Africa are characterized by dilapidated buildings, missing or broken desks and chairs, and a lack of good ventilation and sanitation facilities. These circumstances have the net affect of discouraging school attendance and hampering schools' efforts to enhance learning gains by learners.

Purpose and Objectives of the Study

The purpose of the study was to find out whether there is any relationship between head teachers' leadership experience, teacher supervision, school location, and pupils' performance in KCPE examination. Specifically, the study sought to achieve the following objectives.

- (i) To find out whether there is a statistically significant relationship between headteachers' leadership experience and pupils' performance in KCPE examination.
- (ii) To determine whether there is any statistically significant relationship between teacher supervision and pupils' performance in KCPE examination
- (iii) To find out whether there is any statistically significant relationship between school location and pupils' performance in KCPE examination.

Research Hypotheses

In order to achieve the targeted objectives, the following null hypotheses were formulated and tested at .05 alpha level

- HO₁: There is no statistically significant relationship between headteachers' leadership experience and pupils' performance in KCPE examination.
- HO₂: There is no statistically significant relationship between teacher supervision and pupils' performance in KCPE examination.

HO₃: There is no statistically significant relationship between school location and pupils' performance in KCPE examination.

Conceptual Framework

Drawing from the literature reviewed in this study, it was conceptualized that headteacher's leadership experience, teacher supervision and school location are critical antecedents of successful learning outcomes. The study further hypothesized that learners' personal characteristics, specifically intellectual endowment and socio-economic background may moderate the relationship between the aforementioned antecedents (independent variables) and pupils' performance (dependent variables) in KCPE examination. However, the study controlled learners' personal characteristics (intervening variables) through randomization. Thus, schools were randomly selected (through systematic and simple random sampling) with a view to ensure that schools, irrespective of characteristics of pupils they had presented for the KCPE examination between 2003 and 2010 had an equal chance of being included in the sample. Figure 1 illustrates the conceptualized relationship between the variables subsumed in this study.

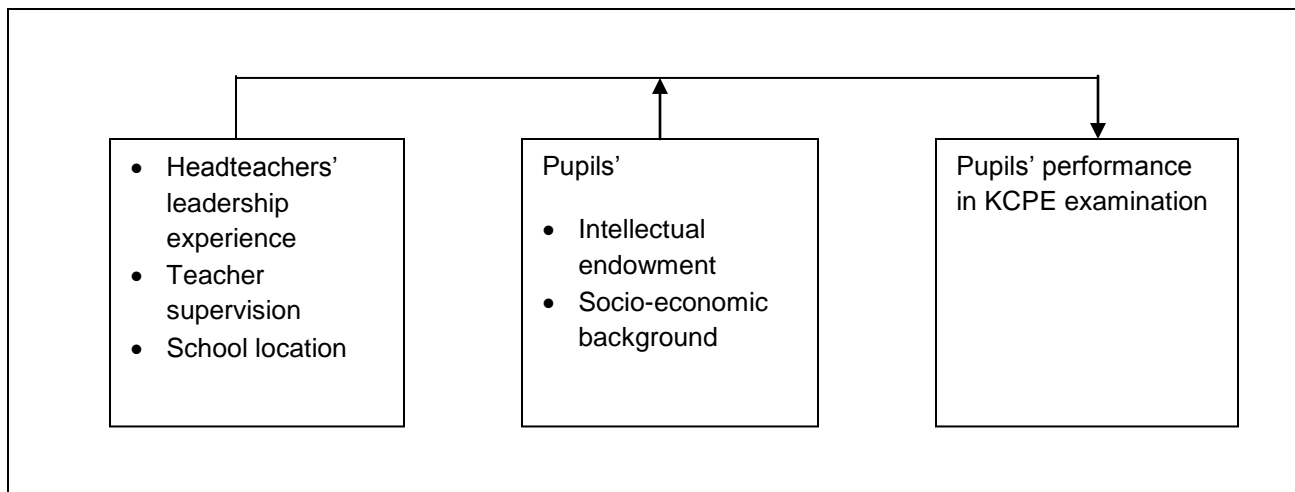


Figure 1: Relationship between Headteachers' leadership experience, teacher supervision, school location (independent variables), pupils' personal characteristics (intervening variables), and pupils' performance in KCPE examination (dependent variable).

Methodology

The study utilized *ex-post facto* research design. *Ex-post facto* design is used in a situation whereby the independent and dependent variable(s) have already interacted. Therefore, the investigator cannot manipulate the independent variable(s) with a view to determining its/their effect on the dependent variable(s). In this regard the effect of the interaction between the independent and dependent variable(s) is determined retrospectively (Kerlinger, 1973). The design was deemed ideal in the sense that the study sought to determine retrospectively the effect of headteachers' leadership experience, teacher supervision and school location (independent variables) on pupils' performance in KCPE examination (dependent variable).

Instrumentation

Data were collected through a questionnaire which was self-administered to a sample of 59 head teachers. Of the 59 head teachers, 46 were in charge of rural schools while 13 were heading urban schools. The sample was generated through systematic and simple

random sampling in line with Krejcie & Morgan's (1970) table for determining sample size from given populations.

The questionnaire had two sections labeled A and B. Section A gathered data on headteachers' personal characteristics, specifically age, gender and leadership experience. Section B collected data pertaining to frequency of school inspection by Ministry of Education's Quality Assurance and Standards Officers (QASO), schools' KCPE examination mean scores between 2003-2010, and school location in terms of whether a school was within Ol Kalou municipality or outside the municipality or outside the municipality. The former were classified as urban schools while the latter were classified as rural schools.

The KCPE average scores (2003-2010) in the sampled schools ranged between 150 and 350 marks out of a possible maximum mean score of 500 marks. The mean scores were divided into three groups. 150-199; 200-249, and 250-350. This constituted level of pupils' performance (LPP) index which was categorized as 'very low' 'low' and 'moderately high' LPP respectively as shown in Table 1.

Table 1: KCPE Examination Average Scores (2003-2010) by LPP Category

KCPE Examination Average Scores	LPP Category
150-199	Very Low
200-249	Low
250-350	Moderately High

Validity of the Research Instrument

One of the major challenges in social science research is determination of the extent to which a given research instrument will generate results which are objective and accurate and, thus generalizable to the entire population (Mugenda and Mugenda, 1999). In line with this

observation, efforts were made to validate the instrument with a view to ensuring that it was capable of eliciting the desired data. This was accomplished in three ways. First, extensive literature search on the influence of headteachers' leadership experience, teacher supervision and school location on learners'

academic performance was carried out. This made it possible to identify the relevant content areas to be captured during the itemization stage of the instrument. Secondly, items in the instrument were prepared in line with the objectives of the study. Thirdly, the instrument was piloted in the neighbouring Ol' joro Orok Division. Items that were found to be unclear or open to misinterpretation were rephrased before the main study was executed.

Data Analysis

Using the statistical package for social science (SPSS) version 11.5 computer programme, nominal scale data (i.e., respondents leadership experience, frequency of teacher supervision and school location) were analysed through frequency counts and percentages while hypotheses were tested using chi-square (χ^2) statistic at .05 alpha level. Computation of χ^2 coefficient was based on the schools' distribution in the KCPE examination score ranges displayed in Table 1. It was hypothesized /expected that the distribution of schools in the three mean score ranges would be even. If there was no discrepancy between the expected and computed distribution, the influence of the independent variable in question on pupils' performance in KCPE examination was held to be statistically insignificant. However, if a statistically significant discrepancy was established, the effect of the independent

Table 2

Respondents' Distribution by Gender

Gender	n	%
Male	46	78
Female	13	22
Total	59	100

The data in Table 2 reveals that 78% of the head teachers in the study sample were males while 22% were females. This indicates that there was no gender parity in headship position in the study area. Male domination (or adrocentricity) of educational management has been noted in other studies in Kenya (e.g., Machila, 2005; Gachoki, 2006). This phenomenon has been associated with the 'male' image of management whereby

variable in question on pupils' performance in KCPE examination was held to be statistically significant, (Wiersma, 1995, Bryman & Cramer, 1997).

Results and Discussion

The results herein are presented in two sections. Section one covers questionnaire return rate, respondents' characteristics (i.e., gender and age, while section two presents the results of testing the three hypotheses which were germane to this study.

Questionnaire Return Rate

All respondents returned their duly filled questionnaire. It needs to be noted that KCPE examination has turned out to be the most competitive examination in Kenya's education system, a factor that has generated parent-school conflict in low performing schools (Kiumi, 2013). In this regard, headteachers might have seen it prudent to participate in the study for their input may offer insights to the MoE, and TSC on how to enhance pupils' performance in KCPE examination.

Respondents' Characteristics

This section highlights respondents' characteristics. These are summarized in Tables 2 and 3 with respect to gender and age.

management is perceived as a field that is less appealing to women (Bush, 2003). This perception is predicated on the belief that management demands masculine traits such as aggressiveness, domination and competition rather than feminine behavioural characteristics such as shared problem solving, negotiation and collaboration (Al Khalifa, 1992). Hall (1993) has, however argued that the association between management and masculinity has not been

established as a fact. Therefore, perpetuating this traditional stereotype serves to discriminate women in the allocation of leadership positions in education, a factor that may impact negatively

on girl child education due to lack of role models in educational leadership (Sifuna & Chege, 2006).

Table 3: Respondents' Distribution by Age

Age group (in years)	n	%
36-40	2	3
41-45	18	31
46-50	27	46
51-55	12	20
Total	59	100

The data displayed in Table 3 shows that majority of the headteachers (46%) were in the 46-50 years age bracket while very few (3%) were below 41 years of age. A closer analysis of the data further reveals that 66% of the headteachers were above 45 years of age implying that schools in the study area were staffed with relatively old head teachers. Based on Reys's (1990) observation, it can be argued that an overwhelming majority of the head teachers were more likely to be committed to their administrative duties.

Results of Hypotheses Testing

The study tested three null hypotheses using χ^2 statistic at .05 alpha level. The results of testing the three hypotheses are presented below.

HO₁: There is no statistically significant relationship between headteacher's leadership experience and pupils' performance in KCPE examination

Table 4 summarizes the results of χ^2 test with respect to HO₁

Table 4: χ^2 Distribution of Schools by Headteachers Leadership Experience and KCPE Examination Mean Scores (2003-2010)

Leadership Experience (in years)	KCPE Mean Scores			Total
	150-199	200-249	250-350	
1-5	5(36)	9(64)	0(0)	14(24)
6-10	(2(22)	5(56)	2(22)	9(16)
11-15	(2(40)	3(60)	0(0)	5(8)
16-20	0(0)	4(80)	1(20)	5(8)
21-25	5(31)	11(69)	0(0)	16(27)

26-30	4(40)	4(40)	2(20)	10(17)
Total	18	36	5	59(100)

(Figures in parentheses represent percentages.) $\chi^2=10.868;df=10;p>.05$

A look at the data presented in Table 4 shows that 18 schools had registered less than a mean score of 200 marks in KCPE examination between 2003-2010. Of the 18 schools, 9(50%) schools were under headteachers with more than 20 years of leadership experience while 7(39%) were headed by headteachers with less than 11 years of leadership experience. This seems to suggest that KCPE examination performance was lower in schools under the more experienced and the less experienced headteachers.

A closer examination of the row totals reveals a pattern worth noting with respect to schools that had attained at least 200 mean score in KCPE examination. For instance, while 64% of schools under headteachers with less than 6 years of leadership experience had registered 200 mean score and above in KCPE examination, the corresponding proportion of schools whose headteachers had a leadership experience ranging between 6-10; 11-15;16-20;21-25 and

26-30) years was 78%, 60%, 100%, 69% and 60% respectively. This indicates that level of KCPE examination performance first increased, reached a maximum in schools whose headteachers had 16-20 years of leadership experience and then declined towards schools whose headteachers had more than 20 years of leadership experience. This has useful implication on optimum period of productive academic leadership which, according to the data in Table 4 does not go beyond 20 years.

The computed χ^2 coefficient nonetheless shows that the relationship between headteachers' leadership experience and KCPE examination performance was statistically insignificant. Therefore, H_{01} was accepted and conclusion made that headteachers leadership experience and pupils' performance in KCPE examination were statistically independent.

H_{02} : there is no statistically significant relationship between teacher supervision and pupils' performance in KCPE examination

Table 5 presents a summary of χ^2 test in regard to H_{02}

Table 5: Distribution of Schools by Frequency of Teacher Supervision and KCPE Examination Mean Scores (2003-2010)

Frequency of Supervision (per year)	KCPE Mean Scores			Total
	150-199	200-249	250-350	
1-2 times	0(0)	2(100)	0(0)	2(3)
3-5 times	7(32)	14(64)	1(4)	22(37)
6-8 times	4(25)	10(63)	2(12)	16(27)
9-10 times	6(50)	6(950)	0(0)	12(21)
11-12 times	1(4)	4(57)	2(29)	7(12)
Total	18	36	5	59(100)

(Figures in parentheses represent percentages) $\chi^2=.8.894;df=8 p>.05$

From the data in Table 5, it can be learnt that none of the schools whose teachers had been supervised less than three times had registered more than 249 KCPE examinations mean score between 2003-2010. However, some schools (save for schools whose teachers had been supervised 9-10 times) whose teachers had been supervised more than two times registered over 249 mean score with the highest majority (29%) being schools whose teachers had been supervised more than 10 times.

The foregoing finding seems to suggest that pupils' performance in KCPE examination improved with increase in frequency of teacher

supervision and vice versa. This is consistent with Gachoya's (2008) study which established that teacher supervision had a positive impact on pupils' learning gains. The computed χ^2 coefficient, however shows that the relationship between teacher supervision and pupils performance in KCPE examination was statistically insignificant ($p > .05$). Consequently H_{02} was accepted and conclusion made that teacher supervision and KCPE examination performance were statistically independent.

H_{03} : There is no statistically significant relationship between school location and pupils' performance in KCPE Examination

The result of χ^2 test in regard to H_{02} is presented in Table 6.

Table 6: χ^2 Distributions of Schools by Location and KCPE Examination Performance (2003-2010)

School location	KCPE Mean Scores			Total
	150-199	200-249	250-350	
Urban	0(0)	9(69)	4(31)	13(22)
Rural	18(39)	27(59)	1(2)	46(78)
Total	18	36	5	59(100)

(Figures in parentheses represent percentages). $\chi^2=15.051$; $df=2$; $p < .05$

It is easily observable from Table 6 that out of the 59 schools in the sample, 18 (31%) had attained less than 200 mean score in the KCPE examination for the period running from 2003 to 2010. It is also notable that none of the 18 schools was urban-based. This finding appears to suggest that KCPE examination performance was skewed in favour of urban schools. The row totals further attests to this observation. For example, while all urban based schools attained a mean score of 200 marks and above (with 31% exceeding 249 mean score), this achievement was comparatively lower among rural schools in the sense that only 61% of this category of schools attained a mean score of 200 marks and above, with only a partly 2% exceeding the 249 mean score. The data in Table 6 further indicates that the association between KCPE examination performance and school location was statistically significant ($p < 0.5$). Therefore, H_{03} was rejected and conclusion made that school location and KCPE

examination performance were statistically not independent.

The finding that school location has a significant influence on pupils' academic performance is in agreement with the findings of Adeyemi's (2010) study which revealed that learners in rural-based schools tended to perform lowly compared to their urban counterparts. The fact that urban schools are generally advantaged (in terms of learning resources and favourable parental stimulation) than rural schools may perhaps explain this scenario (Gitau *et al*, 1993; UNESCO, 2008; Borland and Howsen, 1999).

Summary of the Findings and conclusions

- (i) Majority of respondents (78%) were males implying that there was no gender parity in headship position in the study area.
- (ii) A large majority (66%) of respondents were above 45 years of age. This

- implies that schools in the study area were staffed with relatively old head teachers who were consequently more likely to be committed to their leadership tasks in their respective schools (Reyes, 1990).
- (iii) Although the relationship between headteachers' leadership experience and pupils' performance in KCPE examination was statistically insignificant ($p > .5$), performance depicted an upward trend towards schools under the more experienced headteachers, reaching a maximum at the 16-20 years of experience bracket before declining towards schools whose headteachers had over 20 years of leadership experience. This finding tends to suggest that headteachers' capacity to offer productive academic leadership increases with increase in experience though it is likely to decline after 20 years of experience.
- (iv) Relationship between teacher supervision and pupils' performance in KCPE examination was statistically insignificant ($p > .05$). Nonetheless, performance depicted an upward pattern with increase in frequency of teacher supervision implying that teacher supervision may generate a positive impact on KCPE examination performance.
- (v) Relationship between school location and pupils' performance in KCPE examination was statistically significant ($p < .05$) with pupils in urban schools performing far much better than their rural counterparts. This seems to suggest that chances of pupils success in KCPE

examination were comparatively higher in urban schools.

Recommendations

Findings generated by the study have important implications and lessons as far as KCPE examination performance is concerned. A major observation is that headteachers' leadership experience, teacher supervision, and school location have a bearing on pupils' performance in KCPE examination. For instance, performance improved with increase in headteachers leadership experience though the opposite appeared to be the case beyond 20 years of experience. In this regard, institutions charged with the role of teacher management, specifically the MoE and TSC should enhance leadership skills of the newly appointed headteachers and those with over 20 years of experience through seminars/workshops. This may go along way in enhancing pupils' performance in KCPE examination.

Secondly, since teacher supervision seemed to have a positive impact on KCPE examination performance, QASO should increase frequency of teacher supervision so as to offer teachers the needed professional advice which is critical to pupils' academic performance. Thirdly, rural schools had posted better KCPE examination results. This could be due to lack of modern facilities and staffing shortages which according to Otieno (2010) and Sheldon (2012) are major factors undermining performance in rural areas. Hence, the MoE and TSC need to determine staffing levels and quality of learning facilities in rural schools with a view to addressing any identified gaps for the sake of enhancing pupils' academic performance. (Eds.). *Managing Change in Education: Individual and Organizational Perspectives*. London: Paul Chapman Publishers.

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Students' Absenteeism and its Effects on Academic Performance in Nyandarua Central District, Nyandarua County

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Abstract

The problem of students' absenteeism at the secondary level of education has turned out to be an issue in Kenya. This behavior is appearing to be impacting negatively on the teaching and learning process. This is because persistence absenteeism affects students' academic performance, wastage of learning time and higher education opportunities to the affected student. The purpose of this study was to find out the causes and extent of students' absenteeism and its consequences on academic performance in public secondary schools in Nyandarua Central District Nyandarua County. The study used descriptive survey design. Data was collected using questionnaires from 323 respondents who included 42 teachers and 281 students from 14 public secondary schools. A pilot study was conducted in order to validate the research instruments. Data collected was analyzed using frequencies and percentages. The study found that factors causing absenteeism included lack of school fees (95%), students' illness (86%), domestic chores (74%), peer influence (50%) and bullying by other students (62%). Also that absenteeism leads to poor syllabus coverage hence poor academic performance. The study recommended that teachers should guide and counsel students who are consistently absent from school on the importance of school attendance. The government should provide bursary to the needy student and parents should be sensitized on the negative effect of absenteeism in academic performance.

Keywords: Students' Absenteeism, Effects, Academic Performance

Introduction

Education is the most critical of the variables in the development process of a nation. Education plays an important role not only to the society but also to the individual. For instance through education the society gets trained human resources for enhancing the development process in the social, political and economic realms. Similarly individuals benefit from education by acquiring values and skills that can enable them to fit in the society, (Gideon 2000) For the general public and individuals to benefit fully from education there must be commitment from all stakeholders, namely the state, in terms of investing adequate resources in education and teachers. Similarly parents should ensure that their children are retained in school for the stipulated period of time. Furthermore students must be committed to their schoolwork through adequate interaction with teachers.

The situation in Kenya, however appears to suggest that the aforementioned gains from

education may not be fully realized due the problem of low students participation rate. For example a study by Bantu (2003) in Eldoret municipality showed that students who are persistently absent from school have low education attainment, which leads to repetition and eventually dropout.

Similarly other studies came up with similar findings (Gitonga 1987; Moraa 2003). A student who is frequently absent from school, it should be noted, misses several lessons. Consequently, he /she is unable to steadily progress in learning and ends up performing poorly in his/her academic work. Conversely a student who attends school regularly has a high likelihood of faring well in school (Moraa 2003).

It is worthwhile to observe that many parents are concerned that their children are playing truants for genuine reasons. This behavior has become an issue of concern to many families since parents' sacrifices a lot, in terms of money and effort to retain their children in school. Parents expect their children to do well in terms of academic performance so that they can be self-

supporting individuals when they complete their studies. A child who does not receive adequate education is ill prepared to not only rise up the academic ladder but to lead a successful life. For these reasons, a child's failure to attend school brings great disappointment to the affected family. (Bantu 2003)

It is not only parents who should be concerned with the problem of absenteeism in schools but the government is similarly likely to lose when students fail to cover the stipulated curriculum. This is because such students are likely to perform dismally in their academic work. Consequently they will not have acquired the desired knowledge skills and values by the time they come out of school system. For this reason, they will not be useful citizens. In view of the foregoing, it is imperative to address the problem of students' absenteeism if we expect education to be worthwhile area for investing public and private resources,

Statement of the problem

Education is the most important sector in a country. However, for it to play its role effectively it must be well managed. Stakeholders in this sector, that is teachers, parents and the government should ensure that students cover the stipulated syllabus in a given level. The situation in Kenya, however seems to suggest that investment in secondary education may not yield the expected returns due to the problems of students absenteeism unless it is properly addressed. Therefore, this study was set to find out the causes and extent of students' absenteeism in public secondary schools in Nyandarua Central District. Additionally the study was set to determine whether absenteeism has any influence on students' academic performance.

Purpose of the study

The study was designed to investigate the cause and extent of students' absenteeism and its related effects on students' academic performance in Nyandarua Central District, Nyandarua County.

The study had the following specific objectives:

1. To establish the causes of students absenteeism in public secondary schools in Nyandarua Central District, Nyandarua County.
2. To establish whether there is any relationship between students' absenteeism and academic

performance.

Research questions

The study sought to answer the following questions:

1. What are the major causes of students' absenteeism in Public secondary schools in Nyandarua Central district?
2. Is there any relationship between students' absenteeism and academic performance?

Research methodology

The study employed a descriptive survey design. Descriptive survey designs are used in preliminary and exploratory studies to allow researchers to gather information, summarize, present and interpret information for the purpose of identification (Orodho, 2002). In descriptive surveys, no variables are manipulated and researchers just report the state of affairs as they are in the field.

Location of the study

The study was carried out in Nyandarua Central District, Nyandarua County. The district is well endowed with rich arable agricultural land and has so many activities that may affect school attendance. Also no similar research had been carried out in Nyandarua County by the time the research was being carrying out.

Population of the study

The target population for the study was 23 public secondary schools, of which 17 were day public secondary schools and 6 were boarding public secondary schools.

The total number of teachers and students in public secondary schools in the District were 153 and 2810 respectively (DEO's office Statistical returns). Therefore the twenty-three public secondary schools formed sampling frame for schools whose teachers and students took part in the study.

Sampling procedure

The schools were stratified in two categories; day and boarding secondary schools.

The record from the District education office indicated that the total Number (N) of the day school was 17 while boarding secondary school were 6. The percentage of the day public secondary schools in the entire population was

74 per cent while that of the boarding public secondary was 26 per cent. These percentages

were used to generate the sample size (n) of the school in each category as shown below

Table I. Sampling Procedure

Category of school	Number of schools	Percentage	P/100N
Day	17	74	12
Boarding	6	26	2
Total	23	100	14

The sample size in the day public secondary category was 12 while boarding public secondary schools were 2. This sampling design generated a sample size of 14 secondary schools. The schools were selected through a simple random sampling technique where the name of schools in each category was written on a piece of paper, which was folded and put in a box. The papers were drawn at random until the required number of schools in each category was arrived at.

A total of 281 students were sampled. This was

Research Instrument

The researchers used a questionnaire to collect data from the students and teachers. Gay (1976) maintains that questionnaires give respondents freedom to express their views or opinions and also to make suggestions. He also maintained that anonymity of the respondents help to produce more candid answers than is possible in an interview.

Questionnaires for both students and teachers sought information on the causes of absenteeism and their effects on academic performance. Validation of these instruments was carried out bearing in mind both objectives and purpose of the study. This was followed by pilot testing of the instruments in two public secondary schools in the District. The reliability of the instrument was based on the Cronbach alpha under reliability coefficient of 0.72. The teachers' instrument had coefficient of 0.72

10 percent of the total population as recommended by Mugenda and Mugenda (1999). The researcher generated a list of the students' population and picked the tenth name to make the students sample. These students were drawn from forms 2, 3 and 4 since they had stayed longer in school. Students in the selected schools were randomly sampled. The class teachers (42) who were purposively sampled participated in the study.

while the students' questionnaire was 0.71. The instruments were acceptable. (Githua 2002, Franklin and Warren 1990)

Data collection

The researchers visited the sampled schools to administer the questionnaire to both class teachers and students.

Data analysis

The data collected was numerically coded and entered in the coded sheet. The scores were analyzed using the Statistical package for social sciences (SPSS) programme to give computed descriptive percentage and frequencies.

Results and Discussion

The results were tabulated and followed by an interpretation after every table. A brief discussion of each finding is as follows:

Table 2: Teachers' responses on reasons for students' absenteeism.*N=42.*

Reasons of Absenteeism	Frequency	Percent
Students' illness	36	86
Domestic chores	31	74
Lack of school fees	40	95
Peer influence	21	50
Bullying by other students	26	62

RQ 1: Causes of students absenteeism

From table 2, it is quite clear that the major factors teachers perceived as the causes of absenteeism included lack of fees (95%), students illness (86%), domestic chores (74%),

bullying from other students' (62%) and peer influence (50%).

Moraa (2003), found similar reasons for absenteeism among students in Thika District.

Table 3: Students' response on Reasons for students' Absenteeism*n=28,*

Reason for Absenteeism	frequency	Percent
Students' illness	213	76
Domestic chores	187	66
Lack of school fees	218	78
Peer influence	198	70
Bullying by other students	208	74

According to the students, factors causing absenteeism were, Lack of school fees (78%), students' illness (76%), Bullying by other students (74%) and Domestic chores (66%). Mueni (1984), Bantu (2003), Moraa (2003) are all in agreement that student illness, lack of school fees, peer influence and bullying by other students are factors causing absentism in schools.

RQ2: Effects of students' Absenteeism on academic performance:

The objective of the study was to find out

whether there is any relationship between students' absenteeism and academic performance. The researcher asked the opinion of the class teachers whether absenteeism affects students performance. Their responses are summarized in table 4.

As shown in Table 4, all teachers (100 percent) were of the opinion that absenteeism affects students' academic performance. The researcher intended to know how absenteeism influences academic performance from the class teachers. Table 5 summarizes their responses.

Table 4: Teachers' responses on effects of absenteeism on academic performance.

Teachers' opinion	Frequency	Percent
Yes	42	100
No	0	0
Total	42	100

Table 5: Ways in which students' Absenteeism Affect Students' Academic Performance: Teachers' responses

Effects of absenteeism	Frequency	Percent
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Lack of syllabus coverage	40	95
Lack of mastery of concepts	25	60
Missing of examination	10	24

*percent column total is more than 100% due to multiple responses

Table 5 shows that the major ways through which absenteeism affects academic performance are failure to cover syllabus (95%), lack of mastery of concepts (60%) and missing examinations (24%). The students were asked

to state their opinion on the following statement: "Students who are absent do not cover syllabus". The responses are summarized in Table 6.

Table 6: Absentees do not cover the syllabus

Opinion	Frequency	Percent
Agree	231	82
Undecided	26	9.0
Disagree	26	9.0
Total	281	100

Majority of the students, (82%) reported that students who are absent from school do not cover the syllabus while (9%) of the students disagreed. Further, the students were asked

their opinion on whether students who are absent perform poorly in examinations and their responses are summarized in Table 7 as follows:

Table 7: Absenteeism affects Students' Academic Performance: Students' Responses

Opinion	Frequency	Percent
Agree	211	75
Undecided	31	11
Disagree	39	14
Total	281	100

Table 7 shows that (75%) of the students agreed that absenteeism affects students' academic performance, while (14%) disagreed.

From the foregoing findings and as opined by Gitonga (1997), Gidden (2000) and Moraa (2003) both the teachers and students were in agreement that students absenteeism had effect on academic performance.

Conclusion and Recommendation

The major focus of the study was to determine causes of students' absenteeism and their effects on academic performance. From the findings it can be concluded that causes of students' absenteeism include family related factors, school related factors and personal reasons and also that students absenteeism do affect academic performance in public secondary schools in Nyandarua Central

District, Nyandarua County.

The research study came up with the following recommendations.

1. Parents should pay school fees on time so that children are not sent home to collect money. They should also provide their children with learning materials like stationery and uniform and ensure that they don't give their children excessive household duties so as to allow them attend school.
2. There is need to create a bursary fund kitty to assist the needy students and particularly setting aside a part of the Ward/Constituency Development Fund to promote education by paying fees for needy students.

3. Guidance and Counseling programmes should be enhanced in schools to emphasize on the importance of school attendance to both students and parents. This will minimize the rate of absenteeism among students who miss school due to lack of interest in school work.
4. The administration should hold regular meetings with parents either on regular parents' day or public barazas where the problems facing students can be presented to parents or guardians for solution to be sought.
5. The school administration should purchase drugs for common diseases like malaria, common cold, headaches and stomach aches. The school should also employ a trained nurse to ensure good health precaution. The school should also employ a matron to ensure good sanitary and clean environment in the boarding facilities. Employing of a school nurse will save students a lot of travelling to hospitals and clinics where they spend more time waiting to be treated.
6. Teachers should encourage students to cultivate a personal attitude towards their dreams and challenges, fears and aspirations. This will encourage school attendance.

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Effect of Fresh Garlic Extract on Histoarchitectural Studies of Bone Marrow Stem Cells in Adult Male Rabbits

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Abstract

Garlic is wild progenitor that originated in the high planes of West-Central Asia. It has been widely used as food and medicine. Its effects have been demonstrated in both animals and humans. The aim of this study was to examine the effect of freshly prepared Aqueous Garlic Extract (FAGE) on the *Histomorphology* of rabbit bone marrow stem cells. Adult Male New Zealand white rabbits were used for the study. Five experimental groups were *intraperitoneally* injected with different absolute concentrations of freshly prepared garlic extracts. *Pluripotent* Stem Cells were Histologically analyzed for their rate of growth and development, shape, sizes and characteristic staining to denote normal or abnormal precursor cell functioning. These were done from bone marrow aspirates from selected rabbit bones. There wasn't any statistical significant difference between the control group (2ml distilled water, placebo) and the 4 experimental groups (gp 1 = 0.5, gp 2 = 1.0, gp 3 = 2.0 and gp 4 = 4.0 ml) of absolute fresh garlic extract concentration respectively. However, there seemed to be an increase in the *hematopoietic* activity of rabbits in experimental groups 3 and 4 (83.4%, $p < 0.05$) as compared to groups 1 and 2 (30.3%, $p < 0.01$) and consequently the control group, as microscopically observed from the smears. Conversely, dependent on the dosage, garlic seemed to have an influence in each experimental group, thereby eliciting sigmoid (S-shaped) dose-response curves and an exponential growth rate and development of pluripotent Stem Cells. The study showed that freshly prepared garlic extract and its active chemical compounds are a good source of blood boosting herb which can be used to stimulate the bone marrow cells into efficient hemopoiesis.

Keywords: Garlic, Hemopoiesis, Pluripotent, Histomorphology, Intraperitoneal

Introduction

Garlic is a cultivated plant. Its scientific name is *Allium sativum* L. It is a wild progenitor originated in the high planes of West-Central Asia. It is derived from the Central Asian species *A. longicupis*. People used it widely as food and medicine. The plant spread east and west with nomadic tribes, and was known to be cultivated in the Middle East more than 5000 years ago. The word 'garlic' originates from the Anglo-Saxon 'gar-leac' or 'spear-plant' (Pickering, 1879). This plant has had significant foreign influences in Kenya. The Asians have been in Kenya for many decades, having arrived first as

contractors and later as traders. These people introduced garlic to Kenya and has since been captured and used by different populations. The Coastal region is the major entry region, being a tourist destination and a regional business hub. Fresh cloves, garlic tea, syrup, tincture and other preparations have been made. Garlic has been used as an aphrodisiac, to treat hysteria, dandruff, typhus, epilepsy, antiseptic, colds, fever, flu symptoms, coughs earache, bronchitis, shortness of breath, asthma, sinus congestion, headache, stomach ache, high blood pressure, toothache, atherosclerosis, hypertension, vaginitis, worms, diarrhoea, dysentery, gout,

rheumatism, whooping cough, pinworms, old ulcers, snakebites and for numerous other ailments, conditions, and applications (Foster, 1990).

The effects of this herb have been demonstrated in both animals and human. The herb has been a subject of intensive scientific research (past 5 decades), with over 2000 scientific publications. Scientific publications have shown antibacterial, anti-fungal, anti-tumor, hypolipidemic, hypoglycemic, antiatherosclerotic, hematinic and hypertensive activity. It is this plant's bioactive chemical constituents that beneficially modulate the physiology of an ailing human being. Worldwide, more than 10000 species identified as medicinal.

However, not much has been done on garlic with regard to its Effect on the Histoarchitectural alignment in the Bone Marrow Stem Cells. The aim of this study was to examine the effect of freshly prepared Aqueous Garlic Extract (FAGE) on the histomorphology of rabbit bone marrow stem cells.

Materials and Methods

Fresh garlic bulbs were purchased from the local market. Species with 6-12 cloves covered with white coat were ideal. They were weighed for standardization (100g). The bulbs were peeled, sliced and ground using a blender machine. The resultant semi-solid mixture formed garlic homogenate containing a concentrated composition of garlic's active ingredients. The homogenate was dissolved completely in a known amount of distilled water (1g in 10ml of distilled water). 100ml of FAGE in a 150ml beaker was made and kept for subsequent use, within 30 minutes of preparation. Five doses of different concentrations 26, 52, 104,208 and 416mg/kg body weight (corresponds to 0.5, 1.0,

2.1, 4.78 and 8.4ml) of absolute FAGE were prepared and given to the experimental groups intraperitoneally.

Thirty out of fifty adult male New Zealand white rabbits were used. They were randomly selected (Simple random). 5 experimental groups A, B, C, D, E. Two animals from each group were non-reversibly anaesthetized using diethyl ether (plus ketamine, 50mg/kg i.m.) so that the sedation and immobilization lasts about 30 minutes. The skin of the area to be aspirated was cleaned with 70% alcohol (e.g. ethanol). An Islam's bone marrow aspiration needle was used to bore through the subcutaneous tissue and periosteum of selected site into the bone. Less than 1ml of the marrow content was required. The bones of interest were the Ulna, sternum, tibia, femur and the humerus.

Pluripotent Stem Cells were Histologically analyzed for their rate of growth and development, shape, sizes and characteristic staining to denote normal or abnormal precursor cell functioning. These were done from bone marrow aspirates from selected rabbit bones.

Data Collection, Analysis and Presentation

Levels were compared within and between groups by a one-way ANOVA at 95% confidence interval. Slides of bone marrow were prepared. A post-hoc test (Turkey's HSD) pair-wise multiple comparisons was used to analyse structural significance difference on the baseline between garlic fed and the controls. All values were expressed as Mean +/- SEM. P-value of less than 0.05 was considered statistically significant. Data was tabulated and graphs drawn to depict variations of the measured haematological parameters using Statistical Programme for Social Sciences (SPSS) version 11.5.

Results and Discussion

Table 1. The effect of Fresh Aqueous Garlic Extract on Stem Cell Production

Groups	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
CONTROL	25	5.1200	.83267	.16653	4.7763	5.4637	3.00	7.00
EXP.GP1	25	5.1200	1.39403	.27881	4.5446	5.6954	1.00	7.00
EXP.GP2	25	6.0800	1.63095	.32619	5.4068	6.7532	3.00	11.00
EXP.GP3	25	6.3600	1.84572	.36914	5.5981	7.1219	1.00	9.00
EXP.GP4	25	7.2400	1.09087	.21817	6.7897	7.6903	5.00	9.00
EXP.GP5	25	7.3200	1.57374	.31475	6.6704	7.9696	5.00	11.00
Total	150	6.2067	1.66808	.13620	5.9375	6.4758	1.00	11.00

Table 2: shows the ANOVA results on mean Stem Cell differences between and within groups.

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	117.713	5	23.543	11.419	.000
Within Groups	296.880	144	2.062		
Total	414.593	149			

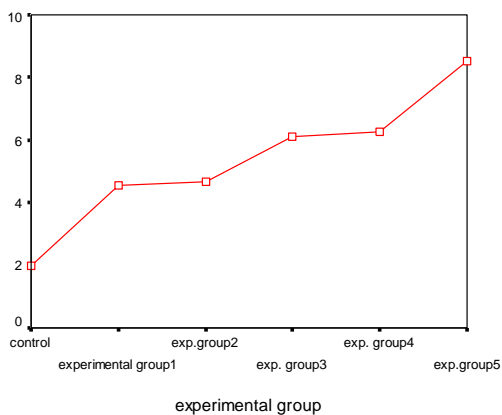


Figure 5.5: Dose response curve for Reticulocyte production

Figure 1: Dose-response curve on the rate of production of Bone Marrow Reticulocytes.

Table 3: Effect of AGE on the rate of production of Bone Marrow Reticulocytes.

Groups	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval of Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Control	25	2.000	.57735	.11547	1.7617	2.2383	1.00	3.00
Exp. Group1	25	4.560	1.87261	.37452	3.7870	5.3330	1.00	8.00
exp. Group2	25	4.680	2.03552	.40710	3.8398	5.5202	1.00	9.00
exp. Group3	25	6.120	2.31517	.46303	5.1643	7.0757	1.00	9.00
exp. Group4	25	6.280	2.99333	.59867	5.0444	7.5156	2.00	14.00
exp. Group5	25	8.520	3.77624	.75525	6.9612	10.0788	1.00	13.00
Total	150	5.360	3.14372	.25668	4.8528	5.8672	1.00	14.00

Figure 2: Mean Bone Marrow Reticulocyte counts between days.

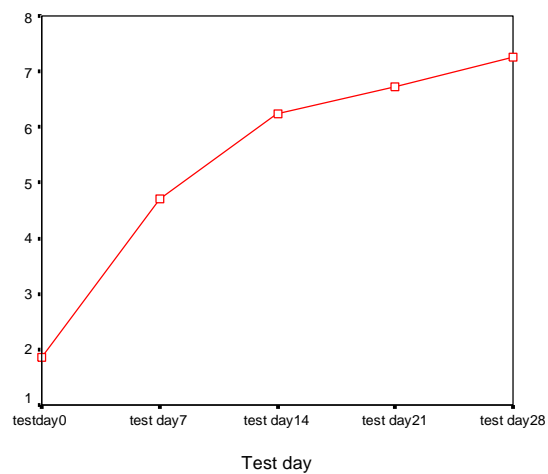


Table 4. Shows ANOVA results of mean rate of Reticulocyte production between and within groups

Retic Level	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	595.040	5	119.008	19.529	.000
Within Groups	877.520	144	6.094		
Total	1472.560	149			

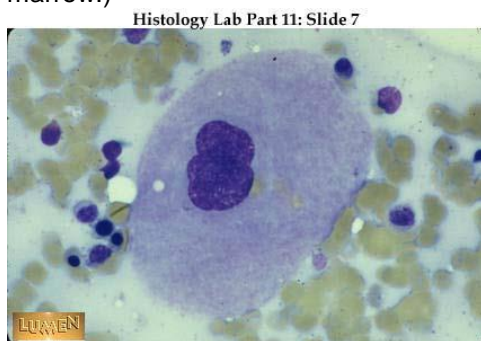
Bone Marrow and Hemopoiesis



Slide 1: Bone marrow showing the typical cellular masses of developing blood cells lying between the round, empty fat cells. There are two large megakaryocytes in the field, one just about in the center and the other to the extreme right. Notice orange-colored RBC's in thin-walled sinusoids.

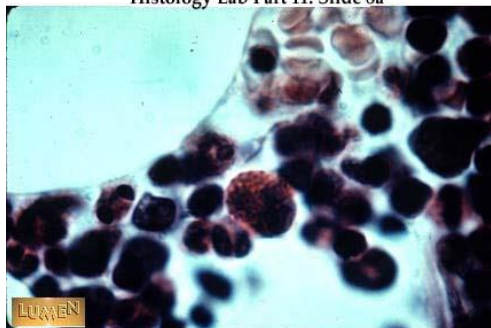


Slide 2: Megakaryocyte as seen in an H & E stained section. Note its multilobed nucleus and its comparatively giant cell size. (Remember that the other giant cell of bone, the osteoclast, has multiple separate nuclei. The osteoclast lies next to bone, while the megakaryocyte lies out in the middle of the marrow.)



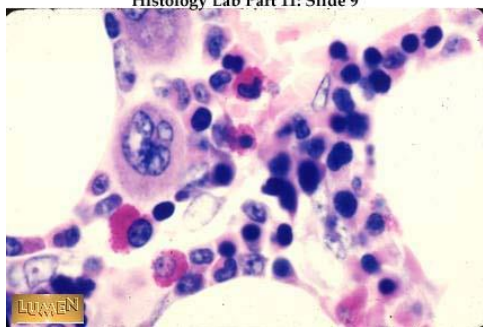
Slide 3: Another megakaryocyte, this time as seen in a marrow smear with the May-Grunwald-Giemsa blood stain. In a smear the whole cell is here, though somewhat flattened. The lobed nucleus seems drawn together into a compact mass. Fragments of cytoplasm will form platelets.

Histology Lab Part 11: Slide 8a



Slide 4: In a section like this, stained with H & E, the developing blood cells are hard to identify. However, about in the middle of the field one can recognize a nearly mature eosinophil with bright red granules.

Histology Lab Part 11: Slide 9



Slide 5: Identification of cells is somewhat easier in marrow stained with phloxine - methylene blue - azur II. Here we see a megakaryocyte near the rim of the fat cell to the left. Immediately below is a brightly stained eosinophil. The pale oval nucleus just to the right of the eosinophil belongs either to a reticular cell or a hemocytoblast (stem cell); both are primitive cells and similar in appearance in a section like this.

Discussion

Garlic has been widely used as food and medicine. Its effects have been demonstrated in both animals and humans. The effect of freshly prepared Aqueous Garlic Extract (FAGE) on the *Histomorphology* of rabbit bone marrow stem cells gives a new direction and hope for the treatment of bone marrow diseases and related ailments of blood. Five experimental groups were *intraperitoneally* injected with different absolute concentrations of freshly prepared garlic extracts. *Pluripotent* Stem Cells were Histologically analyzed for their rate of growth and development, shape, sizes and characteristic staining to denote normal or abnormal precursor cell functioning. There wasn't any statistical significant difference between the control group (2ml distilled water,

placebo) and the 4 experimental groups (gp 1 = 0.5, gp 2 = 1.0, gp 3 = 2.0 and gp 4 = 4.0 ml) of absolute fresh garlic extract concentration respectively (Table 4).

However, there seemed to be an increase in the *hematopoietic* activity of rabbits in experimental groups 3 and 4 (83.4%, $p < 0.05$) as compared to groups 1 and 2 (30.3%, $p < 0.01$) (Table 4) and consequently the control group, as microscopically observed from the smears (Slide 1-5). The slides showed normal staining with the relevant stains. The cells were clearly seen with no abnormal effects on their structure. The numbers of production increased with dosage. Their shapes were also normal. Garlic does not affect body cells in any abnormal way, which makes it good for alleviating human blood related ailments. Conversely, dependent on the

dosage, garlic seemed to have an influence in each experimental group, thereby eliciting sigmoid (S-shaped) dose-response curves (Figure 1) and an exponential growth rate and development of pluripotent Stem Cells (Figure 2).

The study showed that freshly prepared garlic extract and its active chemical compounds are a good source of blood boosting herb which can be used to stimulate the bone marrow cells into efficient hemopoiesis (Table 3) with groups 4 and 5 having the highest increase in the rate of stem cell production dependent on FAGE dosage. The parameters were statistically significant. Garlic has an increase in erythropoietic activity in the bone marrow of experimental groups. Conversely, dependent on the dosage, FAGE had a dose-dependent relationship for Red Blood Cells and Reticulocyte production (Figure 2), and an exponential growth curves in Reticulocyte counts between the groups (Table 1).

This indicated that FAGE, or as used in its naturally occurring form (fresh garlic bulbs), increases erythropoiesis and influences the histoarchitecture of Bone Marrow Stem Cells. Active components of garlic could be extracted and incorporated in the synthetic drug to have a more potent Bone Marrow proliferation and other hematologic drugs, to stimulate the growth of Bone Marrow Stem Cells. This will be best alternatives for Bone Marrow Transplants and healing infected bone marrow cells in vivo.

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Isolation and Identification of Fungal Dermatological Agents among Patients Attending Thika District Hospital Thika, Kenya

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Abstract

Fungal dermatological conditions are caused by a group of fungi called dermatophytes. They cause infections in almost all parts of the body. They are not life threatening but they affect the quality of life of the patients. In Kenya the prevalence and distribution of the infections as well as the common dermatological agents are not known. The main objective of this study was to isolate and identify fungal dermatological agents from clinical samples from patients presenting with suspected fungal skin infection in Thika District Hospital. The study also examined the possible predisposing factors to fungal infections in patients attending Thika District hospital. Clinical samples from 126 patients were subjected to Potassium hydroxide (KOH) preparation and culture. The KOH digested specimens and fungal colonies were examined and identified macroscopically and microscopically. Results were analyzed by SPSS 12 software. The average age of the patients was 15.5 years and the ratio of male to female was 1.7:1. Out of 126 samples 107(84.9%) were KOH positive and 106(84.1%) were culture positive. *Trichophyton spp.* had the highest isolation of 67(62.6%), with *T. verrucosum* being the most common 21(16.3%) followed by *T. sudanenses* and *T. mentagrophytes* each at 12 (9.3%). The other fungal organisms isolated were yeast 26(24.3%), *Epidermophyton spp.* 3(2.8%), *Microsporum spp.* 3 (2.8%) and others that were non-dermatophyte were 8(7.5%). The isolation rate of fungal infection was 84.1 % indicating that dermatophytosis in Thika District Hospital is a major cause of morbidity warranting intervention. This study recommends routine mycological investigations in both adults and children with suspected mycoses for better management of dermatological conditions in Thika District Hospital.

Key words: Dermatophytes :Trichophyton spp.: Thika district hospital

Background

Fungal dermatological conditions are caused by a group of fungi called dermatophytes. They cause infections in almost all parts of the body. They are not life threatening but they affect the quality of life of the patients. Fungal disorders are emerging significant infections in the world (WHO, 2005). They are transmitted from person to person directly by means of contact or via fomites contaminated with infected skin scales or hairs. They can also be acquired by humans from infected animals and by direct exposure to infected soils (Raza and Howard1997; Cohen and Powdery 2004).

In recent years they have become an important clinical condition that deserves public health attention (Cohen and Powdery, 2004).

Mycology is a somewhat ignored field in medical research limiting the availability documented data on the overall prevalence of fungal infections in the world. However, recent literature suggests a prevalence of dermatological conditions as high as 30% depending on the type of fungal agent and the country (Williams, 1993; Souza *et al.*, 2008; Hashemi *et al.*, 2009). The burden is more in developing countries and also ranges from one country to another, for example the prevalence of dermatophytoses in Tunisia is 30.3%, in Brazil 38.4% and in Iran 21.1 % (Souza *et al.*, 2008; Neji *et al.*, 2008; Hashemi *et al.*, 2009).

In Kenya the prevalence and distribution of fungal disorders and the causative agents are undocumented hence the situation is not

known. Personal communication with health care providers suggests an upsurge of fungal infections in hospitals. Despite this, the country lacks systematic studies to monitor the prevalence and distribution of fungal diseases hence there is lack of updated data on fungal disorders. The objective of this study was therefore to isolate and identify fungal agents of dermatological conditions among patients presenting with suspected fungal infections in Thika District Hospital.

Study objective

To isolate and identify fungal dermatological agents from clinical samples of patients presenting with suspected fungal skin infection in Thika District Hospital.

Specific objectives

- i) To isolate fungal causative agents of dermatological conditions in patients presenting with suspected fungal dermatological infections in Thika District Hospital.
- ii) To identify fungal agents isolated from patients in Thika District.

Methodology and study population

The study was conducted between September 2009 and February 2010 in Thika level five hospital in Kiambu county.

The study targeted patients both adults and children in patients and out patients visiting Thika District Hospital whose chief complaints were dermatological conditions consistent with fungal infections.

A prevalence of 10% was used in reference to Chepchirchir *et al.* (2009). The sample size was determined using the formula as used by Fisher (1999).

$$N = \frac{pqz^2}{d^2}$$

Where;

n = minimum sample size required

p = proportion of the target population estimated to have particular problem

q = 1 – p

z = level of precision (1.96) which corresponds to 95 % confidence level

d = degree of accuracy desired set at 0.05

$$n = \frac{0.1 (0.9) (1.96^2)}{0.05^2}$$

$$= 119.2$$

Hence the minimum sample size to be processed was 119 respondents

Purposive sampling was done by enrolling patients presenting with clinical symptoms of fungal infection. Samples were obtained by scraping the infected skin and nails with a sterile scalpel blade while infected hairs were removed by plucking with forceps.

The specimens were examined for the presence of characteristics of dermatophyte infection such as hyphae or spores by adding 20% potassium hydroxide (KOH) and leaving it overnight for the digestion of keratin to occur. Diagnosis of dermatophytes in the skin scales and crusts was predicted on visualization through direct microscopy of branching septate hyphae with angular or spherical arthroconidia (arthropores) usually in chains. On hair pieces, it was predicted on visualizing of arthroconidia arranged along the

length of the hair in chains or in masses around the hair (Ectothrix infections) or inside the hair shaft (endothrix infection) The Specimens were also inoculated in Sabourauds Dextrose Agar (SDA) that contained Chloramphenicol to inhibit the growth of bacterial contaminants. Cultures were read weekly to capture pathogens as well as their rate of growth. A culture plate was kept for a maximum of six weeks before being ruled out as negative growth. Identification of dermatophytes from positive cultures was based on colonial characteristics in pure culture and microscopic morphology of fungi using lactophenol blue, which includes the presence of conidia (macro and micro) and microscopic appearance of the conidia.

RESULTS

Microscopic examination of specimens (KOH)

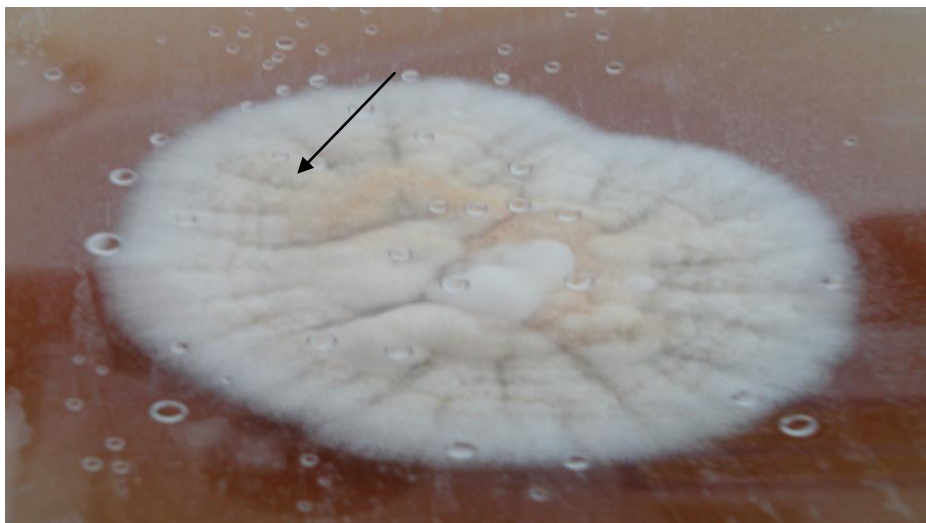
From a total of 126 specimens collected 107 (84.9 %) were KOH positive indicating that the lesions were caused by fungi hence confirming the presence of fungal infection. However, 19 (15.1%) specimens were KOH negative. The KOH positivity is a presumptive diagnosis of fungal infection.

Confirmation of infection by culture

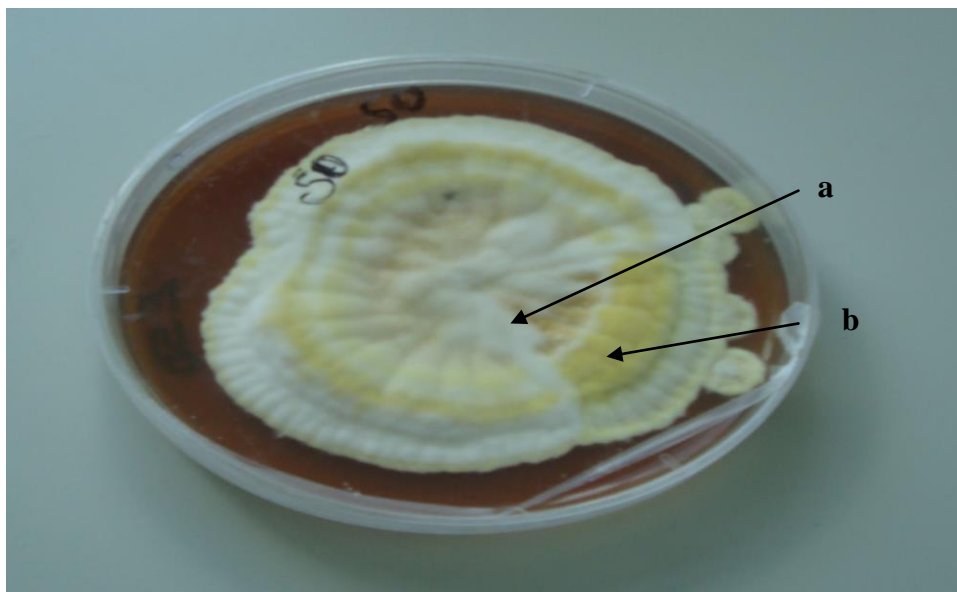
The entire 126 specimen were cultured and out of the 107 specimens that was KOH positive, 106 (84.1%) were culture positive. The specific fungal agents causing the infections were

identified. Only twenty (15.8%) specimens were culture negative but had growth characteristic of bacteria. A total of 107 fungal agents were isolated. *Trichophyton species* had the highest occurrence of 67/107 (62.6%) with *T. verrucosum* being the most common with 21/107 (16.3%) followed by *T. sudanense* and *T.*

mentagrophyte each with 12/107 (9.3%). Other agents were yeast 26/107 (24.3%), *Epidermophyton spp.* 3/107 (2.8%), *Microsporum spp.* 3/107 (2.8%) and others that were not dermatophyte or yeast were 8/107 (7.5%)

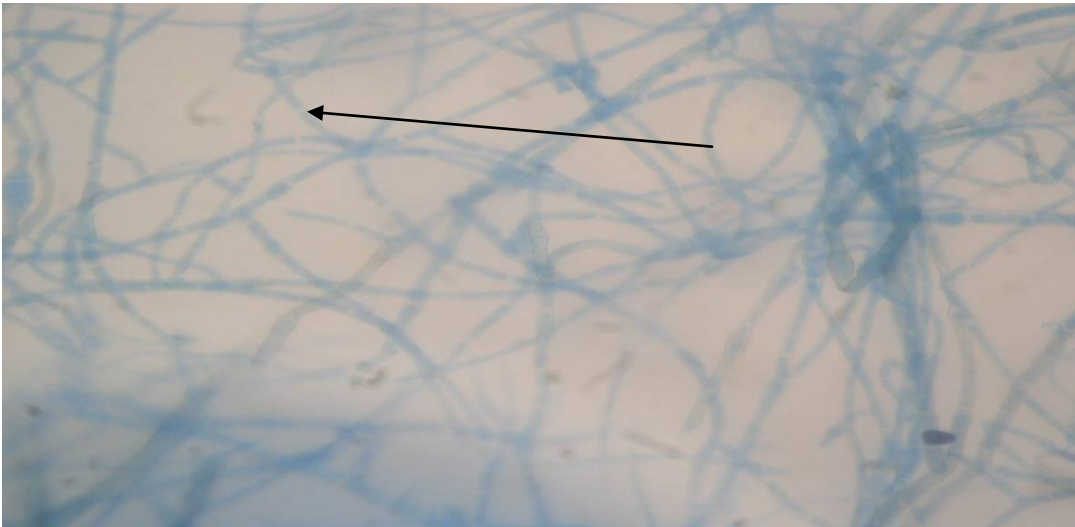


Sabourauds dextrose agar culture plate of *T. verrucosum* showing white to brown colony with rugal folds

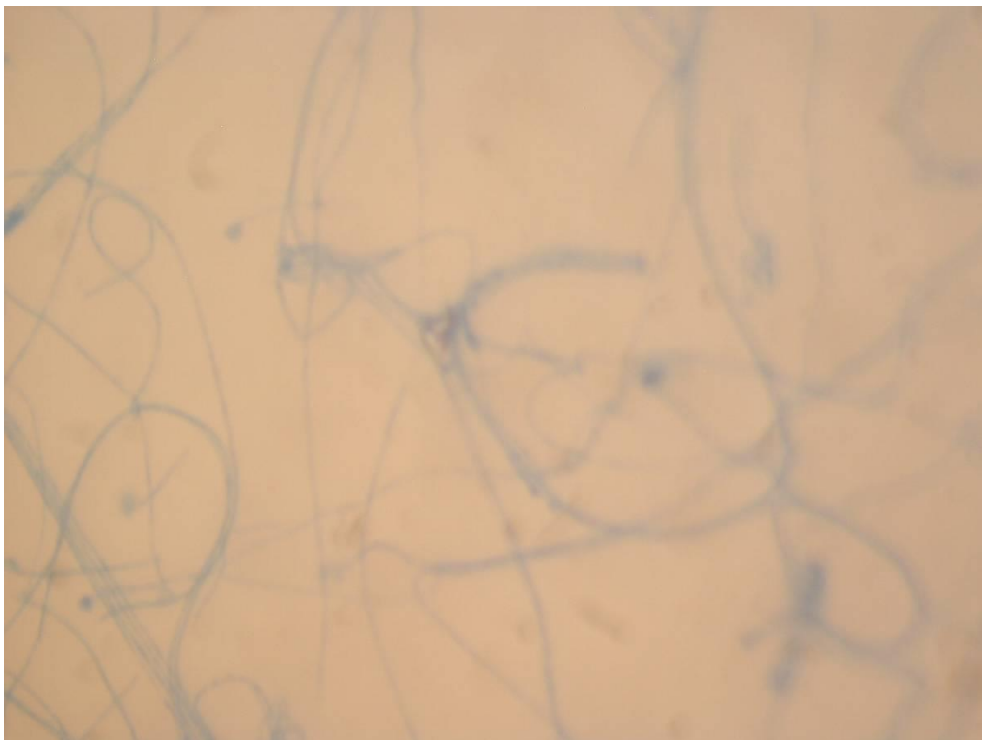


Sabourauds dextrose agar culture plate of *T. concentricum* showing a heaped colony which is highly folded (the white colour (a) intercepted with yellow to brown colour(b))

Confirmation of the species by use of Lactophenol cotton blue stain



Lactophenol cotton blue stain of *T. verrucosum*. Arrow showing hyphal strands characteristic to *T. verrucosum*.



Lactophenol cotton blue stain of *T. mentagrophyte*, arrows showing spiral hyphae and club shaped conidia

Suspected yeast on SDA agar was streaked on CROMEagar candida (CROMEagar Paris France) and identified by observing the type of growth and coloration. CHROMEagar candida is a special chromogenic media for presumptive identification of yeast where they exhibit different colors on growth. *C. albicans* has green coloration, *C. tropicalis* blue, *C. glabrata* purple, and *C. parapsilosis* pink.

Indian ink was used to screen *Cryptococcus neoformans*. Normal saline with the growth was placed on a slide and Indian ink added in equal proportions. The polysaccharide capsule displaced the ink to produce clear halo around the cells surrounding the yeast of *Cryptococcus* indicating presence of the organism.

Discussion

In many clinical and epidemiological studies, fungal infections of the skin and scalp represent a relatively common problem especially in the tropical and subtropical regions of the world where warm and humid climate provides a favorable environment for fungi. They have become a significant health problem affecting children, adolescents and adults (Thappa 2002; Kannan *et al.*, 2006; Chepchirchir *et al.*, 2009). The infections are caused by pathogenic fungi, dermatophytes, which invade the stratum corneum (Cohen and Powdery 2004). In Thika District Hospital fungal agents were isolated from 106(84.1%) specimens out of the total 126 that were cultured. Out of these 62.6% were isolates of *Trichophyton spp.*, 24.3% yeast, 2.8% *Epidermophyton spp.*, 2.8% *Microsporum spp.* and 7.5% for others (those that were not yeast or dermatophytes). The results showed that *Trichophyton spp.* was a leading fungal agent of dermatophytosis while *Epidermophyton spp.* was the least. These results are similar to those obtained from school going children in Kibera slums, Kenya, where *Trichophyton spp.* appeared at 94% while *Epidermophyton spp.* was at 2.1% (Chepchirchir *et al.*, 2009). In other parts of the world the genus *Trichophyton* has been the highest isolate but species vary from one region to another. This could be due to the fact that *Trichophyton* is a keratinophilic filamentous fungus with a high ability to invade keratinized tissue due to possession of several enzymes such as acid proteinases, elastinases,

keratinases and other proteinases while *Epidermophyton* species lack the ability to perforate the hair hence they are low in occurrence (Weitzman and Summerbell 1995).

Of the *Trichophyton spp.*, *T. verrucosum* was the highest isolated 16.3% this was in agreement with hospital findings reported in Sina hospital Iran and primary school children in India (Nejad *et al.*, 2007; Maruthi *et al.* 2008) but different from results obtained in Kenya, Kibera slums, and India where *T. violaceum* was the main isolate (Kannan *et al.*, 2006; Chepchirchir *et al.*, 2009). In other parts of the world different *Trichophyton species* have been reported as most abundant. For example in University of Nigeria hospital *T. soudanense* was the most prevalent (Ozumba and Nlemadium 2008) while in North America and Turkey *T. rubrum* was reported as the most prevalent (Babel and Rogers 2009; Rogers and Babel 2004).

Trichophyton verrucosum was the most commonly isolated agent of dermatophytoses in this study. It is good to note that *T. verrucosum* causes a variety of lesions in cattle and proximity of cattle to human habitation could be the reason. This may be due to the fact that Thika town is surrounded by farming communities who could be coming in contact with animals especially cattle. Rural urban migration could also be the reason, where people migrate when they are already infected. None dermatophyte fungi that were isolated include *Aspergillus niger*, *Fusarium semitectum*, *Cryptococcus spp* and *Rhizopus spp*. One suspected *Penicillium marneffeii* was isolated. This is similar to findings of Maruthi *et al.*, (2008) where *Aspergillus flavus*, *Fusarium oxysporum* and *Penicillium spp* were isolated. Presence of other non-dermatophytes particularly *Aspergillus* and *penicillium* species may be due to the ubiquitous nature of their spores in our environment carried transiently on health skin (Maruthi *et al.*, 2008).

Conclusion

In conclusion the findings of this study suggest that dermatophytosis is a significant cause of morbidity in Thika District Hospital affecting all ages. The isolation rate of 84.1% compared well with those observed in other developed and developing countries. *Trichophyton spp.* is

the major cause of fungal dermatological conditions in Thika Hospital.

Recommendations

This study recommends routine mycological investigations in both adults and children presenting with skin infections suspected to be

of fungal nature for better management of infections.

Although dermatophytosis is not life threatening it should be a public health concern so as to improve the quality of life of those infected. A policy should be formulated on the prevention and treatment of fungal dermatological infections in the country.

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The In Silico Drug Design Approach Against Wolbachium Endosymbiont Of Brugia Malayi

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Abstract

Lymphatic filariasis is a nematode disease, caused by *Brugia malayi* and *Wuchereria bancrofti*. As second causative of morbidity, it continues inflicting socioeconomic burden, pain and suffering amongst endemic areas. This calls for affordable interventions, effective to manage the disease. This study screened *Wolbachia* endosymbiont of *Brugia malayi* genome for putative drug targets using GenScan™ and modeled novel drug compounds by use of *in silico* approach. The target proteins uniqueness was determined using homology search algorithms and BLASTp against human genome. Target sequences were validated by searches against TDR drug targets database. The 3-D structures of the target proteins were modeled and viewed using Cn3D program. Docking was done using Arguslab™ and candidate drug molecules generated. The drug relevant properties of the molecules were predicted. Three target proteins were identified upon which validation confirmed that they are unique to the parasite, not found in the human genome and are available in the TDR database. Structure prediction revealed target proteins were made of either one or two amino acid chains, their sizes ranged between 305- 445 amino acids, molecular weights (34-48 kDa) and had cysteine, arginine and serine residues in the active sites. Ligand docking work reported 3 molecules as candidate drug molecules. Drug property showed that the molecules had molecular weights (307 - 345 g/mol), Log S values (-4.9 - 0), c Log P values (-4.9-3.5),

druglikeness values (-19.1-1.2) and drug score values (0.46 – 0.62). There were no risks of toxicity such as reproductive, irritating and tumorigenic effects reported except for one molecule which had low risk mutagenicity.

Key words: Computer aided drug design, Lymphatic filariasis, *In silico* drug design, docking, wolbachium endosymbiont of *Brugia malayi*.

Introduction

Filariasis is a parasitic disease that arises from thread-like nematodes with eight filarial nematodes causing infection in humans. Main causative of lymphatic filariasis (LF) include, *Wuchereria bancrofti* and *Brugia malayi*. LF manifests itself as swelling of limbs resulting to elephantiasis or hydrocoele. It is the second major cause of clinical morbidity, with an estimated 1.2 billion people at risk of getting LF in the tropics and sub-tropics regions globally (Ghedini, 2007). *Brugia malayi* is the major parasite for LF study as it has reproducible lifecycle in the laboratory.

Within *Brugia malayi* is an intracellular alpha Proteobacteria referred to as *Wolbachium* endosymbiont of *Brugia Malayi* (wBM) rediscovered in 1994 by the filarial genome project by WHO (Taylor *et al.*, 2005). wBM is divided into 7 super groups and additional lineages. wBM is thought to be maternally transferred in some organisms, while in others it is laterally transferred (Werren *et al.*, 2008). Inside the worm, they are located in the lateral cords, ovaries, oocytes and developing embryos in females but absent in male reproductive system (Mc Gary *et al.*, 2005). Apart from complementing the deficient pathways in *Brugia malayi*, wBM is involved in the infection process leading to B-cell proliferation, and antibody generation proofed by wolbachia specific

antigen targeting e.g. wolbachia surface protein, shock protein, aspartate amino transferase (Gillete *et al.*, 2004). wBM exist in all the lifecycle stages of *Brugia malayi* with numbers differing in during lifecycle stages and mammal infection period when the female numbers increase by approximately 600-fold. A recent study in Ghana indicates reduction in the numbers of wBM after treatment by the use of doxycycline for the case for *W. bancrofti*. and *O. volvulus*. This has placed wBM as a target for drug design against *Brugia malayi*.

Lifecycle of *Brugia malayi*

The typical vectors for *Brugia malayi* is transmitted during a blood meal by *Culex*, *Aedes*, and *Anopheles* mosquitoes. Deposited infective stage third-stage filarial larvae develop into larvae stage 4 then into adults that commonly reside in the lymphatic. The adult male and female form network in the lymphatic, here they reproduce sexually via copulation during their lifetime of 10-15 years. Inseminated adult female worms are ovoviviparous and release live larvae (microfilariae) into the lymph, where they eventually circulate in the bloodstream and taken up by mosquitoes during blood feeding. Figure 1 depicts the lifecycle of *B. malayi*.

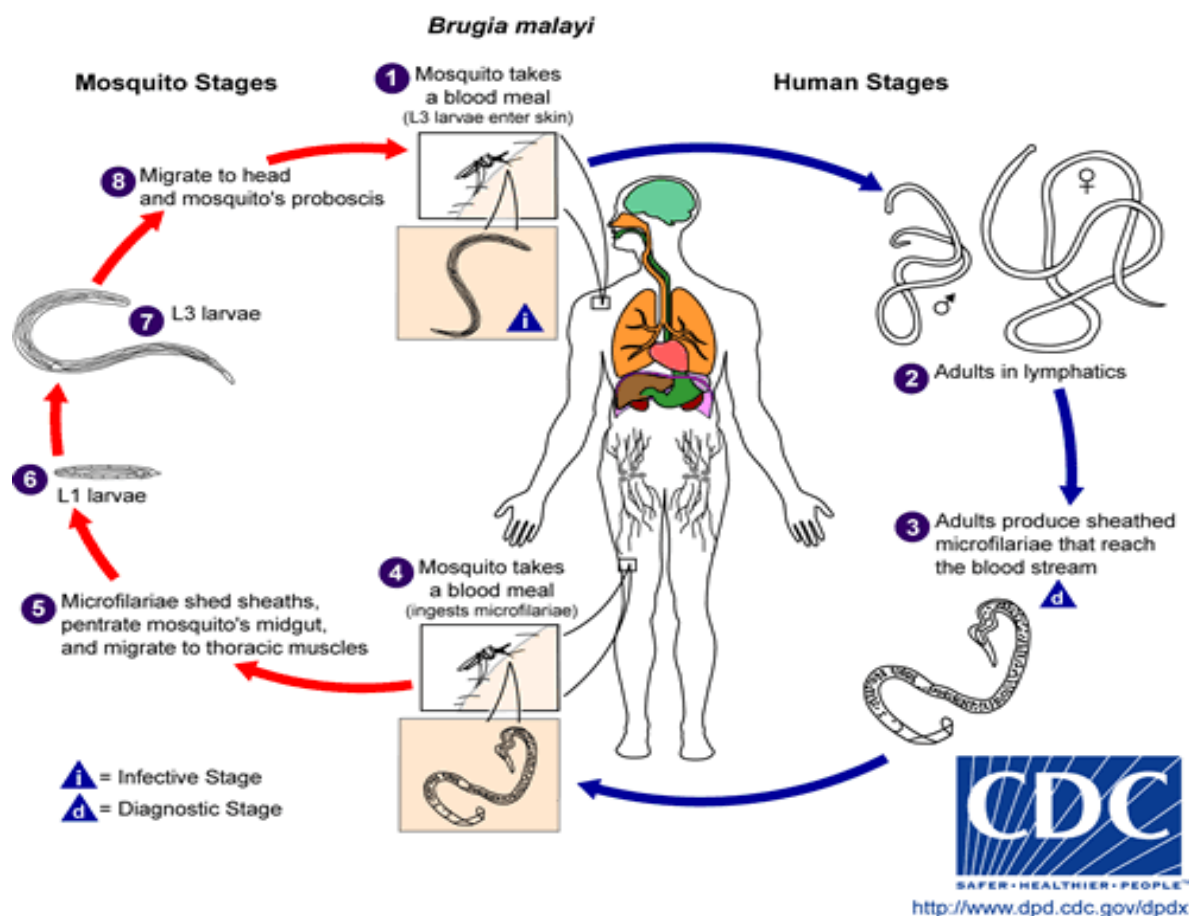


Figure 1: Life cycle of Life cycle of *Brugia malayi* a parasite that causes filariasis.

Clinical manifestation

The disease starts as asymptomatic cases, where parasites hide from the immune and immune complexes by the use of a protein known as (BmMif) that is 42% identical to human macrophage/monocytes migration inhibition factor (MIF) (Ghedini, 2007). It's characterized by hidden damage to kidneys with lymphatic system. Symptoms like lymphangitis or lymphadenopathy, which is the inflammation of the lymphatic vessels, inflammation of a lymph node is known as lymphadenitis, is common in this stage. These cases occur in response to infection characterized by distending of affected lymphatic vessel and overlying skin becoming erythematous and hot (Awadzi, 2004).

One of the non-quantifiable benefits of *in silico* approach is the deep insight that researchers acquire knowledge of drug-receptor interactions (Taylor *et al*, 2005). Molecular models of drug compounds can reveal intricate, atomic scale binding properties that are difficult to envision in any other way. When researchers are shown new molecular models of their putative drug compounds, they often come up with new ideas on how to modify the drug compounds for improved fit (Atschul *et al.*, 1997).

Materials and methods

Screening the *Wolbachium* endosymbiont of *Brugia Malayi* genome.

The search for drug targets in the *Wolbachium* endosymbiont of *Brugia Malayi* genome was an

ab initio search based on the postulation that some proteins are essential for the pathogenesis of this parasite and therefore their inhibition would lead to parasite's death. The *Wolbachium* endosymbiont of *Brugia Malayi* sequence data was downloaded (<http://www.genedb.org/genedb>) and GenScanTM program (Burge and Karlin, 1997) was used to screen the entire genome for genes encoding proteins.

GenScanTM allowed prediction of complete gene structures in a genomic sequence. The larger chromosomes were divided into sections which were each uploaded separately onto GenScanTM with the output indicating the region of the chromosome expressing a particular peptide sequence and calculate the probability of each predicted exon. Very high probability GenScanTM exons ($P > 0.99$) are almost always exactly correct (Burge and Karlin, 1997). Moderate to high probability GenScanTM exons ($0.50 < P < 0.99$) are exactly correct most of the time. Low probability GenScanTM exons ($P < 0.50$) are not reliable and should be treated with caution and it might be desirable to ignore such exons (Burge and Karlin, 1997). Therefore, through screening, only proteins which had a probability ranging from $0.50 < P < 0.99$ and were a single copy gene were selected.

Characterization of target sequences

Target validation

The uniqueness of the candidate targets was determined by homology search algorithms using BLASTp (Altschul *et al.*, 1990) against the human genome. Only proteins which lacked any sequence similarity with human proteins were selected then validated by searching in the TDR drug target database (tdrtargets.org/).

Physico-chemical parameters

The physico-chemical parameters of each target protein sequence, amino acid compositions, molecular weight, and isoelectric point (pI) were determined using Protparam tool (Gasteiger *et*

al., 2005) found at the Expasy website (<http://www.expasy.org/>).

The 3-D structures of target proteins

The 3-D structure of the target proteins were retrieved from the Protein Data Bank (PDB) (Berman *et al.*, 2000). The program RASMOL (Roger *et al.*, 1995) was downloaded and used to visualize structures. The alignments were double-checked using binary ASN1 files and the Cn3D program, v4.1.

Molecular docking

ArguslabTM tool (Thompson, 2004) was used for docking the 3-D structures of target proteins, viewed and loaded in wireframe bonds using Cn3D program, v4.1 (http://www.acdlabs.com/products/chem_dsn_lab/chemsketch). The parameters set for docking included the size of the binding site bounding box, grid resolution, dock calculation type and flexible ligand. During docking, root mean squared distance (RMSD) between the x-ray group and the ligand as well as the binding energy of the ligand to the binding site was calculated. The best ligands were then selected based on their binding energy, that is, lowest energy hence high affinity and the lowest RMSD.

The ligands were then represented on ChemSketch software from ACD laboratory which also generated their names automatically. Through ChemSketch, a search on was performed on Drugbank, emolecules, Pubchem databases (Pubchem compounds, Pubchem substance and Pubchem bioassay) hosted in NCBI Web server to find out any documented studies and bioactivity assays on the molecules.

ADMET Properties Predictions

ADMET Properties Predictions was done using OSIRIS Property explorer tool to determine Log S, cLog P, molar mass, fragment based druglikeness, drug score and toxicity risk assessment (Sander, 2009). Prediction results were valued and color coded. Properties with high risks of undesired effects like

mutagenicity or a poor intestinal absorption were shown in red whereas a green color indicated drug-conform behavior. Drug likeness determines the aqueous solubility of a compound (Log S), partition coefficient of a compound (c Log P), molar mass and toxicity risk assessment (Sander, 2009), as well as comparing the traded drug relevant properties with the generated molecules. Through this, the generated molecules were filtered out by selecting only the molecules whose drug relevant properties conformed to accepted standards.

Results

Screening of the wolbachium endosymbiont of *Brugia malayi* genome and BLAST analysis

Genscan™ results showed that the predicted genes were single copy genes and had probabilities within the range $0.50 < P < 0.99$. Homology searches through BLAST analysis identified hits as putative drug targets with sequence similarities (Z-value) of 100% and expected (E) values of 0.0. Validation of the target proteins confirmed that they are unique to the parasite, not found in the human genome and are available in the TDR database. Three of the targets selected for further characterization included Glutathione synthetase, MurF protein and Murd ligase.

Table 1.1. Physicochemical parameters of selected drug targets

Target Parameter	Glutathione synthetase	MurF protein	Murd Ligase
EC number	6.3.2.3	6.3.2.10	6.3.2.9
Nucleotide location	731584-732500	813732- 814996	808667-811345
No. of amino acids	305	418	445
Molecular weight (kDa)	34.988	43.667	48.582
pI	5.5296	6.892	6.765

The 3-D structures of target proteins

The structures of the target proteins were viewed using Cn3D software. The target

proteins were made of either one or four amino acid chains and had cysteine, arginine and serine residues in the active sites (Figure 1.1).

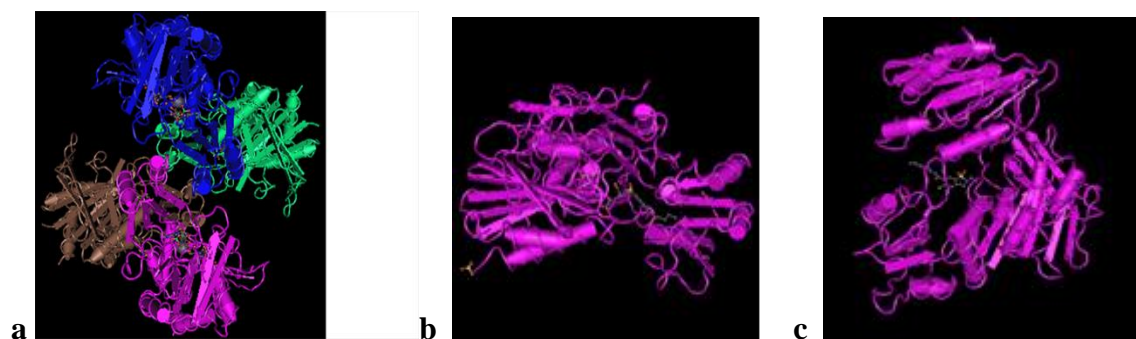


Figure 1.1: The 3-D structures of target proteins

(a) The structure for Glutathione synthetase (PDB id: IGSA), (b) The structure for MurF protein (PDB id: 2AM2), and (c) The structure for MurD ligase (PDB id: 2JFF). The pink region indicates amino acid chain A, blue, grey and yellow indicates other amino acid chains.

Molecular docking

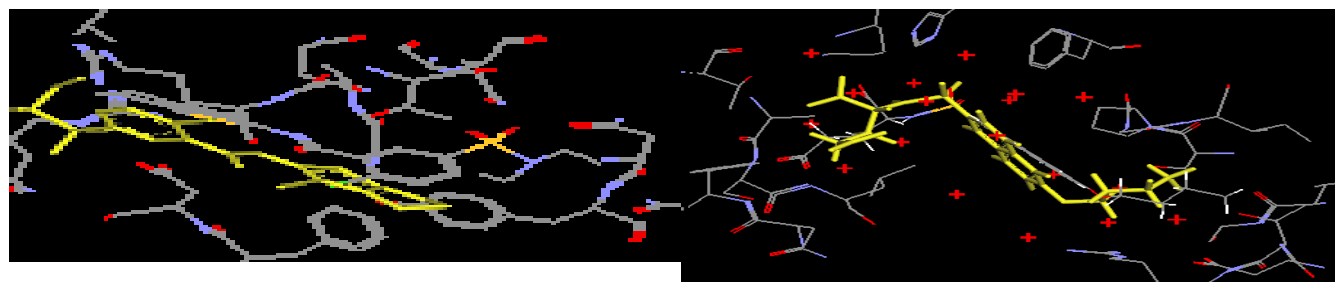
The docked ligands and the amino acids in the binding sites of the target proteins had different amino acid residues (Figure 1.2). Ligand docking showed that the binding site of Glutathione synthetase contained amino acids Arginine, Asparagine, Histidine, Phenylalanine, Serine, Valine, Tyrosine, Threonine and one water molecule. Arginine, Asparagine, Serine and Tyrosine are polar hence important in

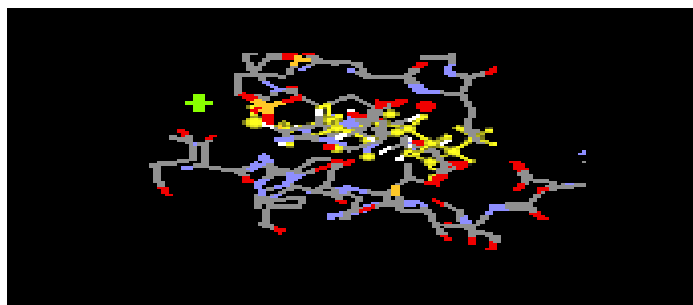
formation of hydrogen bonds with the docked ligand which was glutathione. The binding site of

MurF protein has the amino acids Isoleucine, Leucine, Proline, Tyrosine, Valine, and the docked ligand was 2-chloro-N-(3-cyano-5,6-dihydro-4H-cyclopenta[b]thiophen-2-yl)-5-(diethylsulfamoyl)benzamide. MurD ligase binding site has amino acids Arginine, Asparagine, Cysteine, Glutamine, Glycine, Histidine, Proline, Serine, water molecules (red), and the docked ligand was naphthalene-N-sulfonyl-D-glu derivative (2R)-2-[(6-butoxynaphthalen-2-yl)sulfonylamino]pentanedioic acid.

a).

c)





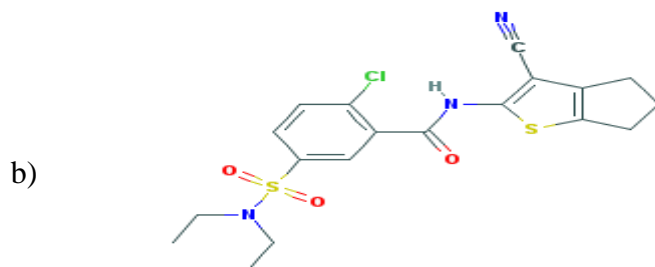
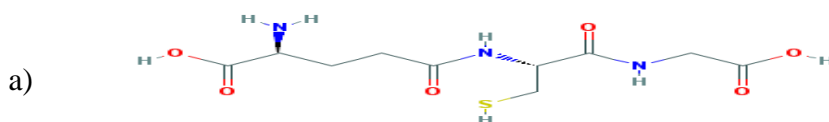
Glutathione synthetase binding site with amino acids (Grey), water molecules (green) and ligand (yellow). b) MurF protein binding site with amino acids (purple and grey), water molecules (green) and the ligand (yellow). c) MurD ligase binding site with amino acids (grey and purple), water molecules (green), and the ligand (blue).

b)

Figure 1.2: Docking of selected ligands onto drug target proteins

Ligands generated through docking

Ligand docking generated a glutathione molecule from Glutathione synthetase, 2-chloro-N-(3-cyano-5,6-dihydro-4H-cyclopenta[b]thiophen-2-yl)-5-(diethylsulfamoyl) benzamide molecule from MurF protein, and naphthalene-N-sulfonyl-D-glu derivative from murd ligase (Figure 3.3). The binding energies and RMSD of the docked ligands are shown in table 1.2.



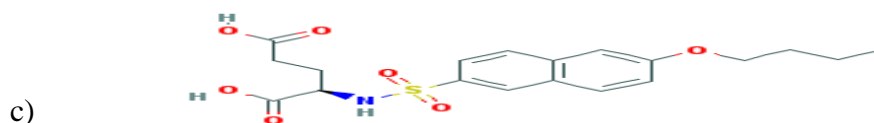


Figure 1.3: The best ligands for selected drug targets.

The molecules are coloured by Arguslab™ program according to their atomic number. The purple colour represents Nitrogen atoms, grey colour represent Carbon atoms, red colour represent oxygen while yellow represent sulphur atoms. (a) Glutathione synthetase: glutathione

b) MurF protein: 2-chloro-N-(3-cyano-5, 6-dihydro-4H-cyclopenta[b]thiophen-2-yl)-5-(diethylsulfamoyl)benzamide c) Murd ligase: naphthalene-N-sulfonyl-D-glu derivative (Figure 1.3).

Table 1.2: Binding energies and RMSD of the docked ligands.

Target	Ligand	Binding energy (Kcal/mol)	RMSD (Angstroms)
Glutathione synthetase	Glutathione	-9.33619	1.92329
MurF protein	2-chloro-N-(3-cyano-5, 6-dihydro-4H-cyclopenta[b]thiophen-2-yl)-5-(diethylsulfamoyl)benzamide	-12.4488	2.608789
Murd ligase	naphthalene-N-sulfonyl-D-glu derivative	-8.344486	1.753213

ADMET Properties Predictions

The analysis of theoretical toxicity risks for the drug candidates using the OSIRIS program showed that all compounds were less toxic and can be used as therapeutic molecules (Table 3.3). As these compounds are considered for oral delivery, they were also subjected to analysis of Lipinski 'rule of five', druglikeness and drug score. The results pointed that all effective

ligands have their druglikeness property such as molecular weight (307-345), c Log P (-4.9-3.5), hydrogen bond donors (0-3) and hydrogen bond acceptors (0-7) were better than those of commercial drugs. Drug likeness, which is related to the similarity with trade drugs (-19.1 to 1.2). Drug score of all derivatives was in the range of (0.46 - 0.62). Among the three candidate drug molecules, two showed the best

values of drug-score (0.56 and 0.62) with a lower toxicity effect.

Table 1.3: The drug relevant properties of optimized molecules.

Property Molecule	Mol Wgt (g/mol)	Log S (mol/liter)	c Log P	Drug likess	Drug score	Toxicity risk
Glutathione	307.3235	-2.8	-2	1.2	0.62	0
2-chloro-N-(3-cyano-5, 6-dihydro-4H-cyclopenta[b]thiophen-2-yl)-5-(diethylsulfamoyl)benzamide	345.0	-4.9	3.5	-19.1	0.56	0
naphthalene-N-sulfonyl-D-glu derivative	324.0	0.0	-4.9	-10.56	0.46	low risk mutagenicity

Discussion

Human filarial nematodes affect more than 150 million people worldwide with 1 billion people at risk in over 80 countries, and lead to some of the most debilitating tropical diseases, including elephantiasis (Basanez *et al.*, 2006; Molyneux *et al.*, 2003). The current anti-filarial treatments e.g. DEC, ivermectin, albendazole (all suitable for lymphatic filariasis) interrupt the cycle of transmission of the causative filarial parasites *Brugia malayi* by predominantly killing microfilaria. However, a lower activity against adult worms, which can survive in human hosts for up to decades, is known. DEC and albendazole produce macrofilaricidal activity only after repeated rounds of mass drug administration (MDA) (Weil *et al.*, (2008).

Since the current treatments have to be

administered annually on a community-wide basis for many years to break the infection cycle, and drug resistance may be emerging, there is still an urgent need to develop novel drugs (particularly macrofilaricidal). Numerous lines of evidence, in both laboratory and human trials, show that depletion of *Wolbachia* in filarial parasites by antibiotics (e.g. doxycycline, tetracycline) can kill adult worms in addition to affecting embryogenesis, mf output and worm development (Hoerauf *et al.* 2003; Supali *et al.*, 2008). These studies indicate that these vertically transmitted *Wolbachia* endosymbionts are indispensable for their filarial hosts and represent a promising therapeutic strategy for filariasis control. *In silico* approach to drug design embraced in this research work is based on the hypothesis that modulation of a specific biological target may have therapeutic value. Therefore, a biomolecule is selected as a drug

target depending on the evidence that it is critical for the disease process and that modulation of that target will have therapeutic value and that the binding of a small molecule will modulate its activity. This is in contrast to traditional methods of drug discovery which rely on trial-and-error testing of chemical substances on cultured cells or animals, and matching the apparent effects to treatments. After screening the entire *Wolbachium* endosymbiont of *Brugia Malayi* genome and carrying out blast analysis Glutathione synthetase, MurF protein and MurD ligase were selected as drug targets.

Glutathione synthetase (γ -l-glutamyl-l-cysteine: glycine ligase (ADP-forming) catalyzes the synthesis of glutathione from γ -l-glutamyl-l-cysteine and Gly in the presence of ATP. The enzyme is a tetramer with four identical subunits of 305 amino acid residues. In the tetrameric molecule, two subunits that are in close contact form a tight dimer, two tight dimers forming a tetramer with two solvent regions. The ATP molecule is located in the cleft between the central and C-terminal domains. The ATP binding site is surrounded by two sets of the structural motif that belong to those respective domains. Each motif consists of an anti-parallel β -sheet and glycine-rich loop.

Through molecular docking, the ligand generated from glutathione synthetase was glutathione. The ligand docked into the binding site with a lower energy and reduced RMSD and a cysteine residue on 403 CYS is involved in the catalytic mechanism. The binding mode of glutathione in the active site of glutathione synthetase also displayed that there were significant hydrogen bonding interaction between the ligand and amino acid residues. The water molecules in the binding site are important for formation of hydrogen bonds.

The drug likeness and the effectiveness of the ligand was found to have a low c Log P value, indicating that they are hydrophobic molecules hence preferentially distributed to hydrophobic compartments such as lipid bilayers of cells. It is also highly soluble and small in size, because diffusion of the drug is directly affected by its weight. The drug molecule also has no reproductive effectiveness property and is neither tumor causing in nature nor has irritant effects. The predicted parameters were very

good, and conformed to those of most traded drugs even though its *in vitro* and *in vivo* efficacies has not been tested.

The pubchem search indicated that there is an ongoing study to investigate how well giving oxidized glutathione together with doxorubicin and cyclophosphamide followed by docetaxel works in treating women with newly diagnosed stage II or stage III breast cancer. It has been postulated that oxidized glutathione may stimulate the immune system in different ways and stop tumor cells from growing (Ikeda *et al.*, 1990).

MurF and MurD proteins belongs to a family of functionally related murein enzymes that participate in the biosynthesis of the bacterial cell wall, and other members include MurA, MurB, MurC and MurE (Ikeda *et al.*, 1990). The sequential nomenclature denotes the order of enzymatic action within the biosynthetic pathway of the peptidoglycan unit that comprises the cell wall and exhibits commonalities among bacterial strains (Bugg and Walsh, 1992; van Heijenoort, 2001). As this feature is both essential for bacteria and unique from human biology, the murein enzymes represent attractive targets for pharmaceutical investigation. Consistent with studies of other bacterial organisms, the screening efforts identified MurF as an essential gene product for the growth of *Wolbachia* endosymbiont of *Brugia malayi*. MurF catalyzes the addition of D-Ala-D-Ala dipeptide to the C terminus of the UDP-N-acetylmuramoylalanine-D-glutamyl-lysine (UDPMurNAc-tripeptide), yielding the UDPMurNAc-pentapeptide unit to which lipids are attached to complete the peptidoglycan monomer (Bugg and Walsh, 1992).

MurD ligase (UDP-N-acetylmuramoyl-L-alanine: D-glutamate ligase) is the second enzyme in the bacterial ligase series and catalyses a highly specific incorporation of D-glutamate to the cytoplasmic intermediate UDP-N-acetylmuramoyl-L-alanine (UMA) concomitant with a degradation of ATP to ADP and Pi. A peptide bond is formed with the growing peptidoglycan via activation of its carboxylate with an acyl-phosphate intermediate followed by nucleophilic attack by the incoming amino acid substrate (Falk *et al.*, 1996).

Through molecular docking, the ligand generated from MurF protein was 2-chloro-N-(3-cyano-5, 6-dihydro-4H-cyclopenta[b]thiophen-

2-yl)-5-(diethylsulfamoyl) benzamide while MurD ligase generated naphthalene-N-sulfonyl-D-glu derivative (2R)-2-[(6-butoxynaphthalen-2-yl) sulfonylamino] pentanedioic acid). The binding mode of these ligands in the active site of MurF and MurD ligase also displayed that there were significant hydrogen bonding interaction between the ligand and amino acid residues. The water molecules in the binding site are important for formation of hydrogen bonds.

The drug likeness and the effectiveness of the ligand was found to have a low c Log P value, indicating that they are hydrophobic molecules hence preferentially distributed to hydrophobic compartments such as lipid bilayers of cells. It is also highly soluble and small in size, because diffusion of the drug is directly affected by its weight. The drug molecule also has no reproductive effectiveness property and is neither tumor causing in nature nor has irritant effects (Osiris Tm).

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Morphological Characterization of Kenyan Native *Macrolepiota* Mushrooms Species From Aberdare National Forest Reserve

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Abstract

Wild edible mushrooms are special forest products. The use of wild mushrooms for food in all probability began with the prehistoric man who gathered the mushrooms from forests that served as an important source of nourishment. Conventional taxonomy emphasizes on the morphological features to characterize a taxon. *Macrolepiota* is a genus in Agaricaceae family which display wide array of morphological variations. The genus is widespread in Southern hemisphere, but also occurs in tropical and Northern hemisphere. A total of 21 *Macrolepiota* fruiting bodies were collected. Both macro and micro-morphological features were used in a conventional taxonomic analysis of fresh material collected from Aberdare National Forest Reserve within Mount Kenya region, Kenya. Results showed that

Macrolepiota species collected were relatively same size, scaled, basiodiocard conical to plane, with centrally attached stipe, microscopically asymmetric elliptical Basidiospores, distinctive geographical distribution, having unique season of fructification. Furthermore, a dichotomous identification key constructed for the six close *Macrolepiota* species proved that Kenyan materials were similar to closely related species compared from other countries. Therefore based on conventional morphological taxonomy Kenyan materials from Aberdare National Forest Reserve are described for the first time as a new member of Basidiomycota; *Macrolepiota dolichaula*. The species is edible. However, domestication protocols can be developed to address food insecurity and supplement families' income.

Key words: *Basiodiocard*, *Basidiomycota*, *Agaricaceae*, *Aberdare National Forest*.

Introduction

Mushrooms are macrofungi usually distinguished by forming fruiting bodies commonly visible to naked eye [Tibuhwa et al., 2012; Rajaratnam & Thiagarajan, 2012]. Ram et al., [2010] describes wild edible mushrooms, as special forest products. Studies on mushrooms have long been of interest to scientist and communities due to their significant roles [Ram et al., 2010; Tibuhwa et al., 2012]. They form integral part of the forest environment and ecosystems such as forest flourishing through saprobic life. Mushrooms have enormous uses generally in human life welfare as well as in food industries.

Edible mushrooms provide a wide range of mineral and vitamins. However, the total nutrient content vary significantly among species, due to different habitation [Tibuhwa et al., 2012]. Therefore, it's amicable that a diverse fungal population contributes to a diverse diet for wild life and human. The sustainability of mushrooms is thus important to maintain and promote productivity of crop land, range lands and forest and may be critical for maintenance of biodiversity and livelihoods [Tibuhwa et al., 2012]. Despite the importance of mushrooms in both natural and agro-ecosystems, little is known about their community structure and dynamics especially in the tropics. Mushrooms in the tropic are under studied, relatively under utilised and very little information on the diversity is known [Tibuhwa et al., 2012]. On the other hand, fungal diversity is usually overlooked during consideration of management of forest ecosystems, yet successful conservation efforts in any ecosystem may require understanding mushrooms communities in terms of ecology and distribution. Classification of macrofungi is constantly anguished by contradictions. This is due to the lack of complete knowledge about all the fungal organisms [Harrington, 1990].

Basidiomycota also known as club fungi, is a sister group to Ascomycota. *Macrolepiota* represents one of the numerous examples of fungal genera in which a sound taxonomy can only be achieved on the basis of vital macro and microscopic characters gained from the study of fresh collections ("vital taxonomy"). Despite the presence of advanced molecular approaches for characterisation of mushrooms, Harrington [1990] in Tibuhwa [2011] states the importance of fresh material for species diagnosis.

The genus *Macrolepiota* (Agaricaceae, Agaricales, and Basidiomycota) was established by Singer [1948]. Macroscopically, basidiomata of species in this genus are typically big, fleshy, and often with squamules on the pileus; lamellae are white to cream; a prominent annulus is usually present which is often movable [Ge et al., 2010; Vellinga et al., 2003]. This character is shared with *Leucoagaricus* Singer, *Leucocoprinus* Pat., and *Chlorophyllum* Mass [Vellinga, 2003; Vellinga et al., 2003; Sysouphanthong et al., 2011]. Microscopically, clamp connections are present on the septa of the hyphae in lamellae; basidiospores are thick-walled, relatively big, white to cream when accumulated, and the inner spore-wall is Dextrinoid, metachromatic in cresyl blue Singer [1948] in Ge et al., [2010]. Originally, *Macrolepiota* only accommodated nonvolvate species. However, Ge et al., [2010] reported that species with a well-formed cup-like volva were placed in a separate genus, namely *Volvolepiota* Singer; Singer [1959] in Ge et al., [2010]. Vellinga and Yang [2003] in their study indicated that a volva at the base of the stipe does not warrant a separate genus, and thus, *Volvolepiota* is synonymous with *Macrolepiota*. Accordingly, the genus *Macrolepiota* in the current sense also contains species with a cup-like volva based on morphological and molecular data [Ge et al., 2010].

Representatives of *Macrolepiota* in the present sense are characterized by the combination of the following characters: pileal squamules of a trichodermal layer made up of long subcylindric elements, spores with a germ pore caused by an interruption of the episporium covered by a hyalinous cap, and the presence of stipe squamules, often visible as coloured bands in the full-grown specimens [Ge et al., 2010; Vellinga, 2003; Vellinga et al., 2003]. Currently, there are about 30 species recognized worldwide [Kirk et al. [2008] in Ge et al., [2010]]. In Europe Jaworska [2010] recorded 17 *Macrolepiota* species. The genus contains some edible species, which has been an interest to cultivate by researchers knowledge of this genus in Kenya is poor and fragmentary.

According to Ge et al., [2010], several species of *Macrolepiota* were recorded from China [Shao & Xiang, 1981; Zang et al., 1996; Bi et al., 1997; Mao, 2000; Teng, 1996; Vellinga & Yang, 2003], literature on some of these records has very limited information in the descriptions and information. Based on extensive morphological examination of *Macrolepiota* in Aberdare National Forest Reserve and the affinities to other species of *Macrolepiota* are presented and discussed. With the ever increasing population and shrinking land, secondary agricultural vocations are going to occupy a prominent place to fill the void of quality food requirements. The demand for quality food and novel products is increasing with the changes in life style and income. Mushroom cultivation fits very well into functional foods free from synthetic chemicals category. Diversification in any farming system imparts sustainability.

Mushrooms are one such component that not only impart diversification but also help in addressing the problems of quality food, health and environmental sustainability. However, this study was aimed at characterising wild edible mushrooms species of *Macrolepiota* genus from Aberdare National Forest Reserve, thus diversify knowledge on myco-utilisation and recommend for domestication adaptations.

Materials and Methods

Study area: Aberdare National Forest Reserve in Kenya

A Five days field trip was made to the forest and covered five reserves of the park (Figure 1) in the month of August 2012.

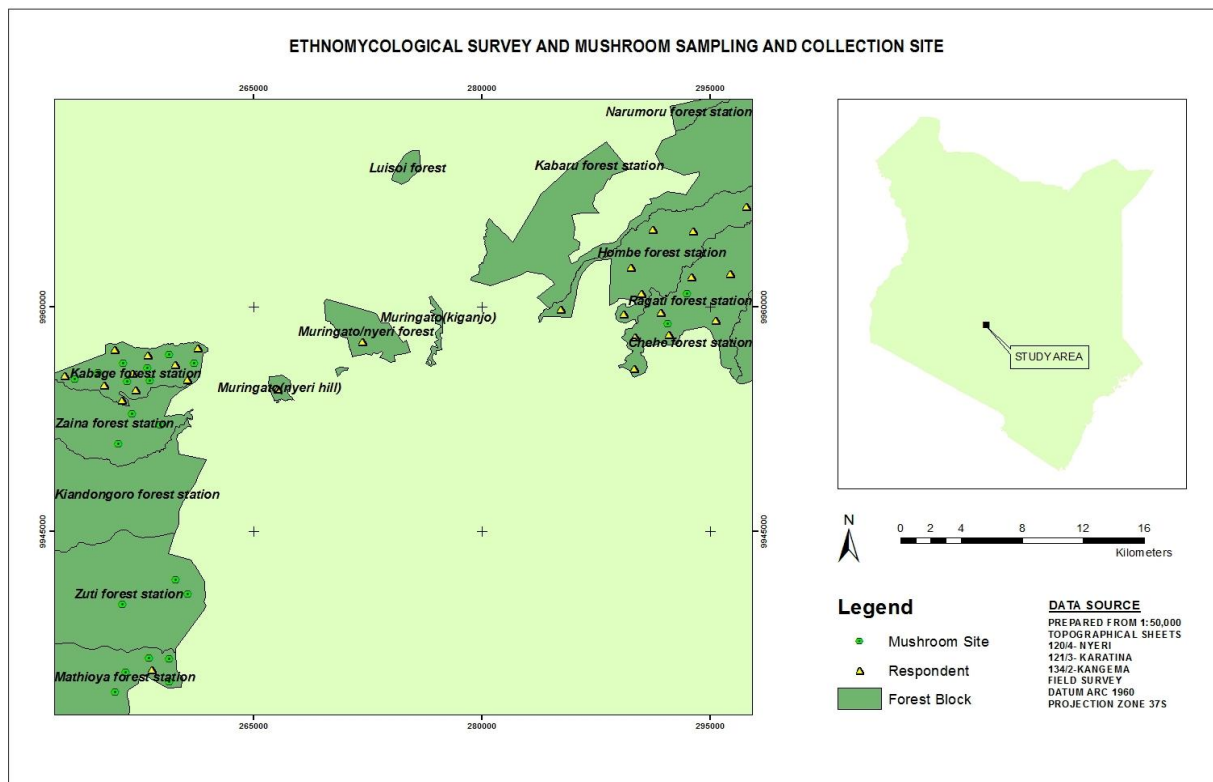


Figure 1: Ethnomycological survey and mushroom sampling sites

- (1). Green points show GPS location where samples were picked;
- (2). Golden points show GPS location where respondents on Ethnomycological survey were interviewed.

Collection, Harvesting and Preservation of *Macrolepiota* sp

Mushroom collection in the forest reserve yielded 21 collections. On the study site, collection positions were recorded using GPS (Global Positioning System-Garmin *etrex-20* Garmin, USA), on spotting the mushroom fruiting bodies. Photographs were taken using a digital camera (CYBER-SHOT DSC-W550 Sony Corporation Japan) and types vegetation around were described by a plant taxonomist. The woody substrates lying on the ground were also identified to the generic level and wherever possible to the species level. Ecological parameters like temperature and relative humidity were also noted. Some of the fresh fruiting bodies were harvested then dehydrated using silica gel and kept in air tight plastic bags until further analysis and molecular studies.

Macroscopic Characterisation of *Macrolepiota* sp

Three representative accessions of the 21 collections are represented in this paper. The collected fresh fruit bodies were examined and described in the field using a detail mushroom collection protocol. The macro-morphology observed in the field included Basidiocarp colour, size, shape, texture margin, exterior surface of the fruit body, presence of stipe and its attachment to the substrates, cap edge curliness, the fruit body fleshiness when fresh and dry, Hymenial structure, Ring presence or absence, developmental stages forms, as well as nature of growth. Other field characters such as spore print were noted as in Leonard, [2010].

Microscopic Characterisation of *Macrolepiota* sp

Microscopic observations of spores were made in Cotton blue, Congo red solution and Melzers reagent. Observations were made at X40, X100 and X400 magnification of a bright field biological microscope. Microscopic features of the Basidiospore observed included; size, shape, stain reaction and symmetry. Photographs were taken using a digital camera mounted on the microscope.

Interview for Local People's Knowledge

Indigenous knowledge, preservation methods and other ethnomycological utilization of wild edible mushrooms in the area were investigated. Information was collected by face to face interviews for over 27 individuals; detailed results will be presented in a separate study.

Comparative Studies and Identification of the *Macrolepiota* sp

Identification of specimens was done using published works on Basidiomycetes mushrooms such as [Ge et al., 2010; Vellinga, 2003; Vellinga et al., 2003]. The materials studied were as follows: Kenya: Aberdare National Forest Reserve-Ragati Reserve, Zaina Reserve, Mathioya Reserve, Kabage Reserve and Zuti Reserve.

Results and Discussion

Mushrooms have been widely studied in different part of the world and have been documented to have economic and ecological importance (Iotti et al., 2005). This report used morphological features to characterize both fruiting bodies indigenous mushrooms. Morphological characteristics have been shown to distinguish different genera of fungi (Iotti et al., 2005). These fungal isolates studied have distinct characteristics that enable grouping them as agaricomycetes in the genus *Macrolepiota* sp. As described by Velliga (2003), these mushrooms are recognized by their big, fleshy, often squamose basidiocarps with prominent annulus and big spores.

Ecology

The fruiting bodies exhibited different habitation and habitats [Table 1]. Sibounnavong et al., [2008] reports specimens at different stages of development should be collected by digging (not pulling) them up so as not to damage their bases. Those attached on dead logs and woods, efforts should be made to scrape a piece of the wood or bark on which the specimen is attached. In this study accession RMK-04 was growing gregarious on soil.

The surrounding vegetations were *Vitex keniensis* (Meru Oak). Accession ZMK-02 had

some species growing Caespitose and gregarious, in mixed forest (plantation, grassland and indigenous) blocks.

The surrounding vegetation comprised of *Copressus lustanica* (Copressuceae), *Vitex kiniensis*, *Croton macrostachyus*, *Albizia gummifera*, *Olea europaea*, *Polycia kikuyuensis*, *Cordia africana*, *Prunus africana*, *Cassipuree molosonia*, *Juniperus*

procera and *Croton megalocapus*. Accession RMK-08 was growing singly (solitary) on soil. Surrounding vegetation was *Copressus lustanica*. The woodlands were also dominated by unknown vegetations. This agrees with Kuo [2007] who reported that macrolepiota are saprobic, growing alone or scattered in woods or on edges of woods, in pastures, on trails and other disturbed ground areas.

Table 1: *Macrolepiota* sp Natural Habitation Characteristics

Accession	Growth	Host substrate	Type of forest	Vegetation
¹ RMK-04	Gregarious	Soil	Indigenous	<i>Vitex kiniensis</i>
² ZMK-02	Caespitose/ Gregarious	Soil	Mixed	Indigenous and plantations
³ RMK-08	Solitary	Soil	Plantation	<i>Copressus lustanica</i>

¹GPS location: S 0°22.564'; E 37°09.456'; Altitude 6733 ft
²GPS location: S 0°25.564'; E 36°49.470'; Altitude 7767 ft
³GPS location: S 0°22.013'; E 37°09.496'; Altitude 6837 ft

Morphological Characteristics

Phenetic feature observed on various fruiting bodies were compared with literature reports [Ge et al., 2010; Kuo, 2007] on conventional *Macrolepiota* genus identification. In agreement with the results, the cap of mature fruit-body when fresh ranged 100-215 mm in diameter while the young fruit bodies were 25 mm. Young caps were closed parabolic to oval shape. Slightly grown fruiting bodies caps were convex, some appressed apex. mature caps were applanate (plano-spread) with a small, rounded umbo dark brown to brown in colour while aging.

Cap surfaces were covered with clearly visible brownish tile like arranged scales. The apex surfaces were smooth. Edges of caps were slightly tomentous to entire. The young fruit bodies had in-rolled margins. The fruiting body was thin for RMK-04 and thick for ZMK-02 and RMK-08. Two main basidiocarps colours were observed, whitish (accessions RMK-08 and ZMK-02) and brownish (accessions RMK-04). However, some accessions bore lighter or darker shades of these colours and were grouped together with the predominant colour [Table 2 and Figures 2].

Table 2: Morphological characteristics of cap for the *Macrolepiota* sp

Phenetic feature	RMK-04 ¹	ZMK-02 ²	RMK-08 ³
Shape	Convex	Convex-plano	Convex-plano
Colour	Brownish	Whitish grey	Whitish grey
Surface features	Squamulose	Squamulose	Squamulose
Apex	Appressed	Umbonate	Umbonate
Margin	Entire	Entire	Entire
Diameter	1 Cm	11.5 Cm	10 Cm
Flesh	Thin	Thick	Thick

¹GPS location: S 0°22.564'; E 37°09.456'; Altitude 6733 ft

²GPS location: S 0°25.564'; E 36°49.470'; Altitude 7767 ft

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The stipes were slim, cylindrical, hollow inside, bulbous at the base except for accession RMK-04 which was un-swollen, 25-270 mm high and 10 mm wide. The base had maximum diameter of up to 40 mm. The stipe bore whitish colour shades [Table 3 and Figure 2], with small brownish scales

characterised by zigzag pattern occurred on some accessions especially mature accessions. Stipe was centrally attached to the cap, fibrous with simple base attachment to the host substrate. This was in agreement with Kuo [2007] findings.

Table 3: Morphological characteristics of stipe for the *Macrolepiota* sp

Phenetic feature	RMK-04 ¹	ZMK-02 ²	RMK-08 ³
Attachment to cap	Central	Central	Central
Colour	White	White	White
Length	30 mm	125 mm	150 mm
Longitudinal Shape	Cylindrical	Cylindrical	Cylindrical
Base shape	Un-swollen	Bulbous	Bulbous
Surface features	Smooth	Smooth	Smooth
Consistency	Fibrous	Fibrous	Fibrous
Base attachment	Simple	Simple	Simple
Flesh	Hollow	Hollow	Hollow

¹GPS location: S 0°22.564'; E 37°09.456'; Altitude 6733 ft

²GPS location: S 0°25.564'; E 36°49.470'; Altitude 7767 ft

³GPS location: S 0°22.013'; E 37°09.496'; Altitude 6837 ft

The remnants of complete velum made on the stipe a double ring, which was relatively stable, and observable only on mature accessions. The ring was positioned towards the stipe apex and was movable along the stipe. Ring was absent on accession RMK-04. The flesh was white when fresh and cream when dry. Ring size ranged between 1-20 mm with rubbery texture. It was membranous for accession ZMK-02 and upturned for accession RMK-08 [Table 4]. Ring was only observable on all accessions with convex to plano basidiocarps.

The hymenophore was composed of the lamellae and lamellulae in intercalated version except for all young accessions which had their cap closed. The lamellae were crowded, bulging out and free except for accession RMK-04 which had adnexed lamellae.

Table 4: Morphological characteristics of ring for the *Macrolepiota* sp

Phenetic feature	RMK-04 ¹	ZMK-02 ²	RMK-08 ³
Present/absent	Absent	Present	Present
Shape	-	Membranous	Up turned
Size	-	2 mm	15 mm
Consistency	-	Rubbery	Rubbery
Colour	-	White	White
Position on stipe	-	Top	Top
Attachment to stipe	-	Movable	Movable

¹GPS location: S 0°22.564'; E 37°09.456'; Altitude 6733 ft

²GPS location: S 0°25.564'; E 36°49.470'; Altitude 7767 ft

³GPS location: S 0°22.013'; E 37°09.496'; Altitude 6837 ft

⁴ - : Features were absent

Both lamellae and their margins were white except for accession RMK-04 which bore brown shades. Accessions RMK-08 had thin gills while RMK-04 and ZMK-02 had broad lamellae, all of which were entire [Table 5].

Table 5: Morphological characteristics of Hymenia for the *Macrolepiota* sp

Accession No.	RMK-04 ¹	ZMK-02 ²	RMK-08 ³
Structure	Gills	Gills	Gills
Attachment to stipe	Adnexed	Free	Free
Gills colour	Brown	Whitish	Cream
Margin texture	Entire	Entire	Entire
Margin colour	Brown	Whitish	Cream
Lamellulae	Intercalated	Intercalated	Intercalated
Thickness	Broad	Broad	Thin
Spacing	Spaced	Crowded	Crowded

¹GPS location: S 0°22.564'; E 37°09.456'; Altitude 6733 ft

²GPS location: S 0°25.564'; E 36°49.470'; Altitude 7767 ft

³GPS location: S 0°22.013'; E 37°09.496'; Altitude 6837 ft

Spores were white, elliptical and asymmetrical in colour, shape and symmetry respectively. Under magnification X400 the lengths were 11.30±0.72, 11.70±0.58 and 13.15±0.67 for RMK-04, ZMK-02 and RMK-08 respectively. The widths were 7.67±0.50,

8.35±0.66 and 8.80±0.51 for ZMK-02, RMK-04 and RMK-08 respectively.

Stain reaction observed was Cyanophillic, Congophilous for Cotton Blue and Congo Red. It was Inamyloid for RMK-04. Accession ZMK-08 and RMK-08 Dextrinoid in Melzers reagent.

Table 6: Spore morphology for *Macrolepiota* sp as observed at (X400)

Phenetic feature	RMK-04 ¹	ZMK-02 ²	RMK-08 ³
Spore characteristics			
Colour (fresh)	White	White	White
Shape	Ellipsoid	Ellipsoid	Ellipsoid
Symmetry	Asymmetric	Asymmetric	Asymmetric
Size at (X400)			
Length (µm)	11.30±0.72	11.70±0.58	13.15±0.67
Width (µm)	8.35±0.66	7.67±0.50	8.80±0.51
Stain reaction			
Cotton blue	Cyanophillic	Cyanophillic	Cyanophillic
Congo red	Congophilous	Congophilous	Congophilous
Melzers reagent	Inamyloid	Inamyloid	Dextrinoid

¹GPS location: S 0°22.564'; E 37°09.456'; Altitude 6733 ft

²GPS location: S 0°25.564'; E 36°49.470'; Altitude 7767 ft

³GPS location: S 0°22.013'; E 37°09.496'; Altitude 6837 ft

Conclusion

Based on the data represented in this study, it's evident that within the Aberdare National Forest Reserves there is rich biodiversity of mushrooms. It can be deduced that within the

restricted area there are more edible mushrooms which are not yet explored. This calls for conservation of these ecosystems. This would aid in conservation of the various edible fungal germplasm for more research

studies thus enhance in addressing food insecurity and low family income. Finally it would also reduce human pressure on the natural ecosystems.

Acknowledgment

Authors are grateful to Commonwealth Scientific Industrial Research Organisation [CSIRO] who sponsored the project through Kenya Industrial Research and Development Institute [KIRDI], Kenya Forest Service [KFS] and Kenya Wildlife Service [KWS] for support in accessing forest reserves during sampling and collection of mushrooms.

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Screening of plant extracts for antifungal potential against Colletotrichum lindemuthianum

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Abstract

Colletotrichum lindemuthianum is an important plant-pathogenic fungus that causes bean anthracnose. Anthracnose is wide spread and constrains the production of quality farm saved seeds which eventually lead to low bean yield in Western Kenya. The objective of the present investigation was to evaluate the antifungal potential of extracts of eight plants in management of bean anthracnose in Western Kenya. Water extracts of *Allium cepa* L., *Allium sativum*, *Azadirachta indica*, *Cleome gynandra*, *Lantana camara*, *Datura stramonium*, *Aloe vera* and *Eucalyptus globules* were screened in vitro for their antifungal activities against *C. lindemuthianum* using poison food technique. *A. vera*, *A. sativum*, *A. cepa* and *D. stramonium* extracts were then tested for antifungal activity in vivo as foliar treatments against anthracnose disease. All the in vitro tested extracts were active against *C. lindemuthianum* at inhibitory concentration of 30% (w/v). *A. vera* (90.6%) had the highest inhibitory activity followed by *D. stramonium* (65.9%), *A. sativum* (65.5%) and *A. cepa* (65.0%). *A. indica* had 58.3% while *E. globules* had 54.3%. *C. gynandra* and *L. camara* had the lowest inhibitory activity of 34.0 and 28.7% respectively. In vivo tests showed that plants treated with *A. vera* extracts had a lower anthracnose incidence and severity (23% and 15% respectively) and compared well with disease reductions due to the application of the synthetic fungicide Mancozeb applied at 2gm l⁻¹ (11.1% and 10% respectively). The result indicated that the water extract of *A. vera* had significantly greater inhibitory activity against *C. lindemuthianum* in vitro and also reduced anthracnose disease in bean. The easy accessibility of these plants and the aqueous extraction could lead to high adoption of the use of the plant extracts as foliar treatments by resource-poor, small holder farmers to obtain quality farm saved seeds.

Key words: Extracts, *Colletotrichum lindemuthianum*, Antifungal, *Phaseolus vulgaris* L.

Introduction

Common bean (*Phaseolus vulgaris* L.) is an important legume food crop widely cultivated and consumed throughout the world. In Kenya it's rated as second to maize among other food crops (GOK, 2006). It is a valuable source of protein (22%), carbohydrates, fiber, vitamins (folate) and minerals (Ca, Cu, Fe, Mg, Mn, Zn) for human diets (Broughton *et al.*, 2003.). The crop also has considerable economic importance in providing income for smallholder farmers (ECABREN, 2000; Mwaniki, 2002; FAO, 2008). The total area under common bean cultivation in Kenya is estimated to be an average area of 910,478 hectares with average production of 0.5 tonnes ha⁻¹ (FAO, 2008).

However this production is much less compared to the yield potential of up to 1–2 tonnes ha⁻¹ (Muasya, 2001). Bean yield has been declining at an average rate of 6.8 percent (MOARD, 2004). Bean anthracnose is a seedborne disease caused by a cosmopolitan fungi *Colletotrichum lindemuthianum* (Sacc.& Magnus) Lams. – Scrib. (Barus, 1911) is one of the causes of declining bean yield. The fungus causes dark brown sunken lesions on all above ground parts including the seeds (Jerba *et al.*, 2005). Under favourable conditions, infection of a susceptible cultivar even in early growth cycle lead to an epidemic which may result in 100 percentage yield losses (Fernandez *et al.*, 2000; Ansari *et al.*, 2004). Infected seeds are of poor quality and primarily spread the pathogen introducing new races of the pathogen into different geographical regions. Poor yield due to the disease has led to some farmers being forced out of bean production in Western Kenya.

Management strategies for anthracnose include use of chemical fungicides among other strategies such as use of disease free seeds and resistant cultivars (Tian *et al.*, 2007). However, continuous and indiscriminate use of chemicals to manage the crop disease results in accumulation of harmful chemical residues in the soil, water and grains and also in development of fungicide-resistant biotypes of the pathogen

(Shovan *et al.*, 2008.). This scenario necessitates the search for and the development of alternative control method that is durable and ecologically sustainable. Fungicides of plant origin have no side effects to the plant, consumers and environment.

Some plant extracts have been found to be most effective in the inhibition of seed-borne pathogens and in the improvement of seed quality and field emergence of plant seeds (Nwachukwu, and Umechuruba, 2001; Wokocho, and Okereke, 2005.; Satish *et al.*, 2007; Muthusamy *et al.*, 2007.; Lindomar, 2008; Shovan *et al.*, 2008). To develop a sustainable integrated control strategies against the pathogen it is essential to find the most effective plant extract. The present investigation is therefore undertaken with the objective to evaluate the efficacy of plant extracts antifungal property against *Colletotrichum lindemuthianum*.

Materials and methods

Plant materials

In this study samples of plant extracts from older plant parts of eight plant species were screened for antifungal activity against seed borne bean anthracnose. The plants were onion (*Allium cepa* L.), garlic (*Allium sativum*), neem (*Azadirachta indica*), spider plant (*Cleome gynandra*), tick berry (*Lantana camara*), thorn apple (*Datura stramonium*), aloeh (*Aloe vera*) and red gum (*Eucalyptus globules*). The plants were purposely selected based on the previous literature information of their antifungal property against various plant pathogens. The plant organs picked from the sampled plants were *A. cepa* (bulb), *A. sativum* (clove), *A. indica* (leaves), *C. gynandra* (leaves), *L. camara* (leaves), *D. stramonium* (leaves), *A. vera* (leaves) and *E. globules* (leaves). They were placed in a labeled paper bag and taken to University of Eldoret Seed laboratory for analysis of their antifungal potential against bean anthracnose disease. The plants samples were identified, given voucher numbers (Table 1) and deposited at an herbarium in the School of natural resources, University of Eldoret.

Table 1: Voucher numbers of the plants from which plant extracts were obtained. They were deposited in the School of natural resources, University of Eldoret herbarium

SN	Voucher number	Plant Name
1	Mogita G.W./ Chepkoilel /06/11/001	<i>Allium cepa L.</i>
2	Mogita G.W./ Chepkoilel /06/11/002	<i>Allium satium</i>
3	Mogita G.W./ Chepkoilel /06/11/003	<i>Azadirachta indica</i>
4	Mogita G.W./ Chepkoilel /06/11/004	<i>Cleome gynandra</i>
5	Mogita G.W./ Chepkoilel /06/11/005	<i>Lantana camara</i>
6	Mogita G.W./ Chepkoilel /06/11/006	<i>Datura stramonium</i>
7	Mogita G.W./Marigati/06/11/007	<i>Aloe vera</i>
8	Mogita G.W./Chepkoilel/06/11/008	<i>Eucalyptus globules</i>

Preparation of the crude plant extracts

Aqueous plant extract were prepared from the collected fresh mature leaves of the plant samples as described by Satish *et al.*, (2007). The leaves were washed first in tap water and then in sterilized distilled water. Hundred grams of fresh sample was chopped and then blended in a surface sterilized blender adding 100 ml sterile water (1:1 w/v) for 10 minutes. The extract was filtered through two layer of muslin cloth and the final filtrate obtained was used as stock solution. The stock solution were then stored in a fridge at 4 °c. Mancozeb a synthetic fungicide recommended for control of bean anthracnose was used as a positive control, applied at 2gm l⁻¹. Mancozeb has chemical component of Zn-manganese ethylene bisdithiocarbamate and its common name is Dithane M-45 80WP.

Collection of anthracnose infected bean plant and isolation of *Colletotrichum lindemuthianum*

Anthrachnose infected bean plant pods showing pronounced characteristic anthracnose symptoms was collected from Uasin Gishu, Riftvalley Kenya

(0°34'28.47"N,35°18'00.33). Small pieces of infected (0.5 cm²) pod parts were cut, held in running tap water for 30 seconds, surface sterilized by immersion in an aqueous solution of commercial bleach (10 % v/v) for 60 seconds and rinsed twice in sterile, distilled water. They were then plated aseptically on Potato dextrose agar (PDA) in the petridishes and incubated in complete darkness at 20-21°C for 7 days. Streptomycin sulphate (0.1 gl⁻¹) was added to the inoculated media to suppress bacterial growth. After 7 days the mycelium were observed and *Colletotrichum lindemuthianum* identified based on its morphological characteristics using the common Laboratory Seed Health Testing Methods for detecting fungi (Mathur and Kongsdal, 2003). To get mono conidial cultures small pieces of hyphae from the distinct colonies that showed growth and morphology of typical *Colletotrichum lindemunthianum* fungi were transferred onto PDA media and incubated for 7 days in darkness at 20-21°C. The monocultures were stored in a fridge (4°c) until needed.

Antifungal bioassays

In- vitro evaluation of plants extracts on the growth of *Colletotrichum lindemuthianum*.

The in-vitro tests were conducted to determine effect of plant extracts on radial colony growth of *Colletotrichum lindemuthianum* by adopting poison food technique (Begum and Bhuiyan. 2006). 80, 75 and 70 ml of PDA medium in 100 ml conical flask was amended with individual plant extract stock solution of 20 ml, 25 ml and 30 ml respectively to yield final concentrations of 20% (w/v) or 200 gm l⁻¹, 25% (w/v) or 250 gm l⁻¹ and 30% (w/v) or 300 gm l⁻¹. The medium was thoroughly shaken for homogeneity and autoclaved at 15 lbs pressure for 20 minutes. On cooling, 15 ml of the amended PDA medium was poured into labeled 90 mm petridishes with preset diametrical lines drawn on the bottom to identify the centre of the petridish. After solidification, each plate was inoculated in an aseptic condition with five mm *C. lindemuthianum* agar discs cut out from periphery of actively growing 7-day-old fungal mycelium using cork borer. The discs were placed at the centre of the amended PDA petridishes. The unamended PDA treatment represented negative control while Dithane M-45 80WP (2gm l⁻¹) represented positive control. The petridishes were then sealed using a parafilm and incubated at 22 ± 2 °C for seven days. The treatments were arranged in a completely randomized design and each treatment was replicated three times. The experiment was treated twice. Evaluation of petridishes was done by measuring the diameter of growth inhibition zones after 14 days of incubation (DAI). The efficacy of the plant extracts was expressed as percentage of radial growth inhibition (dp) which was calculated using the following formula:

$$\% \text{ inhibition (dP)} = \frac{dc - dt}{dc} \times 100$$

Where:- dc = Average diameter increase in mycelia growth in control,
dt = Average diameter increase in mycelia growth in treatment.

The inhibition data were analyzed statistically using the Genstat computer package (VSNi, 2008) after angular transformations of the data. Transformation was done due to the wide range between the means from 0% - 100%. The untransformed and transformed data led to the same conclusion, hence untransformed original data has been used in the presentation of results. Separation of means was done using Turkeys Test at p≤0.05.

In- vivo screening of plant extracts.

In vivo tests were done to determine the effect plant extracts on seed germination. Red haricot (GLP 585) variety was used in the experiment since they were widely grown in Western Kenya. Four plant extract (*A. vera*, *A. cepa*, *A. sativum* and *D. stramonium*) were used at 30% (w/v) concentration. The in vivo assay was adopted as described by Lindomar, 2008.

Certified seeds were sown 3.0 cm deep at the rate of three seeds per 10 cm diameter pots filled with moist vermiculite. Water was applied twice daily in order to maintain soil moisture at field capacity. Aqueous extract (EA) of *Allium cepa* L., *Allium sativum*, *Datura stramonium* and Aloe vera at 30% concentrations were foliar sprayed on 7 days old bean plants at primary leave stage, three days before inoculation with *Colletotrichum lindemuthianum*. Water and Dithane M-45 80WP fungicide (2gm l⁻¹) were used as negative and positive control treatments respectively. Artificial inoculation was done by spraying the inoculum suspension at the rate of 1.2 x 10⁶ conidia ml⁻¹ suspension on both sides of primary leaves, petiole and stem until run off using a hand spray. Nine plants were treated per treatment and each treatment was replicated three times. The experiment was set up in a completely randomized design in moistened chambers at 22 ± 2 °C with more than 95% relative humidity for 48 hours and then transferred to a green house with a temperature ranging from 21-24° C and relative humidity of about 70%. Disease symptoms from the seedling were scored between the sixth day and seventh day after inoculation. Data collected included disease incidence and severity. The

disease incidence was calculated by the following formula:

$$I = \frac{\sum n}{\sum N} \times 100$$

Where:-

I= Disease incidence

$\sum N$ = Total number of infected plants per treatment

$\sum n$ =Total number of plants per treatment

The anthracnose disease severity descriptive scale of 1-5 (Ombiri *et al.*, 2002) was employed during the disease severity data. Further, these scales were converted to percent severity using the formula:

$$S = \frac{\sum n}{N \times 5} \times 100$$

where:

S = severity of anthracnose (%)

$\sum n$ = summation of individual ratings;

N = total number of seedlings assessed

The incidence and severity data were analyzed statistically using the Genstat computer package (VSNi, 2008) after angular transformations of the data. Transformation was done due to the wide range between the means from 0% - 100%. The untransformed and transformed data led to the same conclusion, hence untransformed original data has been used in the presentation of results. Separation of means was done using Turkey's Test at $p \leq 0.05$.

Results

In-vitro evaluation of plants extracts on the growth of *Colletotrichum lindemuthianum*.

There was significant ($P \leq 0.05$) difference in mycelia inhibition for plant extracts, positive control (Dithane M-45 80WP) and negative control (water) (plate 1). The positive control exhibited maximum inhibition of 92.59% while negative control had no mycelia inhibition at all (0%).

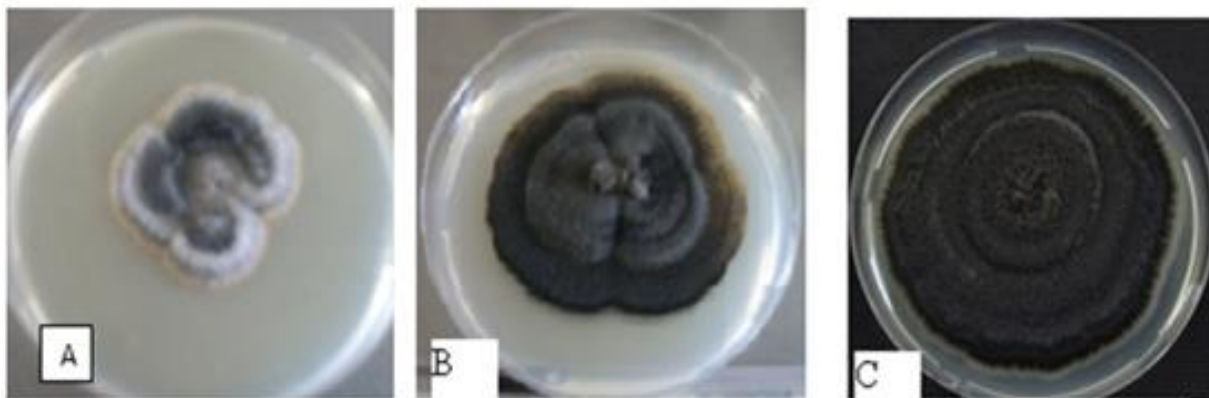


Plate 1: Mycelium inhibition (%) measured in mm. The fungus was cultured in PDA and measurement done in the 14th day after incubation. A. effective *A. vera* 90% inhibition, B. intermediate *L. camara* 50% inhibition, C. Control 0% inhibition.

However there was significant ($P \leq 0.05$) difference in the mycelia inhibition levels of the extracts from different plant species (Figure 1). At 30 % (w/v) concentration, *Aloe vera* had significantly higher (90.6%) mycelia growth inhibition followed by *Datura stramonium* (65.9%), *Allium sativum* (65.5%)

and *Allium cepa* (65.0 %). *Azadirachta indica* had 58.3% while *Eucalyptus globules* had 54.3% mycelia inhibition. Lowest inhibition of mycelia growth at 30 % (w/v) concentration was recorded in *Lantana camara* 28.7% followed by *Cleome gynandra* (34.0 %). The least mycelia inhibition was exhibited with

Cleome gynandra (26.0%) at 20% (w/v) concentration.

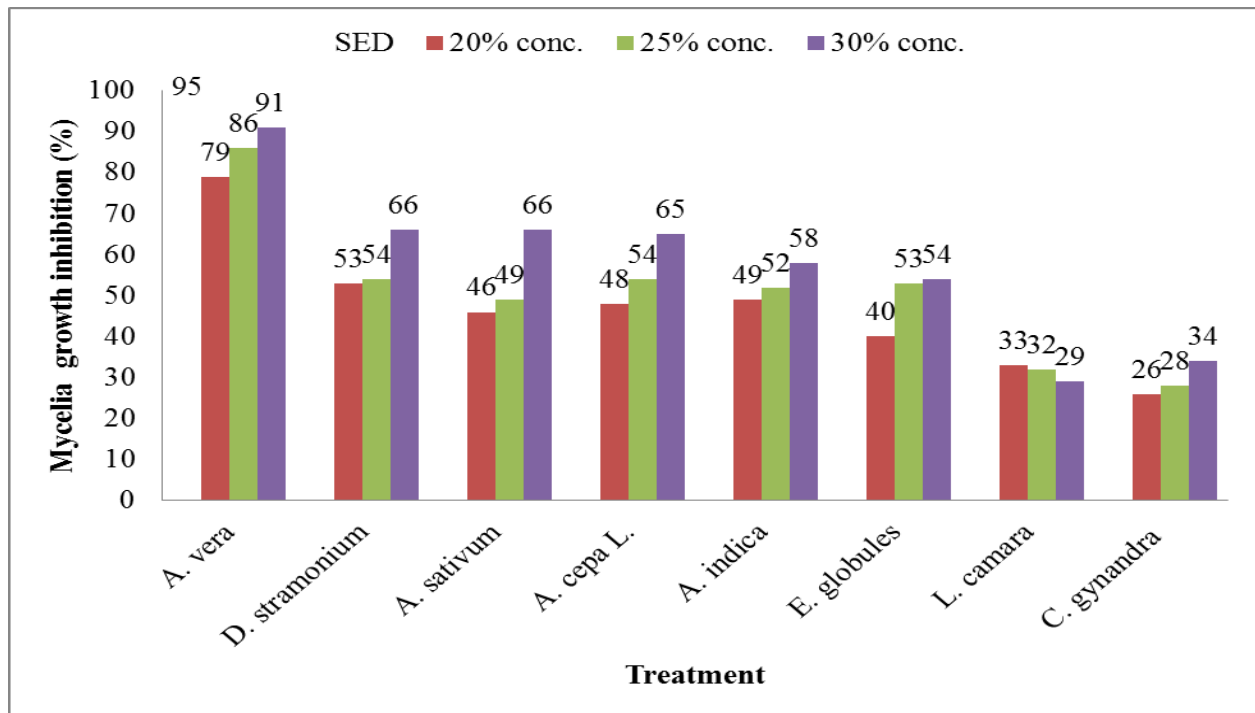


Figure 1: Effect of different plant extracts and their concentrations on mycelia inhibition against *C. lindemuthianum*.

There was a significant ($P \leq 0.05$) difference in the efficacy of the plant extracts at different concentrations. All the extracts had their highest mycelia inhibition at the highest concentration of 30% (w/v). *A. vera* was the most effective extract in all concentrations, however at 30% (w/v) concentration the extract exhibited the highest mycelia inhibition (90.6%), followed by 25% (85.7%) while 20% (79.3 %) was the least effective (Figure 1).

In vivo Screening of plant extracts.

In vivo tests done in the green house were to investigate the effect of four plant extracts; *Aloe vera*, *Datura stramonium*, *Allium sativum* and *Allium cepa*; on incidence and severity of

anthracnose disease. These plant extract had higher percent mycelia inhibition in laboratory tests at 30% (w/v) concentration. Significant ($P \leq 0.05$) difference in incidence and severity of the disease in the different extracts was observed. Plants treated with *A. vera* extracts had a lower incidence and severity (23% and 15% respectively) followed by *D. stramonium* (68% and 38%); then *Allium sativum* (77.8% and 56%) while *Allium cepa* had the incidence and highest severity ((80% and 60% respectively) over negative control water (95% and 91%) (Figure2). Positive control, Dithane M-45 80WP had the lowest incidence and severity (11.1% and 10% respectively).

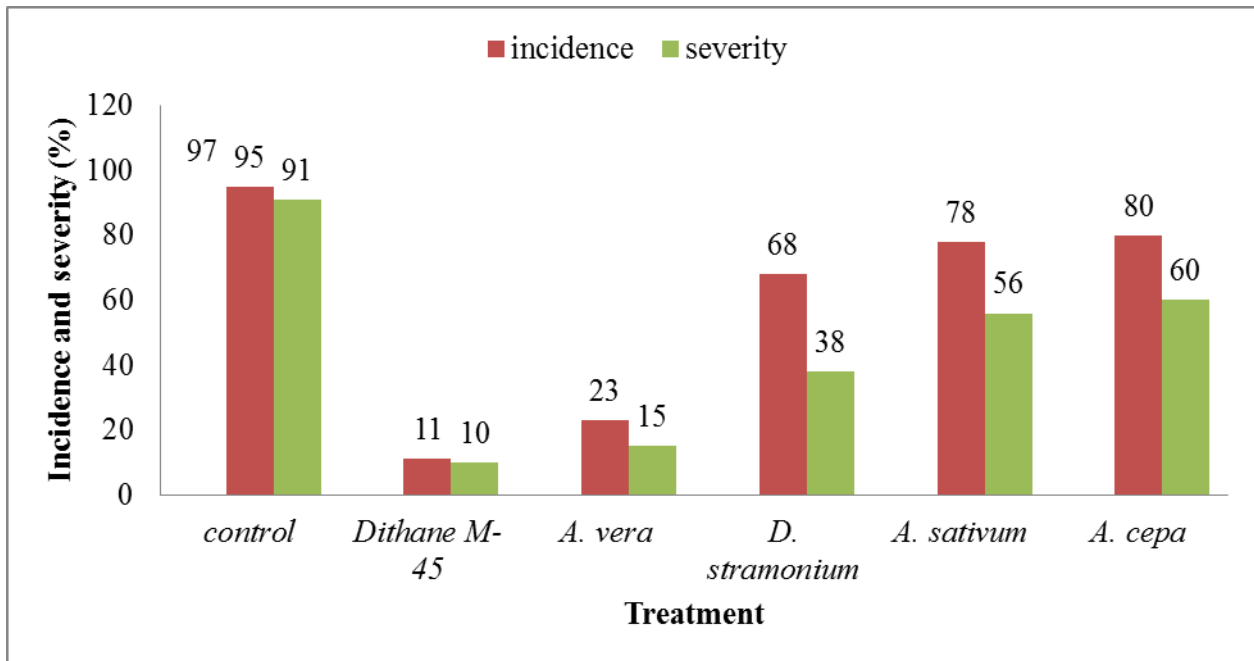


Figure 2: In vivo test showing effect of some plant extracts on the incidence and severity of anthracnose disease.

Discussion

Current investigation clearly indicates that the antifungal activity against *Colletotricum lindemuthianum* vary with the species of the plants tested. The in-vitro tests showed that *Aloe vera* leaf extract was very effective in inhibiting mycelia growth. This indicates that *Aloe* has inherent ability to induce toxic effects on mycelia growth and proliferation of *Colletotricum lindemuthianum*. The toxic effect could be attributed to presence of main active constituent, the aloine, an anthraquinone heteroside.

Datura stramonium showed high mycelia inhibitory after *Aloe vera*. Its extracts contain tropane alkaloids such as scopolamine, hyoscyamine, and atropine (Preissel and Preissel, 2002) and have been used as antifungi against many plant pathogens. Sharma et al., (2009) studied antibacterial and antifungal activities of some common plants and weeds and concluded that weed plant *Datura stramonium* showed pronounced antimicrobial activity against *Escherichia coli*, *Staphylococcus aureus*, *Bacillus subtilis*, *Klebsiella pneumonia*, *Aspergillus niger* and *Candida albicans*. Also Rajesh and Sharma,

(2002) investigated and found antimycotic properties of *Datura* spp against species of *Aspergillus*.

Allium sativum was the next effective in inhibitory activity followed by *Allium cepa*. The effectiveness of *Allium cepa* and *Allium sativum* is well supported by Muthusamy et al., (2007). The *Allium* were revered to possess powerful organosulfur-containing compounds, allicin, and other numerous phenolic compounds (Rivlin, 2001; Griffiths et al., 2002.) which have antifungal properties. However, garlic contains much more sulfur-containing compounds than onions (11–35 mg/100 g fresh weight) (Lawson, 1996). Other investigators also found that garlic extract was effective in controlling the anthracnose pathogen in different crop species (Sing et al., 1997).

In this study *A. indica* had an averagely effective inhibitory activity. The fungicidal spectrum of *Azadirachta indica* has been attributed to Azadirachtin which belong to terpeniodes (Sing et al., 1997) Garlic and neem products have shown some antimicrobial properties and have been used in the control of fungal pathogens.

Eucalyptus globules gave moderate control of the disease. Other studies show that *E. globules* does not have strong antifungal properties. *Cleome gynandra* had the least inhibitory activity in this study followed by *Lantana camara*. *L. camara* has antifungal property due to presence of Lantadene (Fujioka *et al.*, 1994.; Wang, 1994; Nick *et al.*, 1995; Sarita *et al.*, 1999) an pentacyclic triterpenoid present in the leaves. Previous studies showed that *L. camara* significantly suppressed the growth of *Colletotrichum falcatum*, *Fusarium* spp. and *Aspergillus* sp. (Lingayya *et al.*, 2011). *Cleome gynandra* leaves, leaf juice, and seeds have antifungal activity due to the presence of glucosinolates. However despite the presence of antifungal properties in *Lantana camara* and *Cleome gynandra*, in the current studies they showed low inhibitory activities on *Colletotrichum lindemuthianum*.

There was significant ($P \leq 0.05$) difference on the inhibitory activity of the plant extracts at different concentrations. All the tested plant extracts had high inhibitory activity at 30% (w/v) concentration than at 25% (w/v) and 20% (w/v). This indicates that there was an increase in inhibition of fungal mycelia growth as the extract concentrations increased. This could be due to increased availability of the antifungal chemicals in the media. Studies have also shown that there is increase in inhibition of fungal colony when extracts concentrations increased (Cao & van Bruggen, 2001; Shovan *et al.*, 2008; Masangwa *et al.*, 2012). Masoko *et al.*, 2005) speculated it to be due to solubility of

compounds in water and stated that water fails to extract non-polar active compounds in plant materials and hence need for higher plant extracts concentration to achieve fungal toxic level.

The in-vivo tests results confirm that aqueous leaf extracts of *Aloe vera* is the most effective antifungal extracts. The artificially inoculated plants showed low disease incidence and severity when sprayed with *Aloe vera*. *Aloe vera* was found to contain high fungi toxicity against the pathogen in both in-vitro and in-vivo tests compared to the rest. *Aloe vera* has been used in several ways an antimicrobial extract. It is easier to extract it and is readily and easily accessible in Western Kenya hence making it an affordable alternative fungicide in production of quality farm-saved seed in Western Kenya. Use of plant extracts fungicide as an integrated anthracnose management could reduce over reliance on synthetic chemicals by farmers as well as cut down cost of bean production. The plants used in the study are readily available and easy to extract their extracts hence can be conveniently exploited in the control of bean anthracnose. Farmers in Western Kenya should embrace the use of plant extracts especially *Aloe vera* plant as an alternative fungicide against *Colletotrichum lindemuthianum*. This in combination with host resistance property could manage the disease in a cheap environment friendly way. However, more studies on ability of the antifungal property of these plant extracts to reside in the plant body should be conducted.

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Geothermal Mapping Using Heat Flow Measurements In Magadi Area, Southern Kenya Rift

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Abstract

Exploitation of geothermal energy is expensive and requires accurate establishment of the drill points to ensure great success and to achieve maximum potential and output of the well. Of the 14 prospects in Kenya, very few have been earmarked for electricity exploitation. Magadi prospect is one of 14 but most surveys have indicated that the prospect cannot yield temperatures for electricity generation. With the temperatures there, the only possible use of the geothermal energy resource is in direct use. Meaning any drilling that has to be made has to be accurate to increase the chances of drilling a productive well because the return on investment would be long. Investigations done previously on the prospect using magnetic, gravity and seismic indicate that the potential place for exploitation is the northern part. Heat flow analysis hasn't been done on the prospect. Heat flow analysis has been used as one of the geophysical methods to ascertain the drill points and reinjection points for geothermal wells over the years. Shallow wells measuring 0.5 m were drilled north of Lake Magadi and temperatures taken at depth. The heat flux was used to calculate the terrestrial heat flow of the place to ascertain the heat source of the prospect. Ninety five (95) stations with a spacing of 1 km² were mapped out using a GPS. The average earth surface temperature around this area was found to be between 25 – 75°C. These temperatures were mapped using surfer 8 Software and potential drill points marked.

Key words: Geothermal, Heat flow, Geo-physics, Magadi prospect

INTRODUCTION

A significant amount of the financial risk associated with geothermal development results from uncertainties encountered in the early stages of resource development; namely geothermal exploration and the drilling of production wells. Costs associated with the exploration and drilling stages of a geothermal project can account for at least 42% of overall project costs. Success in initial geothermal exploration directly influences success in geothermal drilling operations. Geothermal developers depend upon exploration of surface features to determine first; whether or not a resource is worth the large amount of investment required to drill a geothermal well, and second; where to place a drill rig so as to reach an optimal target depth, permeability and resource temperature. Once surface features have been investigated, several techniques are

used to help identify drill targets without having to put a drill bit into the ground. These exploration technologies not only need to better locate geothermal resources but they must be able to provide more accurate imaging of the structure of the subsurface reservoir and provide accurate reservoir temperatures at specified depths (Jennejohn, 2009).

The drilling of thermal gradient holes is an important step prior to drilling a production well. The drilling of a thermal gradient hole may even precede some geophysical surveys. Thermal gradient holes are shallow and narrow, and can be drilled quickly. Thermal gradient holes measure the gradient – i.e. the change in temperature vs. depth. A higher gradient indicates a greater temperature anomaly. The basic purpose of drilling a thermal gradient hole is two fold. First, it is designed to assess whether deeper temperatures in the geothermal reservoir will

be hot enough to support commercial production. Second, a series of thermal gradient holes should also help to delineate a thermal anomaly and define the extent of the resource (Jennejohn, 2009).

The East African Rift together with the Ethiopian rift forms the larger East African Rift System (EARS). This is a region where tectonic plate activity resulted into faulting and subsequent rifting and formation of a graben. The rift formation process also resulted in previously deep seated hot rocks being brought closer to the surface and thus becoming a heat source while the faults serve as channels of leakage for heated subsurface fluids and form a geothermal system.

Geothermal systems are associated with several heat loss features such as hot springs, geysers, mud pools, fumaroles, steaming grounds, hot grounds and altered grounds. These features continuously transfer mass and natural heat from the geothermal system to the atmosphere. Localized thermal gradients can therefore be used to map out geothermal active grounds. The Magadi prospect has hot springs which characterise the geothermal system. The hottest of this hot springs are situated north of little Magadi with up to 85°C.

GEOLOGY OF MAGADI AREA

Magadi, area is located at the Kenya Rift Valley southwest of Nairobi city, in southern Kenya. Magadi is northeast of Lake Natron in Tanzania, bounded by latitude 1°53` and longitude 36°18` (Smith, 1993) defined the geology of Lake Magadi as being made up of mostly Achaean to early Palaeozoic crystalline basement rocks and rifted related volcanic and sediments. The Magadi area was classified into three formations by (Baker, 1963) namely Precambrian metamorphic rocks, Plio- Pleistocene volcanics, the Holocene to Recent Lake and fluvial sediments. The basement rocks consist mainly of regular banded schist, gneisses and muscovite-rich quartzite. The oldest rocks in the area are the quartzite, gneisses and schist of the basement formation which is of Archaean age. In the southern and northern ends of the Lake Magadi area, there is a deposition of irregular interbedded chert rocks which consists of silicified bedded clays on top of Alkali trachytes (Atmaoui, 2003; Sequar, 2009).

The broader Magadi area is largely covered by Holocene sediments that overlie extensive Pleistocene trachyte lavas. The trachyte lava overlies Pliocene olivine basalts and nephelinites, which, in turn rest on the Archean basement. A dense network of grid faults affects the area. These faults, especially the north-south trending fault scarps, control the occurrence of geothermal manifestations (Riaroh, 1994)

THERMAL EXPLORATION

Thermal exploration techniques are extremely useful in assessing the size and potential of a geothermal system. Near-surface temperature gradient and heat flow measurements are routinely made in any geothermal exploration program and are often used as primary criteria for selection of drilling sites.

Temperature measurements at 1 m depth are inexpensive and quick, and can be used to detect anomalously hot areas. The results obtained from the shallow temperature surveys could guide whether undertaking intermediate-depth, thermal gradient surveys are warranted.

The distance between holes used for heat flow investigations depends upon the size of the subsurface heat source. Magmatic intrusions, which are usually the sources for economic geothermal fields, cause geothermal disturbances of at least 1–2 km lateral extent.

METHODOLOGY

Estimation of energy loss was done by obtaining temperature gradient from shallow 0.5 m depth holes drilled manually using 1 inch diameter by 1 m long metal rod. Where the ground was hard and rocky, the metal rod was hammered to the ground. Temperature was then measured at the surface, 50 cm and 100 cm depths by a digital laser thermometer (only a handful of holes were

done to 100 cm. Magadi area is generally rocky.). Locations of these holes were read from a portable hand held Global Positioning System (GPS). Holes were drilled at an interval of 100m – 1km in an area of high thermal activity and at 1 - 2km in an area of low thermal activity.

Temperature readings from shallow holes were recorded in a field work book. Golden surfer software version 8 was used to generate thermal contour maps for the heat flux of the area. The heat flux was calculated using the formula:

$$heat\ flux = \frac{change\ in\ temp\ (temp\ at\ 50cm - temp\ at\ surface)}{hole\ depth\ (50cm)} \dots\dots\dots (1)$$

Thermal contours were used to demarcate the temperature range areas. The thermal conductivity (*k*) of the rock was taken to be 2W/m°C. The heat conduction equation was used to compute the heat flow

$$Q = k \frac{dT}{dy} \dots\dots\dots (2)$$

Where: Q= Heat flow

K=Thermal conductivity of the rock

T= Temperature

y= depth

After getting the heat flow for each hole drilled, Golden surfer software was used again to generate the heat flow contour map of the area.

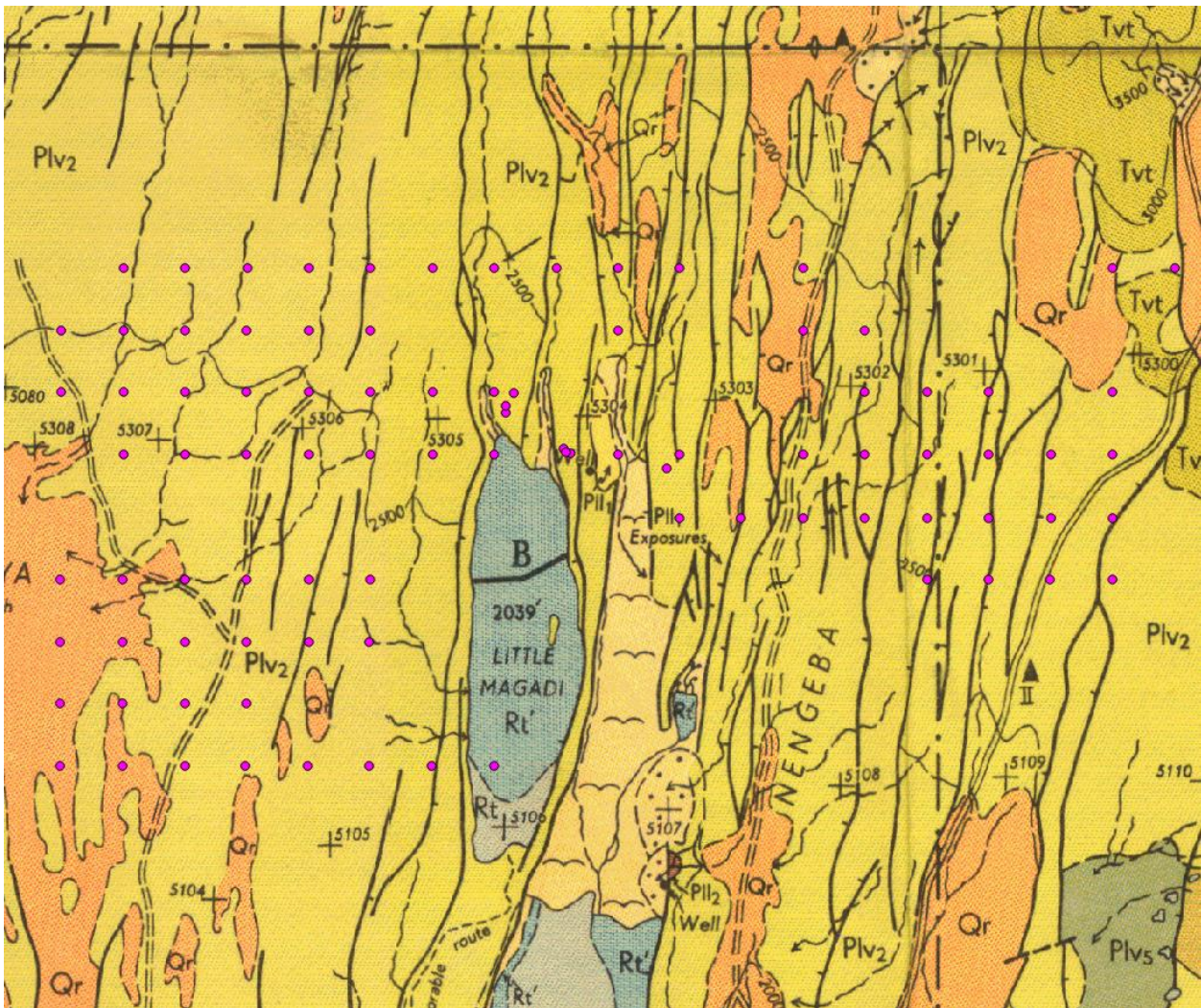


Figure 2: Geological map of magadi with the data collection stations mapped. The stations are pink dots (stations mapped using Q-GIS). (Geological map of the magadi area, degree sheet No, 51)

RESULTS, CONCLUSION AND RECOMMENDATIONS

The temperature flux of the area was estimated to be between 10 – 40°C with 10 being considered very low. The heat flow of the area is 25 – 75°C but the possible areas for drilling are areas with temperatures between 50 – 75°C. At the right side of the contour map (coordinate 9806000, 20600) is considered to be noise (fig 3 and 4). Data wasn't collected at these points because of the terrain.

It was concluded that if a geothermal well is to be drilled, it should be done on the coordinates 9807000, 192000 with a heat flow of 50°C (fig. 4).

It is recommended that:

1. Deeper holes of about two meters to be drilled using a power drill and temperatures collected at depth for a period of three months so as to eliminate the surface temperature variation.

2. That thermal conductivity of the rock in the area to be calculated. In this paper, the thermal conductivity of the alkaline trachytes was assumed to be $2\text{W/m}^{\circ}\text{C}$.

ACKNOWLEDGEMENT

We acknowledge the Magadi community for guiding us, giving us information and providing assistance when we were collecting this information. Also we cannot forget the geological team at TATA Chemicals Magadi for their assistance.

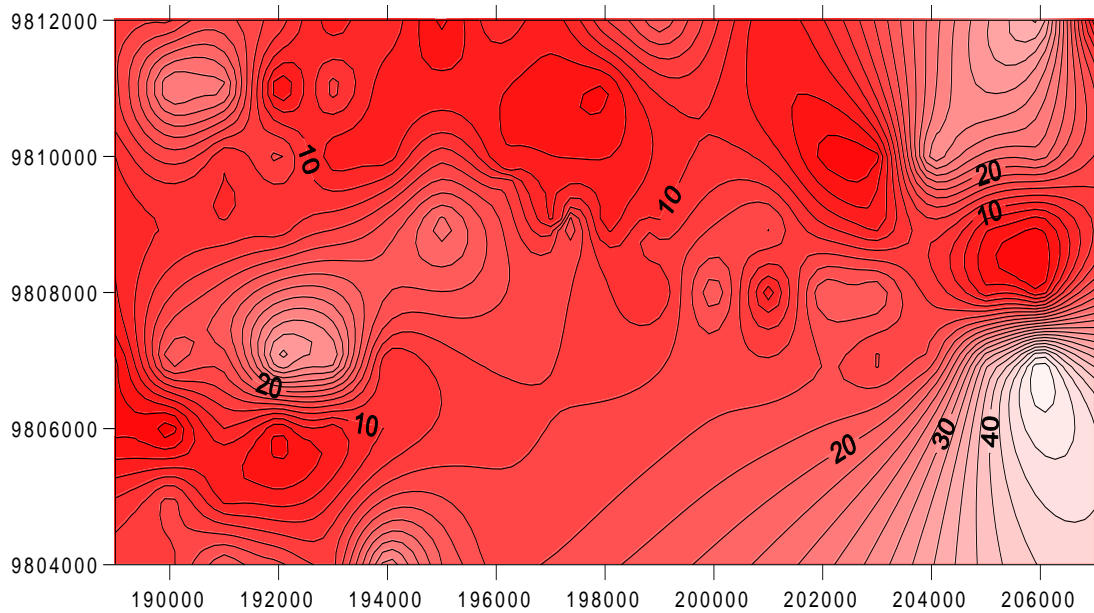


Figure 3: Temperature Gradient (heat flux) Contour map

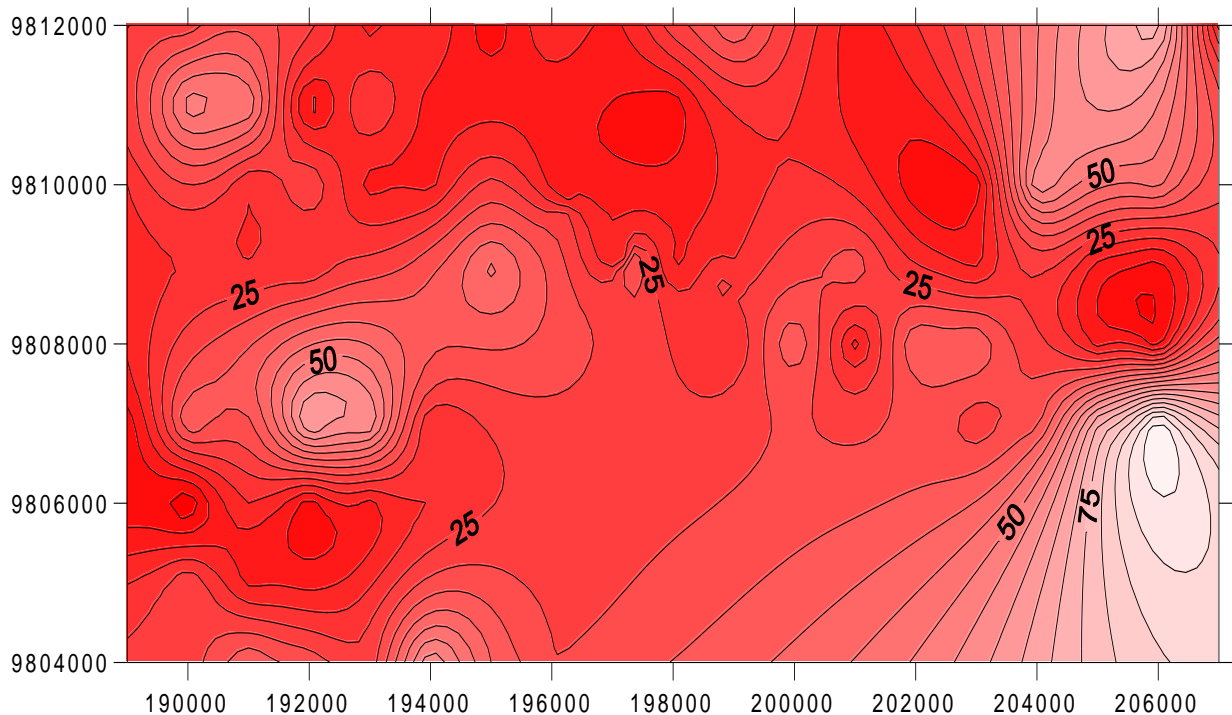


Figure 4: A contour map for the heat flow of the northern part of Lake Magadi

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Factors Influencing the Use of Drugs in Primary School: The Case of Mombasa Island

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Abstract

The school setting lends to outdated pedagogical approaches in which young people are expected to passively absorb the lessons of life transmitted by their adult superiors. This disconnect is further emphasized by the fact that during their school years, young people begin to look for role models among their peers rather than among their teachers or parents. It is imperative to find these children abusing drugs and alcohol as fashion or solace in their frustrations. Kenya's population has hit the 40 million mark and the youth constitute a huge percentage of the population. The youth need to be given special attention in all spheres including the area of alcohol and drug abuse. Alcohol is one of the major substances of abuse among young people in Kenya. Factors influencing the use of drugs in primary school in Mombasa Island include experimentation, peer groups, enjoyment, idleness, and lack of role models. What is the effect of drugs on primary students in Mombasa? This includes poor academic performance, poor relationship with parents, lack of social conformity and more sensation seeking. The study was conducted in nine randomly selected schools in Mombasa Island and assessed alcohol, cigarettes, cannabis, inhalant and *khat* (miraa). The study group comprised the students available during the day of the survey. The study established that 58% of youth consume drugs at least once in their lives. The age group is 16-18 years. More boys than girls abuse the drugs. Drug abuse was found to be higher in students living in low socio-economic classes areas of the town than high class areas.

KEY WORDS: *Drugs, youth, alcohol, cigarettes, miraa*

INTRODUCTION

A drug has been defined as any substance that when absorbed into a living organism may modify one or more of its physiological functions (Kamanga et al 2009). The term is used in reference to a substance taken for a therapeutic purpose and as well as abused substances. Drug abuse has also been defined as self administration of drugs for non-medical reasons, in quantities and frequencies which may impart inability to function effectively and which may result in physical, social or emotional harm. A large number of students across all age groups have been exposed to tobacco, miraa (*khat*), glue sniffing, bhang, marijuana, and even hard drugs such as heroin and cocaine. The prevalence of drug abuse increases from primary school to higher institutions (secondary school and colleges) (Nacada 2011)

Findings of a study undertaken by the (child welfare Association 2010) reveal that one in every 15 Kenya students was abusing bhang or hashish. Abuse of drugs is a major public health problem in our schools. It was therefore important to undertake this study in order to establish the extent of this problem so that preventive public health measures can be undertaken. (Kamanga et al 2009) found lifetime cigarettes smoking rates up to 32%. (Rohde et al 2008) demonstrated that adolescent substance use disorder is associated with numerous functioning difficulties at age 30, some of which appear to be related to recurrent substance use disorder, co-morbid adolescent disorder or functioning problems already evident in adolescence. (Kuria et al 200) found alcohol use prevalence rates up to 15% among students.

The rate of bhang use among youth aged 12 – 18 has been rising steadily. Bhang use is now common with high school student as well as students in upper classes in primary school (child welfare association 2010).Likewise daily use of bhang is more prevalent among males (6.5 percent and female 2.4 percent) (Kamanga et al 2003). The highest risk of drugs and alcohol use is in households where only one parent is present (25.1 percent) (Kamanga et el 2009).Adolescents who place a personal importance on religion and prayer are less likely to be involved in substance abuse. Those with high levels of self-esteem report fewer drugs and alcohol use (Olutawara M o and A o odejide 1974). Adolescents who begin drug use at early ages not only use drugs more frequently, but also escalate to higher levels more quickly and less likely to stop it (kamanga et el 2009).

- 90 percent of all adults with a substance use disorder started using under the age 18 and half under the age of 15 (Child welfare Association 2010)

- Children who first smoke marijuana under the age of 14 are more than five times more likely to abuse drugs as adults than those who first use drugs and alcohol at age 18 (Olutawara M O and Odejide 1980).

- The children of alcoholics are four times more likely to develop problems with alcohol (Kamanga et al 2009)

- Among teens, alcohol is the most commonly abused drug (Rohde et al 2008)

60 to 80 percent of adolescents with substance use disorders have a co-occurring mental illness (Rohde et al 2008)

Cannabis plant contains 400 different chemicals with about 60 of them being cannabinoids which affect the mood (Kamanga et al 2009). There is no safe way of consuming cannabis. All the ways lead to intoxication, abuse or dependence. The effects of drugs include laughter and talkativeness, feeling of being, loss of concentration, short-term memory, slower reaction times, changes in heart rate and

blood pressure,dizziness,widening of the air passages in the lungs, red (bloodshot) eyes, altered perception of things,confusion,anxiety or panic attacks, feeling of paranoia and depression.

Health problems from smoking cannabis include chronic cough, wheezing, shortness of breath or chronic bronchitis and respiratory problems. There is increased risk of cancer of the lung, mouth, throat, and tongue. Others include increased risk of psychotic illness, such as schizophrenia, dependence etc.

The three common substance abuse disorders are intoxication, abuse, and dependence.

PURPOSE OF THE STUDY

The purpose of the study was to investigate the use of drugs in primary schools in Mombasa Island. It was a way of highlighting to the parents, teachers and stakeholders the dangers of drug use by pupils and ways of eliminating this vice.

METHODOLOGY

The study was conducted in nine randomly chosen schools in Mombasa Island. The study was conducted on a single day in (July2012) and assessed the use of alcohol, cigarettes, cannabis, inhalants, *khat* (miraa), glue and cocaine. The study group comprised the students present in their school on the day of the survey. The research design was through cross-sectional survey. Data collection was through the use of structured closed ended questionnaire to collect information on the use of various drugs including alcohol, tobacco, stimulants, marijuana, cocaine, *khat* and heroine. The results were analyzed using the SPSS computer program. A total of 400 students were sampled.

RESULTS

The drugs consumed were bhang, *khat*, glue, marijuana, alcohol, cocaine. These drugs found their way in schools through the hawkers who sell ice outside school gates. Also other sellers pretend to bring children to school but are carrying the drugs. The

children do fundraising in classes early in the morning, even those who do not use, are forced to contribute. When it is bought it is taken to the washrooms or toilet from there every child will be asking for permission to go to the toilet and abuse the drug. By lunch time the children are rowdy and very noisy. In the lower classes the children sniff glue which has been left unattended at school or at home or brought by a friend. During weekends the students attend discos which specialize in luring school going students to attend and awarding the best dancers with cash. Here alcohol and *khat* is abused. In those school where drugs are abused the standards of education are low and children are not disciplined. The parents are not helpful. The environment is also a factor. Out of 400 students, 50 smoked bhang and 70 chew *khat* and 20 sniffed glue out of the nine schools in total. The schools are Kikowani, Kaloleni, Tom mboya, Mvita, Serani, Ziwani, Majengo, Tudor, Mombasa primary. Only 5% of the totals were girls, where only one girl per school was involved in smoking or none at all. The age ranges from 9 years to 18 years. My sample concentrated on the upper primary only as because they were the ones present that during that time.

SOURCE

The source of drugs is the peddlers who pretend to bring young children in school but they sell the drugs to children. Other source is the sweet sellers who sell lanced sweet and glue to children. The drugs are put in the toilet and children start asking for permission to go to the toilet but abuse the drugs. After a lesson or two children are intoxicated and rowdy and they interfere with the learning process in the class. Each child in class contributes willingly but others if they are girls are forced to pay money, even those who do not take.

LIMITATION

The sample size was small and so it might not have captured the true extent of drug use in Mombasa Island. The study design also precludes generalization of the results to students in other institutions. However, the results are at least comparable to those found in similar studies.

DISCUSSION AND RECOMMENDATIONS

Drug prevention programmes are most effective when young people participate. Young people are often portrayed as irresponsible and incompetent and as a result excluded from being actively involved in drug prevention programmes. This exclusion is harmful because it discourages youths from taking prevention programmes seriously, it widens the gap of mutual distrust and misunderstanding between youth and adults and it denies the drug programs the unique element that only young people can heal. It is time to include youth in drug prevention programmes. It is just a matter of giving them occasions to put this knowledge into practice in order to create better drug prevention programmes with active youth involvement which ensures that young people are better protected, better outcomes are achieved, innovative approaches are realized, decisions are more applicable to youth needs and young people improve upon important skills such as communication and co-operation. Participation builds character and confidence when young people feel needed and appreciated. Young people are capable individuals and thrive upon responsibility. They are full of energy and insights and are committed individuals. Young people are both experts in their own rights. Young people know their interest and the interest of their peers and they are knowledgeable on youth culture. Adults have life experiences and can offer expertise and knowledge. When working together, young people and adults must respect each other's points of views, regardless of whether or not they speak the truth without respect, it is difficult to build trust and to be able to counter misconceptions. Building communication between young people and adults is essential for any drug prevention programme to be successful. Through consultative process young people and adults have the opportunity to share their own experiences and knowledge and as a result, prevention programmes are more effective and responsive to young people.

Young people feel the huge gap between their needs and the services provided. Parents are the most effective force in preventing and reducing adolescent risky

behaviours and helping our nation's youth lead healthy drug free lives. Research shows that kids who learn about the dangers of drugs at home are up to 50 percent less likely to use drugs than children who don't learn about these dangers from their parents (Kamanga et al 2009)

- The abuse of alcohol and drugs by students is a major public health problem. In order to prevent drug abuse it is important to identify the main reasons for using a drug. Practical efforts should be made to overcome this inclination.
- The reasons for using drugs are very varied within each culture. Preventative programmes may need to vary according to local problems.
- On an official level there are international agreements to control the movement and export of drugs. On a national level, control depends on the police and customs and government measures. The best preventive measures are those which are developed by people within their own culture and social life. Religious groups can play an effective preventative role against the abuse of alcohol and drugs through their teaching about moral values and self-discipline.
- Young people are often portrayed as irresponsible and incompetent and as a result are excluded from being actively involved in drug prevention programmes. This exclusion is harmful because it discourages youths from taking prevention programmes seriously and widens the gap of mutual distrust and misunderstanding between youth and adults.

There must be a substantial and sustained commitment to the development and deployment of new technologies to stop the world's top killers, drug and substance abuse in their tracks and remove the burden they place on development.

Drug abuse problems are among the most damaging menaces of modern life. Their effective prevention calls for huge efforts from government authorities, widespread education and awareness raising campaign and active community participation. This

study should be taken seriously by the government or Nacada (National Agency for the campaign against drug abuse) so that the recommendations are acted upon.

Kenya has an anti-narcotic unit within the police force which is the lead agency in the war against drug trafficking. Officers of the unit are charged with the responsibility of enforcing the Narcotic drugs and psychotropic substances control act. This act of parliament makes a provision with respect to the control, possession and trafficking of narcotic drugs and psychotropic substances and cultivation of certain plants. It states the penalty to be accorded when one is found in possession of the illegal drugs or in use of the illegal substances or any other activities related to the trafficking of these illegal substances. The authorities should ensure that apprehended drug suppliers are slapped with heavy penalties and jail times to discourage the trade.

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Information Management for Improved Government Decisions in Tanzania: The Case of Kinondoni Municipality.

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Abstract

The article presents the results from the study conducted in the Kinondoni Municipal Council (KMC) in the city of Dar es Salaam in Tanzania. There are three interlinked objectives that were attached to the study: firstly, to identify the structure of information management that is in place within the Municipality; secondly, the investigation identified the use of captured or tamed information such as reports by the Municipality; finally it identifies the roles of internal stakeholders (users) in the delivery of public services. To attain these three goals/objectives the research design were created and data were captured through desk reviews and field work in the Municipality. A sample of 60 respondents was selected; some of them purposively while others were randomly selected. The findings show that information structure, form and format play the key role in the use and behaviors or activities of users of information in making decisions for improved delivery of public services in Tanzania. The way information management is structured attracts the quality retrieval and use of such information by the users during planning, decision making and general management within the respective section of the public service.

Key words: Information Management; Administrative Decision Making

Introduction

Information is important to any organization (Rad, 2008). Good and quality information can improve decision making, enhance efficiency and allow organizations to gain competitive advantages. Many organizations are continuously looking for solutions to effectively seek and handle information within their internal and external environments. Business sectors in particular also need information and effective means of managing information in order to assess their strengths and weaknesses. This is followed by Porter and Miller (1999) who reported that one of

the most important elements in competitive advantage is information. According to them, some information is critical enough that it is crucial for organizations to identify and manage such information using various means and tools from both knowledge management (KM) and information management (IM).

From the historical point of view, literature has shown that information management throughout the 1970s was largely limited to files, file maintenance, and the life cycle management of paper-based files, other media and records. With the advancement of

information technology starting in the 1970s, the job of information management took on a new light, and also began to include the field of data maintenance. No longer was information management a simple job that could be performed by almost anyone. An understanding of the technology involved, and the theory behind it became necessary. As information storage shifted to electronic means, this became more and more difficult. By the late 1990s when information was regularly disseminated across computer networks and by other electronic means, network managers, in a sense, became information managers. Those individuals found themselves tasked with increasingly complex tasks, hardware and software. With the latest tools available, information management has become a powerful resource and a large expense for many organizations.

Experience has shown that many organizations are faced with an abundance of information that is sourced from numerous resources within and outside of the organization. To elude problems such as information overload, information management has become more significant each day as organizations strive to ensure their employees have access to information that enables them to perform their jobs most effectively and support organizational objectives (Gregson, 1995).

In Tanzania, for example, literature and essentially the Local government (Urban Authorities) Act Number 8 of 1982 provides for the decision making functions within their areas of jurisdiction which among others are the following :- to provide and secure enabling environment for successful performance of the duties of the urban authority; ensure compliance by all persons and urban authorities with appropriate government decisions, guidelines in relation to the promotion of the local government system; secure the effective, efficient and lawful execution by the urban authorities of the statutory or incidental duties.

The same Act in section 54(2) miscellaneous amendment provides for the functions of the Sector Ministries which among other things in relation to local government authorities are :- to supervise professionalism of

personnel relating to the particular sector in the local government authorities; to ensure quality assurance in the performance of the functions of technical personnel relating to the sector in the local government authorities; to undertake monitoring and evaluation of the technical personnel's performance such as ;to ensure all posts as required by the establishment of a particular profession are properly filled; to ensure human resources development and to ensure availability of equipment, human resources and funds for implementation of sectoral programmes in the local government authorities.

Section 78(1) (2) of the same Act provides the urban authorities with the mandate to prepare and submit quarterly reports to the Regional Commissioner of its implementation of development plans or such other report as may be required by the District Commissioner and Regional Commissioner in relation to the functions under the Regional Administration Act, 1997.

Problem statement of the paper

Information is essential for the improved government decisions. Thus, for the government to make proper and improved decisions management of information is of great importance. Information management on the other hand is associated with the managerial functions namely planning, organizing, directing, staffing, coordinating, controlling, reporting and budgeting. It includes the management of information and related information resources, such as personnel, equipment, funds, and technology. In Tanzania, for example, the Local Government Reform Programme II (URT, 2010) stipulates among other things community participation in local government planning and alignment of resources allocation to strategic priorities at all levels of central and sector Ministries including RS's and LGAs.

Aminu (1986) argue that information resource is one of the major issues and indices of planning. That, where the relevant information required for planning are not available at the appropriate time, there is bound to be poor planning, inappropriate decision making, poor priority of needs,

defective programming or scheduling of activities.

In addition to that experience has shown that government needs timely, accurate, appropriate and relevant information for improved decision making but in most of the organizations and LGAs in particular information is not well managed for improved decision making. For this purpose proper management of any organization information is the most strategic resource which needs to be properly planned, collected, stored, retrieved and perhaps discarded for improved decision making, but most of the Information management → Decision making (Information management influences decisionmaking)

organizations do not pay attention to information as a strategic resource leading to in effective decisions due to irrelevant information which is not properly collected, planned, stored and retrieved for improved decision making. This is attributed to a number of factors which among other things include inadequate access to, or possession of, relevant information which has negative impact on the effectiveness of the administrative decision-making process. The below is a description of the information management frame work.

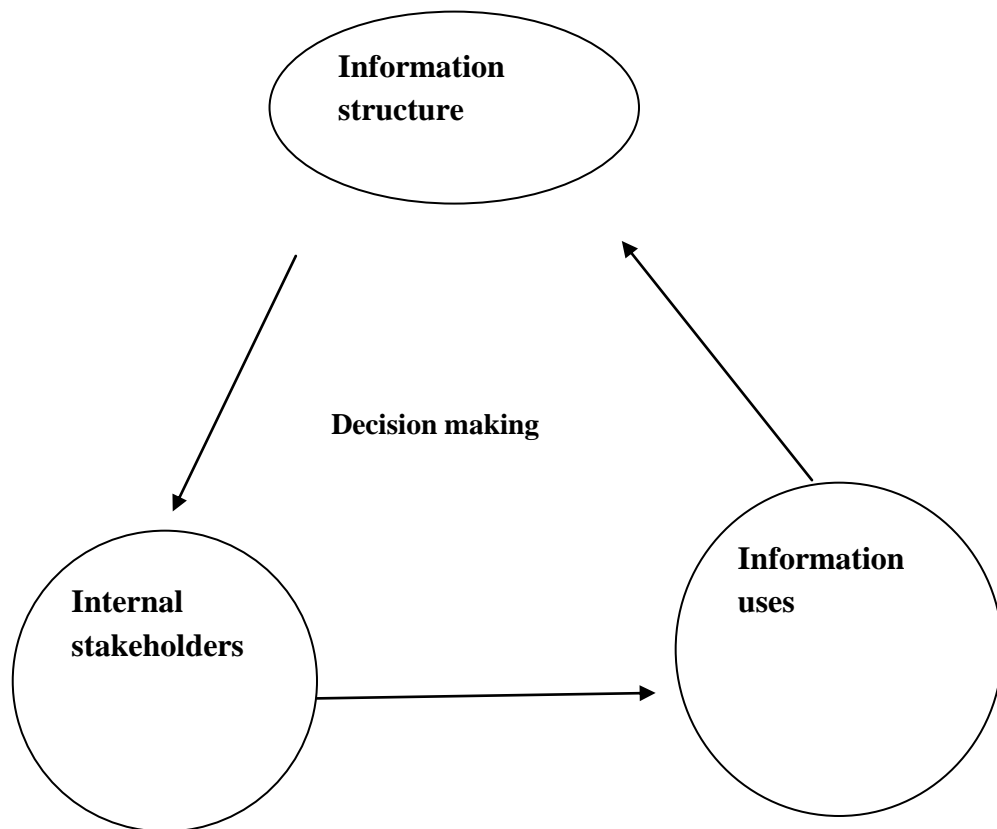


Figure 1.1: Information management framework

Source: Compiled from different literatures (2013)

In this model, the theoretical idea is that: information management influences decision making in the organization which is the function of the three variables as described here below:-

X1=Information structure. Generally, information structure is the design and implementation of information organization; it is the intermediate step of work between conceptual database design and the practical implementation of file structure through which information is used for various activities within the council such as in meetings and groups or individual decision making process. It clearly lays out the level of authority and processes and procedures whereby strategic and key operational decisions are made. Proper information structure for information management outlines the relationship among the multiple stakeholders, the decision-making process and how issues are resolved.

X2= Information uses: Information use is a dynamic, interactive social process of inquiry that may result in the making of meaning or the making of decisions. The inquiry cycles between consideration of parts and the

Carnegie Mellon School of information management

This theory tries to advocates on the five important concepts for the proper management of information and ultimately decision making. These concepts are Environmental management, Creation of slack resources, Creation of self contained resources, Creation of lateral resources and Investment in lateral information system as shown in Table 1.1

whole, and between practical details and general assumptions. Therefore it is described as the manner through which information is used for decision making such as planning, directing, coordinating, organizing, evaluation, budgeting and few to name for improved decision making in the council so as to meet with the strategic priorities of the council upon by the stakeholders who may be internal and external stakeholders respectively.

X3= Stakeholders of information management: These are people who have a stake in a situation. They can be described in organization terms as, those who are maybe internal (e.g. employees and management) and those external (e.g. customers, competitors, suppliers).

Literature review

This section of the paper provides different theories and concepts relating to information management and decision making. With regard to the accessibility of the reviewed literature and the concept of time, the following theories provide for the justification of this section; however the theory of human decision making process by Simon (1957) assumes to be suitable for this study. The theories presented in this section are Carnegie Mellon School of information management, information processing theory and human decision making process.

Information management	Decision making
Environmental management	<ul style="list-style-type: none"> • Monitor and implement the environmental policy of the organization such as social, political , legal and other environmental aspects of the organization
Creation of slack resources	<ul style="list-style-type: none"> • Decrease the information on the hierarchy
Creation of self contained resources	<ul style="list-style-type: none"> • Interaction between different organization units/ sections
Creation of lateral resources	<ul style="list-style-type: none"> • Cuts across functional organization sections /units for moving information from the process to the hierarchy
Investment in lateral information system	<ul style="list-style-type: none"> • Information flow is routed in accordance to the applied business logic

Table 1.1: Theoretical relationship between information management and administrative decision making. Source: Carnegie Mellon School of information management (2013)

This school of thought was developed by Bernard, Richard Cyert and Simon (1958), most of what goes on in service organizations is actually decision making and information process. The theory goes further to the crucial factor in the information and decision making process analysis in the individual limited ability to process information and to make decision under those limitations.

March and Simon (1958) state that organizations have to be considered as cooperative systems with a high level of information processing and a vast need for decision making at various levels. However they have identified some factors that would prevent individuals from acting strictly rationally, in opposite to what has been proposed and advocated by classic theorists.

Instead of using the model of the economic man, as advocated in classic theorists, they proposed the administrative man as an alternative based on their argumentation about the cognitive limits of rationality. This is attributed by the idea that human beings are rational. This theory is advocating on the

proper and improved decision making process.

While the theories developed at Carnegie Mellon clearly filled some theoretical gaps in the discipline, March and Simon (1958) did not propose a certain organizational form that they considered especially feasible for coping with cognitive limitations and bounded rationality of decision-makers. Through their own argumentation against normative decision-making models, i.e., models that prescribe people how they ought to choose, they also abandoned the idea of an ideal organizational form.

In addition to the factors mentioned by March and Simon, there are two other considerable aspects, stemming from environmental and organizational dynamics. Firstly, it is not possible to access, collect and evaluate all environmental information being relevant for taking a certain decision at a reasonable price, i.e., time and effort. In other words, following a national economic framework, the transaction cost associated with the information process is too high. Secondly, established organizational rules and

procedures can prevent the taking of the most appropriate decision, i.e., that a sub-optimum solution is chosen in accordance to organizational rank structure or institutional rules, guidelines and procedures, an issue that also has been brought forward as a major critique against the principles of bureaucratic organizations ;the school suggests that information management, i.e., the organization's ability to process information is at the core of organizational and managerial competencies. Consequently, strategies for organization design must be aiming at improved information processing capability. Jay Galbraith has identified five main organizational designs for increased information processing capacity and reduced need for information processing. These five main organization designs are:-

Environmental management: This is an administrative function that develops, implements, and monitors the environmental policy of an organization. It provides for the system which for the same time provides for a framework that helps a company achieve its environmental goals through consistent control of its operations. The assumption is that this increased control will improve the environmental performance of the organization. The Environment Management System (EMS) itself does not dictate a level of environmental performance that must be achieved; each company's EMS is tailored to the company's business and goals. Basic Elements of an EMS:
<http://www.epa.gov/ems/>

Creation of slack resources: In order to reduce exceptions, performance levels can be reduced, thus decreasing the information load on the hierarchy. These additional slack resources, required to reduce information processing in the hierarchy, represent an additional cost to the organization. The choice of this method clearly depends on the alternative costs of other strategies.

Creation of self-contained tasks: This is another way of reducing information processing. In this case, the task-performing

unit has all the resources required to perform the task. This approach is concerned with task (de-)composition and interaction between different organizational units, i.e. organizational and information interfaces.

Creation of lateral relations: For the purpose of this section lateral decision processes are established that cut across functional organizational units. The aim is to apply a system of decision subsidiary, i.e. to move decision power to the process, instead of moving information from the process into the hierarchy for decision-making.

Investment in vertical information systems: Instead of processing information through the existing hierarchical channels, the organization can establish vertical information systems. In this case, the information flow for a specific task is routed in accordance to the applied business logic, rather than the hierarchical organization.

Following the lateral relations concept, it also becomes possible to employ an organizational form that is different from the simple hierarchical information. The Matrix organization is aiming at bringing together the functional and product departmental bases and achieving a balance in information processing and decision making between the vertical and the horizontal structure. The creation of a matrix organization can also be considered as management's response to a persistent or permanent demand for adaptation to environmental dynamics, instead of the response to episodic demands.

Information Processing Theory

The theory advocates on the three important concepts for the proper management of information which then lead to improved decision making. These concepts are first information processing needs which is all about the collection, storage and dissemination of information for decision making, Secondly, information processing capability which is the ability to apply the theoretical information for decision making and lastly is the fit between the two concepts.

Table 1.2: Theoretical relationship between information processing theory and decision making

Information management concepts	Decision making
Information processing needs	<ul style="list-style-type: none"> • Collection, storage and dissemination of information for decision making
Information processing capability	<ul style="list-style-type: none"> • The ability to apply the theoretical information processing needs for decision making
The fit between the two concepts above	<ul style="list-style-type: none"> • Relates to the application of the information processing needs and information processing capability for improved decision making

This theory identifies three important concepts: information processing needs, information processing capability, and the fit between the two to obtain optimal performance. Organizations need quality information to cope with environmental uncertainty and improve their decision making. Environmental uncertainty stems from the complexity of the environment and dynamism, or the frequency of changes to various environmental variables.

The theory suggests that, organizations have two strategies to cope with uncertainty and increased information needs in which the first one is to develop buffers to reduce the effect of uncertainty, and second one is to implement structural mechanisms and information processing capability to enhance

the information flow and thereby reduce uncertainty.

Information Management functions

Schlogl and Hayes (2007), provide for the information management functions which are essentially the functions and processes which are connected with; information selection; information acquisition; information description (metadata creation); information preservation; information product creation; information services. Traditionally, these functions are well defined in libraries and information centers, but for the purpose of this thesis these functions may also be applied in any organization for improved decision making.

Variable	Functions
Information selection	<ul style="list-style-type: none"> • Assessment of relevance, quality, nature of the sources and the cost to be incurred for effective information management
Information acquisition	<ul style="list-style-type: none"> • Involves acquiring materials, including ordering and paying for it, in handling the materials, and in preparing them for storage and use.
Information description	<ul style="list-style-type: none"> • For providing the means both for managing the collection of materials and for using it
Information preservation	<ul style="list-style-type: none"> • Used to preserve information for future use for example even in the age of the electronic distribution and digital libraries, preservation is important for proper records of information or data for future use when required...
Information product creation	<ul style="list-style-type: none"> • Mostly used for publications for example in some libraries take responsibility for production of scholarly publications.
Information services	<ul style="list-style-type: none"> • In contrast to information products, information services respond to the need of individual customers for improved service provision.

Table 1.3: Information management functions

The structure of information management in governance

A governance structure clearly lays out the level of authority and processes and procedures whereby strategic and key operational decisions are made. Proper governance of information management outlines the relationship among the multiple stakeholders, the decision-making process and how issues are resolved. It ensures that ongoing implementation continues to support the strategy agreed upon by the stakeholders.

Public agencies encounter frequent changes in administration that affect policy, processes and priorities. Governance structures can help manage change so that changes in your management of information are based on evaluation of the overall impact relative to the organization's mission and vision rather than on the current direction of political winds.

Within individual agencies, information management staff should be at the table with program and policy staff to understand agency needs and be a part of the discussion to improve service delivery through the use of technology. One process that helps information management staff maintain close and positive relationships with public child welfare staff is through the development and maintenance of an information management advisory committee that includes child welfare staff. Whenever changes to the technological or information management structures are considered, the impact is most felt by the child welfare staff. These staff members are responsible for supplying data to the system and are an important group of stakeholders who need information to help them improve their practice.

Principles for effective information management in the organization

Information management requires the adoption and adherence to guiding principles that include the following:-

First, information assets are corporate assets should be acknowledged or agreed upon and across the organization for improved information management practices otherwise any business case and support for information will be weak.

Secondly, information must be made available and shared amongst the information users such as the Head of sections, Head of Departments, the subordinates and other stakeholders of information use. However not all information is open to anyone, but in principle the sharing of information helps the use and exploitation of organizational knowledge.

Lastly but not least Information the organization needs to keep is managed and retained corporately. For example if you save a document today, you expect it to be secured and still available to you tomorrow.

Statutory and regulatory framework for information management in perspective

In South Africa, For example a legal framework exist for both public and private bodies to have effective control and management of their records and to be able to make information available when required. Statutory bodies were also established to ensure proper management and care of records and accessibility of the public to the records to protect their rights. Examples of such bodies are the Human Rights Commission which should ensure that mechanisms are put in place for the public to exercise their constitutional right of access to information held by the public and private bodies, and the National Archives and Records Services which is assigned with the responsibility of ensuring proper care and management of records by public bodies (<http://www.sahrc.org.za> and the NARS Act 43 of 1996).

The Constitution of the united republic of Tanzania, article 18 of 1997

Article 18(b) of the Constitution of the United Republic of Tanzania of 1977 (as amended in 2005) states that everyone has the right of access to information held by the state or held by another person when that information is required for the exercise or protection of any right. This clause demonstrates the importance of information management to protect human rights as information can only be accessed when there are sound records or information management system.

National Archives and Records Management Act (2002)

The national archives and Record management Act (2002) provides for the establishment of the National Archives and Records Management (NARM) essentially in the LGAs which are entrusted with the responsibility of ensuring proper management and care of public records and proper information management in particular. In terms of Section 10 to section13 the NARM shall:

- Ensure the proper management and care of all public records; and
- Promote an awareness of archives and records management, and encourage archival and records management activities.

Section 14(3) of the same Act stipulates that in respect of public records or information in this case created, received and maintained by local authorities the responsibilities set out under section 9 and 10 of this Act shall be those of the heads of such local authorities and the responsibilities set out under sections 10, 12 and 13 shall be those of the heads of the appropriate branch offices of the Department within the local authority.

In accordance with Section13 (2b) prescribe about the rules to be observed by those wishing to consult public records or information in this case in the National Archives or any other archival repository under his control; This is to say that the head of a governmental body shall, subject to any law governing the employment of personnel of the governmental body concerned and such requirements as may be prescribed,

designate an official of the body to be the Records Manager of the body. The record Manager is responsible for the overall control and management of records. If records Managers can perform their duties diligently and effectively, records would be correctly filed and easily accessible, and that would facilitate transparency, accountability and democracy. Further to that, controls would be exercised to ensure that only authorized persons have access to the information, thus preventing information and/or the records from being stolen or damaged.

The Tanzania Communications

Regulatory Authority Act section 17, 2003

Section (17) of this Act states that where the Authority has reasons to believe that a person is capable of supplying information, producing a document or giving evidence that may assist in the performance of any of its functions, any officer of the Authority may, by summons signed by the Director- General or Secretary of the Authority served on that person, require that person to furnish the information in writing, signed by him, in the case of a body corporate, signed by a competent officer of the body corporate; produce the document to the Authority and appear before the Authority to give evidence

The Tanzania Information and Communication Technologies Policy (2003)

The policy states that the government will be a model user of ICT by deploying ICT systems within the public administration arena so as to improve efficiency, reduce wastage of resources, enhance planning, raise the quality of services, access global resources, support the application of ICT to promote good governance, transparency and accountability and awareness of the implications of long term ICT investment and total costs of ownership.

Not only that but also the policy state further that the government will deploy ICT extensively to strengthen law enforcement, security and national defense capability, to monitor and respond to environmental

disaster and collect and disseminate information on environment problems.

Furthermore the government will review its operation processes and institutional structures with a view to making them amenable to ICT application and deployment. However the policy is experiencing some of the following challenges.

Increasing productivity (efficiency, effectiveness, and continuity of the public services, creating an e-governance environment responsive to the needs of the citizens, improving accessibility and affordability of public services to the citizens, wherever they are, build efficient communications and knowledge sharing within the public service, setting up harmonized information banks with uniform, consistent, up to date, and secure data and management systems, introducing operational processes and institution and structures that are amenable to ICT application and deployment, increasing the ICT awareness, knowledge and skills of public servants.

More over the policy is experiencing a challenge on the capture, preservation and dissemination of relevant government records and archives and their potential use as multimedia content of significant local relevant and lastly establishing safeguards on data systems to protect the privacy of individuals whose personal data is held, and the confidentiality of information about entities and activities are relevant.

The Tanzania Intelligence and Security Service Act, 2006

Section 14(1) of the Act states about the duty to collect, analyse and retain information. That, it shall be the duty of the Service to collect, by investigation or otherwise, to the extent that it is strictly necessary, and analyse and retain information and intelligence respecting activities that may on reasonable grounds be suspected of constituting a threat to the security of the United Republic or any part of it. In addition to that section 14 (2) of the same Act, further

state that, the Service shall, in relation to the information dealt with under subsection (1), report to and advise the Government of the united republic.

Section 20(1) and section 20(2) of the same Act respectively states for the Protection of source of information. That, No person shall disclose any information obtained in the course of the performance of functions under this Act, from which the identity of (a) any other person who is or was a confidential source of information or assistance to the Service shall be revealed; (b) any person who is or was an employee or officer employed in covert operational activities of the Service can be inferred.

Section 20 (2) of the same Act stipulates that, Any person who contravenes or fails or refuses to comply with the provisions of this section commits an offence and upon conviction is liable to a fine of not less than five hundred thousand shillings or imprisonment for a term not exceeding two years or to both the fine and the imprisonment.

Methods and materials

In the course of methods and materials which aimed to find on whether information management has any sustainable contribution in decision making, a number of instruments such as review of documentary sources for content analysis and extensive reading of journal, articles, research reports, academic papers, on line sources were used to collect information. Interviews were done in order to validate information gathered from the documentary sources. In order to accomplish the required information, a sample of 60 respondents was selected; some of them purposively while others were randomly selected. These were from different cadres such as Heads of Departments, Heads of Sections, the politicians and the subordinates.

Results and Discussion of the study

In this part the paper presents the findings based on the specific objectives of the study. Firstly the study found out that the structure of information management in Kinondoni Municipal Council is bottom up structure

comprising of both electronic information management software such as the PlanRep2, Local Government Management Data base (LGMD), District Road Maintenance Systems(DROMAS), Tanzania Output Monitoring system for HIV&AIDS (TOMSHA), District Health Information System (DHIS), LAWSON and EPICOR. On the other hand the physical information management structure were found to be the files cabinet systems, Council's management meeting and the Monday prayers in which information is flowing from the grass roots to the appropriate authority for a decision to be made.

Secondly the information uses in the Kinondoni Municipal Council were found to have many uses such as planning, staffing, directing, controlling, budgeting, organizing and directing. Thus, if information is properly used it can lead to the better performance of the organisation. Therefore proper management of information is essential for planning, staffing, directing and budgeting in particular priority areas. In addition to that proper information management influence improved decision making for the better performance of the organization.

Lastly the paper presents the role of internal stakeholders for effective information management for improved decision making in the Kinondoni Municipal Council. From this study it was found that the roles of internal stakeholders for effective information management are to monitor the information flow, store and supply of information for decision making. As it is in the case of accountability in the public sector in many of the public organizations in Africa and Tanzania in particular; the stakeholders for information management are not fully accountable towards their role leading to loss of information such as the information pertaining to the particulars of employees such as the salary arrears which are not resolved on time due to poor information management in the public sector.

Summary and Conclusion

Information management is a function that is generally underestimated and is always aligned to both internal and external

stakeholders within and outside the council. Conversely, information management is the collection and management of information from one or more sources and the distribution of that information to one or more audiences. This sometimes involves those who have a stake in, or a right to that information.

Information is essential to the administration of local government as it contains and keeps government programmes functioning properly. The main objective of this study was to investigate the role played by information management in an organization's decision making. The primary question that was explored was whether the management of information receives the attention it deserves in KMC by looking at the information structure, information uses and stakeholders of information management.

By conducting this study, the aim of it was to create awareness and sensitize public servants, particularly municipal officials, that ineffective management of information indirectly affects the performance of an organization and may have adverse effects on the delivery of services, by either delaying or hampering the service delivery process. The empirical survey formed part of the study since the users' behavior, attitudes and characteristics were central to the study.

Meanwhile the paper found out that the structure of information management in KMC is pyramid in structure flowing from the sub-

wards to the top decision makers. On the other hand the study revealed that information has many uses such as planning, staffing, directing, controlling, budgeting, organizing and dissemination of information itself to the respective users for decision making. Lastly the study found that the roles of information users for effective information management are to monitor the information flow, store and supply of information for decision making.

Policy implications and need for further studies

Accomplishment of this study gives an opportunity to further study on IM. Thus, the study has provided the way for further studies on information management on various issues which are information related such as demand for and supply of information in the organization, information planning, information needs and requirements in the organization. In the light of the above statement there are some interesting areas in this research in which other researchers may concentrate on doing other useful researches, therefore the findings from this research may provide some gaps for more researches, thus the researcher calls upon other researchers from universities, colleges, research organizations and those with special interests to conduct more comprehensive studies on the subject matter.

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Factors Leading To High Turnover of House Helps (A Case Study Of Shaabab Estate In Nakuru Town)

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Abstract

At one time or another, you have come across a house help who plays a major role as a second parent but on the same you might have been brought by numerous house helps who have shaped your behavior up to today. At least 3/5 homes have a house help meaning it has one of the largest number on employees. In contrast it is also one the jobs where job turnover is also very high. According to Armstrong (2001) labour turnover refers to people leaving their place of work at any time for any reason. House help turnover may have a negative impact on the employer performance at the place of work and also disrupt daily running of the house. Negative effects include recruitment cost, induction cost; time spent looking for the replacement, increased work load to the employer among others. The researcher studied the factors that lead to high turnover of house helps. Objectives of the study were to find out whether terms and conditions of work of house helps lead to high turnover of house helps, to establish whether discrimination by the employers lead to high turnover of house helps and to examine whether lack of job security lead to high turnover of house helps and to examine whether working conditions lead to high turnover of house helps. Limitations of the study were that some respondents feared their employers such that they were not willing to give information when the employer was in the house and also feared to open the homes to the outsiders. Therefore the researcher pretended to be looking for a job as a house help to get access to the house. Some respondents were not well conversant with the English language and the research used Kiswahili. A case study design was adopted owing to the ability to provide information on population perception, attitude, opinion, views and behavior about a given subject under study. Target Population was 600 househelps in Shaabab estate. The sample size of the study was selected using systematic sampling whereby after every 10th house one house help was chosen to get a sample of 60 respondents who comprised 10% of the population. The data was collected using open ended and closed ended questionnaires. The findings showed that the following factors lead to high turnover of house helps lack of terms and conditions of employment; poor pay discrimination, lack of training, overworking, domestic conflicts, religion, dress code, sexual harassment and family size. The recommendations were that the employers of

the house helps should improve terms and conditions and provide a conducive work environment for the house helps. The house helps should also be educated on how to tackle some of these factors like sexual harassment. Some respondents were not well conversant with the English language and the research used Kiswahili. A case study design was adopted owing to the ability to provide information on population perception, attitude, opinion, views and behavior about a given subject under study. Target Population was 600 house helps and 600 employers in Shaabab estate. The sample size of the study was selected using systematic sampling whereby after every 10th house one house help was chosen to get a sample of 60 respondents who comprised 10% of the population and 40 employers were selected from every 17th house forming 17% of the employers. The data was collected using open ended and closed ended questionnaires. The findings showed that the following factors lead to high turnover of house helps lack of terms and conditions of employment; poor pay discrimination, lack of training, overworking, domestic conflicts, religion, dress code, sexual harassment and family size. The recommendations were that the employers of the house helps should improve terms and conditions and provide a conducive work environment for the house helps. The house helps should also be educated on how to tackle some of these factors like sexual harassment. Further researcher should be conducted to find out whether the new regulations set by the government on domestic workers are adhered to or not on matters pertaining salaries and National Social Security Fund contribution.

Background of the Study

Labour turnover refers to people leaving their place of work at any time for any reason (Armstrong, 2001). Labour turnover may have both negative and positive effects (Mobley, 1979). Negative effects of labor turnover includes; recruitment cost, induction cost, training cost, time spent looking for the replacement training and inducting, low productivity, bad organization image, demonization, leaving cost of house helps and also time spent during recruitment, increase the workload to the employer. According to (Mullins,2002) positive effects turnover include termination of bad matches even under the conditions of careful recruitment and selection innovations such as creates possibilities for replacing house helps and therefore enable urbanization to import new type of knowledge and skills to market conditions.

Statement of the problem

At one time or another, you have come across a house help who plays a major role as a second parent but on the same you might have been brought by numerous house helps who have shaped your behavior up to today. At least 3/5 homes have a house help meaning it has one of the largest number on employees. In contrast it is also one the jobs where job turnover is also very high. Labor turnover is not a unique problem to many

homes. Many homes were facing this problem of house helps turnover. In many houses in Nakuru where the study was carried out, the problem was rising every day and this raised questions as to what is happening with the househelps. The researcher sought to find the factors causing labour turnover of house helps specifically in, Shaabab estate in Nakuru town.

Objectives of the study

The main objective of the study was to find out factors leading to high turnover of househelps in Nakuru town specifically in Shaabab estate.

Specific objectives were; to establish whether terms and conditions of work of house helps lead to high turnover of house helps, to find out whether discrimination by the employers lead to high turnover of house helps and to examine whether lack of job security lead to high turnover of house helps. To determine whether working conditions lead to high turnover of house helps.

Significance of the study

The findings of the study served as a useful indicator on the factors that lead to house help turnover and the effects of house help turnover to the house help owners and to the house help so that these factors can be addressed by the house help employers. The

findings can also help the government to enact laws which will address some of the issues facing house helps and protect the house helps.

Limitations of the study

Some respondents feared their employers such that they were not willing to give information when the employer was in the house and also feared to open the homes to the outsiders. Therefore the researcher pretended to be looking for a job as a house help to get access to the house. Some respondents were not well conversant with the English language and the research used Kiswahili.

Literature Review

Previous studies in the area

According to industrial relations services and employee development bulletin (IFRS, 2000) high rate of labor turn over can destabilize the performance of house helps and demotivate them. (Clifton,2000) commented that labor turn over may be a function of negative job attitudes, low job satisfaction, poor working conditions, favoritism, lack of motivation and other personal factors. While(Cole, 2004) revealed that the main factor that influenced house help to leave their place of work were career change which influenced most house helps, dissatisfaction with pay followed by dissatisfaction with benefits and lack of opportunities for career development.

Elsewhere, (Githigi,2007) found that the main factors that influence house helps turnover were need for career and education advancement, dissatisfaction with supervision style at work also affected to a large extent.) revealed that the major causes of house helps leaving the houses was low salary compared to similar houses, lack of job security and poor working conditions would cause them to leave (Beatrice, 2007).

Labor turnover is an outcome of resignation due to dissatisfaction with working conditions, influences of wages, bad health and sickness, old age and family circumstances. He also found that better pay motivates house helps, supervision at work, relationship

between bosses and house helps .Poor personal policies lead to house help turnover (Wairimu, 2002). Frequent retrenchment and redundancy may cause house helps to leave work. Armstrong (2001) cited negative job attitude, low job satisfaction, combined with ability to secure employment elsewhere was the reason why house helps moved from their place of work. He also noted that left due to poor salaries. Boxall (2012) explained that house helps turnover affected levels of productivity of the employers. He further noted that house helps can move from places of work because they were dissatisfied with their employment and due to inadequate recruitment and selection process which incorrectly matches people with their job. According to (Chipton, 2000) indicated that house helps becomes dissatisfied if their employers not maintain a record for each house helps containing full and accurate details of pay. According to (Gupta, 2005) causes of house help turnover can be unavoidable and are initiated by either house helps or the employer. The house helps avoidable causes include; incompetence, laziness, dislike of work, insubordination, rolling stone by nature and desire to work near home. According to Gomez et al (1997) there are two types of labor turnover which are voluntary turnover that occurs when the house help decides to leave work for personal reasons and to end the relationship with the employer. The other type of turnover is involuntary turnover which occurs when management decides to terminate its relationship with the house helps due to economic necessity or a poor fit. However turnover is higher when workers are trained to be multi skilled which may imply that this type of training enhances the prospects of house helps to find work elsewhere. The role of human relationship in house helps performance, Lack of commitment to the organization of house helps is one of the causes of labor turnover.

In 1995 a media analysis of some 800 turnover studies was conducted at homes. The analysis confirmed some well-established findings on the causes of turnover (Gupta, 2005).

Review of Major Issues

Pay and Benefits

Pay and benefits influence house helps mostly to leave the place of work. Gichigi (2007) recommended that management should consider pay and benefits for the house help are competitive compared to what other organization offer.

Compensation and remuneration

Compensation package has great bearing on employee's attitude in an organization. The package generally includes earnings, economic advantage and frequency of pay increments and fairness of the compensation. This will assist the house helps develop positive attitudes towards their work and also maintain a good relationship with the house help. The employer should be able to provide house helps with comfortable environment for the house help, increase pay and some leave allowance. Remuneration package cannot be underestimated as it is used to meet physiological needs.

Retention

House help retention involves providing an atmosphere in which the house helps will continue to stay longer with the employer. Retention methods include; ability of house help to speak his or her mind freely with the employer, solicit ideas and provide environment in which house helps are comfortable in providing feedback, foreshadow the information with the house helps (Boxall, 2003).

Supervision at work place

Poor supervision between the employer and the house help promotes high turnover (Githigi, 2007). Supervision style at work between the house helps and the employer should be improved. With good supervision at work it ensures that the organization runs its operations smoothly without any problem.

Poor working conditions

Poor working conditions lead to house helps to leave their places of work. According to Mullins (2002) Herzberg's two factor theory that is motivation or satisfiers and hygiene or maintenance factors. He argued that motivation of house helps had a significant

effect on house help performance. The house help motivation is a variable management tool for improving the house help work performance and training the house helps make them feel part of the home and improve productivity.

Lack of opportunities for career and education advancement

The organization should develop clear policy for career and education advancement. According to (Cole, 2004), the concept of employee development can be better understood if it is viewed in the context of each individual employee. Through training an employee is enabled to achieve proficiency in his or her work. Provision of adequate and right kind of training facilities is therefore essential. Employees should be given a chance to practice their abilities and skills are utilized to the maximum extent possible. Training should be related to the needs of the organization and the employees concerned. For the ordinary workers whose job does not call for any particular administrative or supervisory skills, orientation training, induction, training in safety devices and special service training is recommended. Job training is given in the normal work situation using actual tools, equipment or materials that he or she will use when fully trained. Off the job training takes place way form the normal situation usually employing specifically simplified tools and equipment and the worker is regarded as not productive form the beginning. (Cole, 2004). Training improves individual performance in terms of output, speed and overall productivity. Training improves the operational flexibility thus extending the range of skills possessed by employees and this helps the employees to perform different duties and increase commitment to work (Armstrong, 2004).

Working conditions

Every person need to work in a healthy environment. Unhealthy working condition is a source of stress to both the employer and the house helps. House helps are supposed to be protected against any hazards and accidents arising in the house. Every household have safety and health policies

where managers should ensure that house helps are protected against any risks. Conflicts may positively or negatively affect the relationship of the employer and the house help in different ways. Conflicts may arise due to tough issues which are not known to the employer to identify most vital issues as to curb those problems. It is good for the employers to avoid conflicts that arise. Interpersonal conflicts affect person's emotion this is because there is a need to protect self-esteem and self-image (Armstrong, 2004).

Effects of labour turnover

Cole (2004) stated that the main disadvantage of labor turnover is the additional cost of placement and recruitment, disruptions and additional training cost. Other disadvantages are wasted investment in people if they were trained by the organization, difficult in attraction new and retaining old house helps, low motivation among house helps leading to low productivity and poor corporate image He stressed that involuntary turnover result in very painful decision that can have a profound impact on the entire organization especially to the house help who losses his

or her job. He found that heavy workload, redeployment and stress are the effects of labor turnover affecting house helps.

Research Design and Methodology

A case study design was adopted owing to the ability to provide information on population perception, attitude, option, views and behavior about a given subject under study.

Target Population

The research project targeted 600 house helps and 600 employers in Shaabab estate. The research selected the estate since it is among the oldest and the largest estate in Nakuru town.

Sampling design and procedure

The sample design of the study was selected using systematic sampling whereby after every 10th house one house help was chosen. This systematic sampling was used to get a sample of 60 respondents who comprised 10% of the population. Every fifteenth house an employer was selected to get a sample size of 40 employers which presented 17% of the population.

Table 1: House helps

Category	Number of houses	Sample size
House girls	440	44
Houseboys	160	16
Total	600	60

Table 2: Employers

Category	Number of houses	Sample size
Male	210	14
Female	390	26

Total	600	40
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Data Collection Instruments

The data was collected using open ended and closed ended questionnaires which were administered to the house helps and the employers. The questionnaires were hand delivered and the researcher assisted the respondent to answer the questions for any clarification and to ensure immediate feedback. The 20questionarre were piloted at

Racetrack estate to ensure validity. This estate was chosen because it had homogeneous characteristics as the area of study.

Data Analysis and Presentation

Data was analyzed by use of descriptive statistics and the data was presented in form of tables.

Table 3: Respondent Response rate

Respondent	House helps	%	Employers	%
Expected	60	100	40	100
Received	60	100	40	100

Table 4: Demographic characteristic

Gender	Frequency	%
Male	16	27
Female	44	73
Total	60	100

The respondents comprised of 27% male and 73% females.

Age distribution

Out of the 100% respondents who participated in the study the study revealed that there were no house help who were aged between 10 – 15 years. 16-20 years were 20%, 21-25 years were 10% and above 31 years were 10%.

Level of education

The results revealed that 30% of the respondents had attained primary level of

education, 17% had attained secondary level, 6% had attained college level and the majorities 47% were illiterate. This implies that the society should be sensitized to support house helps to go to school.

Length of service

The study revealed that 60% of the house helps who participated have worked for their employers less than one year. 33% worked between 1-3 years while 7% had worked for 4 years and above.

Income bracket

The study revealed that 30% of the house help earn salary bracket between Ksh1500-2000, 37% earn between Ksh. 2001- 3000, 20% earn Ksh. 3001- 4000 and 13% earn a salary above Ksh 4000.

Concerns of the employer to the house help

Most of the respondents, 53% revealed that they were not rewarded by their employers apart from receiving their salaries while 47% were rewarded by the employer. Majority of the respondents 63% revealed that family size affect their performance while 37% were comfortable with the family size. The results revealed while 47% respondents were comfortable with where they were, 53% of the respondents complained of mistreatment by the family members, overworking, and delay in salary payment, waking up very early and sleeping very late, sexual harassment, and small house, Specific mode of dressing, following the religion of the employer, isolated eating area, eating different food from the family members, no medical care, and no social media. The study also revealed that 98% of the house helps were not inducted on the job leading to a lot of conflict with the employer especially on the cooking methods, menu selection and on the use of electrical gargets. The study also revealed that 99% of the house helps were not allowed to hold parties at the employers premises neither to allow visitors in the houses and this made them feel socially discriminated while 10% were comfortable.

Salary perception and job security

The study revealed that 50% of the house helps were unsatisfied with their salary while 33% were satisfied and 17% were very unsatisfied. The study also revealed that 100% househelps were not issued with contract letters therefore not sure of their job security neither sure of the amount of salaries.

Employer respondents

The study revealed that 65% of the employers were female while 35% were male.

Age of the employer

The results revealed that 10% of the employers were aged between 16-20 years. While 20% were aged between 21-25 years while 30% were aged between 26-30 years and 40% were above 31 years.

Length of service

The study revealed that 60% of the employers stayed with their house helps for less than a year and 30% of the employers stayed with the house helps between 1-2 years. While 10% of the employers stayed with their house helps between 2-3 years and none of the employers stayed with the house helps for more than 3 years.

Size of the family

Of the 100% employers who participated in the study, 45% revealed that the family size caused the house help to leave work because large family size made the house helps to overwork while 55% of the employers with small family size revealed that the house helps were comfortable.

Size of the house

The study revealed that none of the employers lived in a single room house 20% of the employers lived in 3 bed roomed house while 40% lived in 2 bed roomed house and 40% lived in one-bed roomed house. This shows that majority of the house helps lived in congested houses making them leave work.

Extent to which house helps services affect the employer

The study revealed that 100% of the employers were affected by the services offered by the house helps.

Measures to maintain house helps

The study revealed that 30% of the employers advocated for better pay and 10% suggested rewarding the house helps apart from paying them salaries. While 25% advocated for work plan to avoid overworking the house helps while 35 % suggested creating a good relationship with the house help and making them feel part of the family.

Summary of findings and Conclusion

The study revealed that 73% of the house helps in Nakuru town where female while 27% were male. 65% of the house helps employers were female while 35% of the employers were male. Most house helps are aged between 21- 25 years while the employers were aged between 31 years and above and 37% of the house helps earned a salary bracket between shs2001-3000.

The findings showed that the following factors lead to high turnover of house helps;

Terms and conditions of employment

100% of the house helps sampled were not given any contract letter on employment and therefore they were not even aware of their duties and responsibilities, working hours; leave schedule and off days. This was majorly done verbally and this led to house helps being overworked and underpaid. The house helps were not issued with a pay slip at the end of the month and this made them not access loans from any financial institution therefore cannot be empowered. The study showed that 70% of the house helps were discriminated on the following areas; *Food-*where in some houses the house helps were supposed to eat different menus from the other members of the family where some were not even allowed to take tea with milk and also to take meat especially chicken. In 60% of the houses house helps were supposed to eat leftovers and also had specific plates and cups to eat from and had a specific amount to eat. In 50% of the houses sampled the house helps were supposed to eat from the kitchen while other ate from the dining area. *Social media-* In 37% the houses sampled the house helps were not supposed to make calls as the employer suspected that the house help might be looking for another place and the employers felt insecure. The study revealed that 40% of the houses house helps were not allowed to watch the television with the family members neither to listen to the radio especially if she/ he channeled the vernacular language. *Parties and outings –* The study showed that 100% of the house helps were not allowed to hold birthday parties in their employers' houses neither were they bought a present during their

birthdays while the other family members were allowed to hold parties and given presents. The study also showed that 90% of the house helps were also left out during the family outings unless the house help was to accompany them in case there was a responsibility to be carried out by her e.g. swinging the children while the parents relaxed. The study findings revealed that 79% of the houses sampled the house helps were not allowed to go outside the house neither to talk to their neighbours. *Medical care-* The study showed that 90% of the house helps were not catered for when sick and were supposed to use their own resources when sick or were bought for pain killers when sick and were also expected to work when sick. In case a house help was discovered to be pregnant the employer sucked her immediately with no notice neither a maternity leave was allowed. *Visitors-*The study showed that 99% of the house helps were not allowed to bring visitors in the houses even in cases the employer was familiar with the visitors as some employers felt insecure and some were suspicious of the visitors intention. *Training and induction-*The study showed that 90% of the house helps were not inducted to their duties and this affected their work performance since some of them had problems using electronic gadgets and gas. *Workload-*The study revealed that 40% of the house helps did not like working in homes with large family especially families with small children or teenagers as they were being overworked. The study also showed 10% of the house helps claimed that some employers forced them to dress in a certain way especially when the employer was from a different religion or belief. In 30% of the houses sampled the house help was forced to follow the religion of the employer. *Physical and sexual abuse-*The study showed that 40% confessed to have been abused physically by the employer especially those below 20 years while 20% confessed to have been abused sexually by the employer either willingly or unwillingly and this was especially so if the employer was a male or in cases where there was domestic conflicts in the house.

Conclusion

Based on the findings, it shows that there are many factors that lead to turnover of house helps in Shaabab estate Nakuru town and the main factors were lack of job security, poor pay, overworking, lack of job induction, discrimination, and physical abuse.

Recommendations

Based on this study, the following recommendations were made; The employers should provide a contract letter to the house helps to guarantee job security for a period of time where the terms and conditions should be well described to avoid overworking the house helps and also to ensure the recommended government domestic worker pay is adhered to avoid underpaying the house helps. The employers should also induct the house helps once employed especially on usage of some equipment and on some first aid skills which can be done internally or externally by involving an expert in order to improve their skills leading to good performance of their duties. To ensure that the house helps are not physically or sexually abused by the employer, the house helps should be made

aware to report such cases to the relevant authority for example to the chief, police station or to their guardians.

Suggestions for further studies

The researcher suggested that further studies to be conducted to find out the whether the law enacted by the government on domestic workers on matters pertaining salaries and National Social Security Fund(NSSF) compulsory contribution is being adhered to manage some of these factors leading to high turnover of house helps. Also further study should be done to find the mechanisms that can be put in place to ensure that house helps are issued with recognizable payslips by the banks in order to empower them through loan accessibility and also by the government especially with the introduction of the compulsory contribution of National Social Security Fund (NSSF) by the government on all domestic workers which will enable the follow their benefits claims in case of discrepancies. This will enable a good social economic environment for the house helps to develop themselves economically and socially.

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Effect of Leadership Paradigms on Customer Service Delivery in the Local Public Sector in Kenya

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Abstract

This study examined the effect of transactional and transformational leadership paradigms on customer service delivery in local authorities in the Western region of Kenya. This was based on the recognition of the role played by local authorities namely county, municipal and town councils in offering essential services to citizens at the grassroot level of governance. Using a co-relational research design, data was collected from 322 employees of these entities using questionnaires. It was analysed descriptively using frequencies and percentages and inferentially using Pearson's Product Moment Correlation test. The study found that both transformational and transactional leadership approaches had a positive and significant influence on customer service delivery. However, the transformational leadership approach had a greater effect on customer service delivery than the transactional leadership approach. The study recommends that the successors of the local authorities, that is county governments, should utilize these approaches in managing their operations in order for them to for accrue benefits to themselves and the citizens in their jurisdiction.

Key words: *transactional leadership, transformational leadership, customer service delivery*

Introduction

With global competitiveness, sound corporate governance and enhanced sensitivity to corporate social responsibility taking the centre stage in the modern organizational scenario, only those

organizations that know how to navigate around these realities will survive. In the public sector, strategic management has been embraced as an approach of driving Government Ministries and agencies towards citizens' service delivery.

In Kenya just as in other developed and developing countries, the concept of performance contracting has been implemented in a bid to enable government agencies' managers to set targets and work towards their attainment within defined contractual terms (Obong'o, 2009; Kobia and Mohammed, 2006). The success of such endeavours however is dependent on the use of an appropriate leadership model to enhance service delivery and organizational performance (Pretorius and Schurink, 2007). Identification and deployment of talented and informed managers who focus on setting and attainment of targets as well as incorporating their subordinates in all aspects of task planning and accomplishment is a critical success factor in modern organizations. According to Yukl (2010), this has resulted in the growing interest in the emotional aspects of leadership where the influence of the leader on the followers in relation to their performance has been explored.

From the 1980's, researchers have been at cross roads in their choice of the most appropriate leadership approach to utilize in ensuring organizational success. Although various paradigms have been explored in studying leadership in recent times, transformational and transactional leadership approaches remain the most studied and discussed paradigms. Several studies have advocated for the transformational leadership paradigm in ensuring superior employee performance (Bass, 1999; Bass and Riggio, 2006; Bass and Avolio, 1994).

Such studies argue that this paradigm has promoted employee performance as well as enhanced job satisfaction by encouraging followers to seek new challenges, motivating them to get more involved in their work, involving them in decision making processes and inspiring loyalty (Wambulwa and Lawler; 2003; Bass and Avolio, 1994). Other scholars however point out the salient positive influences of the transactional leadership paradigm and its determining effect on employee and organizational performance. To them, this leadership paradigm motivates employees,

helps them to set work goals, defines rewards they should expect for giving desired effort and provides feedback which ensures that the followers are focused on task attainment (Howell and Hall-Merenda, 2002). Both these paradigms are being practiced in the public and private sector in Kenya. The emphasis of a given leadership paradigm is however dependent on the unique characteristics of a given sector.

Statement of the Research Problem

Local authorities as established under the repealed Local Government Act, Cap 265 of the Laws of Kenya were bodies set up to provide community, social and economic services to citizens such as market stalls, garbage collection, water and sanitation and road construction among others. These bodies included Municipal, County and Town councils. They received funding from the Central Government in the form of Local Authorities Transfer Fund and also collected revenues through charging fees allowed by their By-Laws, which they used to provide services to citizens. To do so, these entities formulated and implemented strategic plans.

Although strategic planning and implementation had been adopted by these entities, the precursor to the current County Governments in Kenya since 2004, many complaints from the citizens were reported on the quality of their service delivery. This scenario begged for answers, given that with steady financial and human resources, an organization is expected to provide the requisite services to its customers. This paradoxical situation where strategic plans exist, funds for their implementation are provided yet the organization fails to implement the chosen strategies resulting in customer dissatisfaction called for a thorough analysis.

Studies on similar public sector organizations have been done to establish determinants of service delivery where leadership, organizational culture and structure as well as staffing have been identified (Poister and Streib, 2005; Plant, 2009) as drivers of service delivery. However the extent to which transformational and transactional

leadership paradigms determine customer service delivery in local public sector organizations, specifically, local authorities has not been examined, especially in Kenya. This study sought to fill that empirical gap by establishing the effect of leadership paradigms on customer service delivery in the local public sector in Kenya.

Objectives

- i) Establish the relationship between transformational leadership paradigm and customer service delivery in the public sector.
- ii) Establish the relationship between transactional leadership paradigm and customer service delivery in the public sector.

Hypothesis

- i) There is no relationship between transformational leadership paradigm and customer service delivery in the public sector.
- ii) There is no relationship between transactional leadership paradigm and customer service delivery in the public sector.

Literature review

The concept of leadership has been studied for a long period of time. This has led it to receive various definitions and perspectives from different schools. This study utilized the definition of Yukl (2010) who saw leadership as the process of influencing others to understand and agree about what needs to be done and how to do it and the process of facilitating individual and collective efforts to accomplish shared objectives. This definition captures the salient duties of a leader as well as expectations the followers have of the leader.

The study of leadership has been through various phases where in the 1930's and 1940's, researchers in the University of Michigan and Ohio State University identified two broad categories of leadership behavior namely behavior focused on task accomplishment as well as focusing on developing relationships with followers (Nelson and Quick 2009). In the

1960's and 1970's focus of studies on leadership shifted to leaders decision making processes and how leaders delegated duties to followers as well as allowed them to take part in those processes (Moorhead and Griffin, 2000). Situational aspects of leadership featured prominently during this period.

In the 1980's the focus of studies in leadership shifted to emotional and symbolic aspects (Yukl, 2010). Transformational and transactional leadership paradigms began to be explored (Bass and Avolio, 1994; Bass 1990). The debate on the merits and demerits of each paradigm has been on going since then with research focusing on the applicability of each paradigm to different sectors of the economy such as public hospitals (Avolio, Zhu, Koh and Bhatia, 2004) private schools (Paracha, Qamai, Mizra, Hassan and Waqas, 2012), manufacturing firms (Udo and Agu, 2012) and commercial banks (Walumbwa, Lawler and Avolio, 2007) among others.

Transformational leadership paradigm holds the leader should transform and inspire followers to perform beyond expectations, transcending self interest for the good of the organization (Bass, 1999). Such leaders are visionary, creative and promote participatory decision making (Magutt, 2011). They combine charisma, inspirational leadership and intellectual stimulation in helping people to make positive changes in the way they act. Transactional leadership on the other hand is characterized by the leader guiding and motivating followers towards attainment of goals by clarifying task and role requirements, appealing to their self interest, intervening when standards are not met and sometimes perpetuating patronage (Magutt, 2011; Zhu, Sosik, Riggio and Yang, 2012).

Each of these paradigms has been studied and noted for its contribution to organizational performance. The transformational leadership paradigm emanates from the works of Burns (1978) who felt that such a leadership approach raised the leaders and followers to higher levels of motivation and morality. It focuses

on exchanges between leaders and followers in an organizational context where efforts are directed towards human and economic pursuits. The leadership approach influences the development of organizational culture where the desired behavior is embraced, practiced and sustained. Such a culture builds acceptance for the mission of the organization and directs everyone's behavior towards willingly working towards its attainment (Magutt, 2011; Bass, 1999).

Bass (1990) identified four components of the transformational leadership paradigm namely charisma, inspirational motivation, intellectual stimulation and individual consideration. Charisma is characterized by the leader having a vision, mission and ability to motivate followers to go beyond self interest in pursuit of organizational goals. This usually emanates from the ability to win the trust and confidence of the followers as well as being their role model. Inspirational motivation on its part entails a leader setting higher standards to be pursued to the extent that they become the points of reference and pursuit for the followers. He/she builds a vision of an attractive future state that appeals to the followers hence motivates them to go out of their way to pursue such a vision (De Groot, Kiker and Cross 2000).

Intellectual stimulation is another facet of transformational leadership. Here the leader provides followers with new models of thinking that make them break from old ways (Johnson, 2009). The followers find themselves critically analyzing situations, logically engage in thought and undertake careful problem solving processes. As a result, innovation and creativity is built in them as they come up with novel ways of solving problems (Magutt, 2011; De Groot *et al* 2000). Lastly individual consideration focuses on the leader paying close attention, coaching and mentoring the followers (Bass and Avolio, 1994). He teaches and helps them to develop their strengths, individually addresses their concerns and enhances their effectiveness in pursuit of goals and overcoming challenges. In general, when well executed, transformational leadership paradigm has

enabled organizations to attain superior performance (Jung and Avolio, 1999; Bass and Avolio, 1994; Howell *et al*, 2002; Bass and Riggio, 2006).

In contrast research on transactional leadership paradigm highlights an exchange process where emphasis is placed on the followers' compliance with the leaders request for pursuit of organizational goals. This may be adhered to by the followers out of fear of reprisals hence they may not enthusiastically pursue task accomplishment. According to Boehanke, Bontis, Distefano and Distefano (2013), the leader under this paradigm focuses on ensuring a path-goal formation in pursuit of organizational goals. The followers clearly understand what is expected of them, are motivated to achieve these pre-determined goals and the leader strives to eliminate any barriers that may hinder goal attainment. It uses formal rewards and punishment to engage in deal making and meeting contractual obligations in pursuit of organizational goals. This leadership paradigm is therefore built on the reciprocity principle. The leaders will be expected to clarify, provide needed resources and communicate tasks to be accomplished. They will rely on their position, organizational rules and regulations to get employees to co-operate and pursue organizational goals.

Transactional leadership paradigm therefore ensures goals are attained according to a predetermined schedule with followers benefitting from such successful pursuits through contingent rewards. The leader here has to closely monitor the followers in their task performance to ensure minimal deviations and timely correction of mistakes (Obiwuru, Okwu, Akpa and Nwakere, 2011). This leadership paradigm was found to be appropriate and preferable in the small scale enterprise sector in Nigeria (Obiwuru *et al*, 2011) as well as the manufacturing sector (Udoh and Agu, 2012).

With both leadership paradigms appearing to lead to positive outcomes for organizations, researchers are divided on the best leadership paradigm to use to attain superior organizational performance.

Findings of various studies highlight the paradoxical nature of utilizing the different leadership approaches. Whereas one may result in superior performance in a given situation, it may bring contrary results in another. Yukl (2010) posits that the same leader may use both leadership paradigms at different times and in different situations. To him therefore, transformational and transactional leadership paradigms are distinct but not mutually exclusive processes.

Another study by Jung and Avolio (1999) showed that employees with a collectivist mindset generated more ideas in brainstorming sessions with a transformational leader whereas those with an individualistic one generated more ideas with a transactional leader under similar circumstances. This pointed to a paradoxical situation requiring further investigation to determine which leadership paradigm was suitable in ensuring superior customer service delivery especially in the local public sector in Kenya. This was based on recognition of the important role played by local authorities, namely county, municipal and town councils in offering essential services to citizens at the grass

root level of governance hence the motivation for the study.

Service delivery was looked at from the perspective of the respondents' perception of their level of satisfaction with the extent to which the local authorities provided services as stipulated in the Local Government Act in terms of adequacy, timeliness, relevance and equitably.

Methodology

The study adopted a correlation survey design. Data was collected from 322 respondents who were employees of selected local authorities in the Western region of Kenya. Thirteen out of twenty three local authorities in the area were selected; four county councils, six municipalities and three town councils. Data was collected using questionnaires with items adapted from the Multifactor Leadership Questionnaire which measured presence of both transactional and transformational leadership paradigms. Data was coded and analyzed at 95% confidence level using both descriptive and Pearson's product moment correlation coefficient test with the aid of Statistical Package for Social Science computer programme (SPSS version 15).

Table 1: Demographic characteristics of respondents

Characteristics	Dimensions	Frequency(%)
Gender	Male	176 (54.7)
	Female	146 (45.3)
Age	Below 25 years	16 (0.5)
	25 - 34 years	97 (30.1)
	35 – 44 years	138 (42.9)
	45 – 54 years	67 (20.8)
	55 years and above	4 (1.2)
Highest level of education	Primary	15 (4.7)
	Secondary	84 (26.1)
	Certificate	72 (22.4)
	Diploma /CPA	121 (37.6)
	Bachelors degree	28 (8.7)
	Masters	2(0.6)
Duration of employment	Below 5 years	112 (24.8)
	6 – 10 years	66 (20.5)
	11 – 14 years	55 (17.1)

	15 years and above	89 (27.6)
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Results

The study found out that most of the local authorities had male employees, 176 (54.7%), many were aged between 35 and 44 years and had a secondary school education 84 (26.1%) and certificate level, 72 (22.4%) as their highest level of education as shown on Table 1. The study further revealed that employees of local authorities acknowledged the practice of both transactional and transformational leadership paradigms in their entities shown on Table 2. The study found out that the managers of local authorities utilized both transactional and transformational leadership paradigms in pursuit of service delivery to citizens. They told the employees what was expected of them as was confirmed by 122 (37.9%) respondents who agreed and 39 (12.1%) respondents who strongly agreed with the statement on the issue. They related these expectations with rewards although the rewards were not forthcoming to the expectations of the respondents. The managers were also concerned with employees doing only what was absolutely essential as was confirmed by 125 (38.8%) respondents who agreed and 52 (16.1%) respondents who strongly

agreed with the statement on the issue. This pointed to a scenario where transactional leadership was emphasized. The study further revealed that with adoption of strategic planning and implementation in the local public sector, managers were beginning to make employees rethink how things were to be done differently from before as was confirmed by 183 (56.8%) of the respondents. They made employees tackle old problems in new ways, helped employees to be intrinsically motivated by finding meaning in what they did as acknowledged by 158 (49.1%) respondents. This made the respondents to feel confident and appreciated. As a result the employees were proud to be associated with the managers, especially when given personal attention by the managers. In general the study found that both transformational leadership constructs and the transactional leadership paradigm were being practiced in the local authorities. This could be attributed to the adoption of strategic planning by these entities that calls for transformational leadership as well as the bureaucratic manner in which public organizations are run.

Table 2: Respondents' perception of the leadership paradigms in use in their organizations

Statement	SD f (%)	D f (%)	FA f (%)	A f (%)	SA f (%)
Transformational leadership					
My supervisor makes me feel good around him/her.	16 (5)	80 (24.8)	28 (8.7)	169 (52.7)	29 (9)
I have complete faith in my supervisor.	15 (4.7)	82 (25.5)	18 (5.6)	185 (57.5)	22 (6.8)
I am proud to associate with my supervisor.	16 (5)	45 (14)	21 (6.5)	172 (53.4)	68 (21.1)
My supervisor provides appealing images of what I can accomplish.	58 (18)	34 (10.6)	30 (9.3)	190 (59)	10 (3.1)
My supervisor helps me find meaning in what I do.	28 (8.7)	62 (19.3)	23 (7.1)	158 (49.1)	51 (15.8)
My supervisor expresses in simple words what I can and should do.	18 (5.6)	47 (14.6)	30(9.3)	174 (54)	53 (16.5)
My supervisor helps us think about problems in new ways.	10 (3.1)	23 (7.1)	72 (22.4)	183 (56.8)	34 (10.6)
My supervisor provides us with new ways of looking at puzzling issues.	16 (5.0)	65 (20.2)	16 (5.0)	157 (48.8)	68 (21.1)
My supervisor gets us rethinking ideas that we had never questioned before.	32 (9.9)	108 (33.5)	36 (11.2)	121 (37.6)	25 (7.8)
My supervisor lets us develop ourselves.	26 (8.1)	157 (48.8)	30 (9.3)	98 (30.4)	11 (3.4)
My supervisor lets us know how he/she thinks we are doing.	41(12.7)	82(25.5)	22 (6.8)	126 (39.1)	51 (15.8)
My supervisor gives personal attention to those who feel or seem rejected.	63 (19.6)	68 (21.1)	10 (3.1)	109 (33.9)	72 (22.4)
Transactional Leadership					
My supervisor tells us what to do if we want to be rewarded.	33 (10.2)	27 (8.4)	101 (31.4)	122 (37.9)	39 (12.1)
My supervisor rewards us when we meet our goals.	60(18.6)	126(39.1)	33(10.2)	77 (23.9)	26 (8.1)
My leader is satisfied when we meet set standards.	50 (15.5)	117 (36.3)	56 (17.4)	77 (23.9)	22 (6.8)
My supervisor does not change the way we work as long as things are working.	46 (14.3)	27(8.4)	50(15.5)	85 (26.4)	114 (35.4)
My supervisor informs us about the expected standards for our work.	33 (10.2)	49 (15.2)	21 (6.5)	183 (56.8)	36 (11.2)
My supervisor is content to let us continue working in the same way as always.	64 (19.9)	18 (5.6)	44 (13.7)	78 (24.2)	118 (36.6)
Whatever we do is okay with our supervisor.	33 (10.2)	62 (19.3)	47 (14.6)	152 (47.2)	28(8.7)
My supervisor does not ask us to do more than what is absolutely essential.	47 (14.6)	82 (25.5)	16(5)	125 (38.8)	52(16.1)

Key: : SD=Strongly Disagree, D=Disagree, FA=Fairly Agree, A=Agree, SA=Strongly Agree

The two null hypotheses of the study were tested in relation to customer service delivery in local authorities using Pearson's

Product Moment Correlation test. The findings are presented on Table 3.

Table 3: Relationship between Transactional and Transformational leadership and customer service delivery

		Customer service delivery
Transactional and leadership	Pearson's correlation (r)	.613
	Sig(2 – tailed)	0.000
	N	322
Transformational leadership	Pearson's correlation (r)	.689
	Sig (2 tailed)	0.000
	N	322

The findings of Table 3 show that there is a strong positive and significant relationship between transformational leadership paradigm and customer service delivery at 0.05 level of significance ($r = 0.689$ $p < 0.05$). It further shows that there is also a strong positive and significant relationship between transactional leadership paradigm and customer service delivery ($r = 0.613$; $p < 0.05$). This led the study to reject both null hypotheses and affirm the alternative hypotheses. The study therefore concluded that there is a positive and significant relationship between both transactional leadership and customer service delivery and transformational leadership and customer service delivery in the local public sector. However, transformational leadership paradigm has a greater effect than transactional leadership paradigm on customer service delivery.

These findings differ with those of earlier studies done on the two paradigms by Obiwuru *et al* (2011) who found out that transactional leadership paradigm had a stronger positive and significant effect on employees' performance than transformational leadership paradigm in the small and medium enterprise sector in Nigeria. The current study findings are

however similar to those of Udo and Agu (2012) who found that transformational leadership paradigm has a stronger and positive effect on employee and organizational performance than the transactional paradigm in the manufacturing sector in Nigeria. Similar findings on the effect of transformational and transactional leadership paradigms have been reported in the private school sector in Pakistan (Paracha *et al*, 2012).

Conclusions and Implications

From the results, the study concluded that both transactional and transformational leadership paradigms are critical in determining the quality of public service delivery by the local public sector. However, since the adoption of Vision 2030 and the emphasis on strategic planning by government entities to align their activities to the Vision, leaders are expected to display transformational leadership skills so that they can be able to change cultural mindsets that hamper expected service delivery.

With County Governments taking over most of the functions of the former local authorities and getting additional ones as outlined in the Constitution of Kenya, 2010

and the County Governments Act of 2012, there are high expectations among citizens with regard to service delivery. Managers of these entities are therefore expected to utilize the transactional leadership paradigm to get their employees to perform duties as per the rules, regulations and by-laws of these entities. They are further expected to use the transformational leadership constructs to provide selfless, visionary and charismatic leadership that will enable them to motivate employees to perform duties and serve the public to extents that are beyond the bare minimum or what is normally expected of them. This will guarantee superior public service delivery.

Recommendations

- i. Leadership training on both transactional and transformational leadership paradigms should be prioritized by the county governments for enhanced service delivery to the citizens.
- ii. Managers of the local public sector should be encouraged to be proactive and utilize the appropriate leadership paradigm for each situation that will enable them to maximize the benefits from the available resources so as to achieve societal and organizational goals.

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An Investigation of Dimensional Strategy In Religious Research on Christian Commitment in Selected High Schools, University and Churches in Kenya

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Abstract

With the contemporary increase in religious diversity and postmodern spiritualities around the world, there is a growing interest among researchers in religion to investigate dimensional strategies as viable approach to investigate various aspects of Christian commitment to God and fellow man. The study was conducted as a case of selected schools, churches and Mount Kenya University using descriptive survey design. The specific schools were Ndaragwa Girls Secondary, Kigumo Mixed Secondary in Muranga and Mount Kenya University, Thika Campus. Churches surveyed were Covenant Revival Altar, Greenhouse Church and Deliverance Church Kimbo. The target population was secondary school, university students and churches. Specifically the participants were Christian students with no leadership position, student leaders, Christian religious education teachers, Church leaders and pastors. Data was collected using semi-structured questionnaire and interview guide. Data analysis was done using Statistical Package for the Social Sciences (SPSS) and descriptive narratives. The correlation value r , varied from weak negative relationship (-0.185) to strong positive relationship (0.832). Standard research ethics were observed. The findings reveal that there is a wide range of correlation values between groups of participants and within members of the same group concerning various aspects of Christian commitment. Missing variables in Glock's dimensional model are included in this study. Recommendations are made to various stakeholders.

Key Words: Dimensional Strategy, Religious Research, Christian Commitment

Introduction

With the contemporary increase in religious diversity and postmodern spiritualities around the world, there was a growing interest among researchers in religion to investigate dimensional strategies as viable approach to investigate various aspects of Christian commitment to God and fellow man. The selected literature review indicates that

dimensional approach to an academic study of religion is not limited to Glock and dimensions are more than Glock first named them. The review of related literature, notably, the influential studies of Glock and Stark (Glock 1962; Glock and Stark 1965, 1966; Stark and Glock 1968) distinguished

different dimensions of religiosity: belief, practice, experience and consequences.

Ninian (2010) has identified seven dimensions of religion as ritual, narrative and mythic, experiential and emotional, social and institutional, ethical and legal, doctrinal and philosophical and material. Ritual dimension includes, and not limited to, all forms and orders of ceremonies, narrative and mythic includes sacred stories, experiential and emotional include devotion to God, mystery, inner peace, awe, guilt and mystery. Social and institutional dimension include shared beliefs and practices in a religious group, ethical and legal include revealed divine rules about expected human behavior, doctrinal and philosophical include systematic religious teachings in an intellectually coherent form, material dimension include sacred symbols of supernatural.

The two scholars were interested in categorizing religious aspects into broad dimensions to make research in religious studies more objective. These dimensions are a useful guide to religious researchers of the twenty first century. Other Scholars sharing similar views are Cleary (2010), Ebaugh (2007), and Djupe & Gilbert (2009).

Purpose of the Study

The study investigated the extent to which Christian beliefs translate into Christian practices using dimensional approach religious research.

Study Objectives

1. To establish the extent to which Christian beliefs translate into Christian practices
2. To explore the challenges faced by Christians in doing what they believe is biblically right.
3. To identify ways of minimizing the gaps between right beliefs (orthocardia) and right practice (orthopraxy).

The researcher's observation of religious interest in Kenya in the press and media suggested there was need to develop an innovative dimensional strategy as a viable approach to more comprehensive religious

research in postmodern world. In the 'Shepherd' Magazine of July, 2012, Issue No. 37, articles cited cases such as "The shocking world of fake TV miracles and rehearsed testimonies" and "Clergy, believers get new names in search of blessings". This was a case of unbiblical beliefs leading to unbiblical practices. Such problems lead to mistaken identity of the Church need to be addressed using correlation studies such as right beliefs and right practices and the strength of such relationships. The outcomes can produce a quest for more authentic Christian practices for salt and light functions that Jesus intended His church to fulfill on earth. In New York, (unknown author, 2013), a faith house in Manhattan invited Jews, Muslims and Christians to an interfaith worship experience. This is an indication of postmodern philosophy of religion that insists on all religions having equal recognition (Sean Easley, 2009).

A comparative study conducted in Kenya to investigate postmodern indicators of religious commitment between Christians and Muslims is an expression of need to establish which religion performs better than the other in dimensions of beliefs and practices(online survey responses, 2013.Pew research religion and public life project).A descriptive survey design was used to correct data from a randomly sampled group of Christians and Muslims from the general public different religious communities. The structured questionnaire used Likert scales of 1-5.

A summary of the findings is captured in table 1. Item one investigated the value of religion to participants. It would have been made more specific in order to provide a specific value-based answer. Generally, the items used are elementary and incoherent in that they do not allow researchers to study a specific dimension of religion in detail. In the light of the foregoing challenges presented by mixed beliefs and practices, investigation of relationship between what one believes and associated practices as an indicator of Christian commitment to God and people using selected variables is necessary. The emerging relationships based on selected set of beliefs and associated practices. In this study, the problem investigated is the possible gap and departures between

Christian beliefs and practices similar to those demonstrated in table 1 (online survey responses, 2013).

Theoretical framework

Since commitment indicators are observed behavior, the guiding theory adopted is the social behavior theory developed by Andersen and Taylor (2009) and cited by Corcoran (2013) in his article Divine exchanges: Applying social exchange theory to religious behavior. The underlying hypothesis in this theory is that high level of uncertainty reduces human activity and vice versa. The theory contended that the church can increase commitment of its members in a

variety of religious behavior by increasing faith and decreasing uncertainty, taken to mean unbelief in this study. Andersen and Taylor (2009), cited by Corcoran (2013), have pointed out the underlying assumptions for the theory to work for this study to work. They assume; that people who are involved in the interaction are rationally seeking to maximize their profits. From a cultural perspective, a multidimensional view of variables influence human practices makes it a challenge to apply this theory to faith leading to practice because other factors that influence human actions are hard to identify or control (Tarakeshwar, Stanton, Pargament, 2003, Streib, 2007,).

Table 1: Summary of participants' responses to investigated variables

Variable	Christian, % affirmation	Muslims, % affirmation	Difference
<u>How important is religion in your life? 'Very important'</u>	87	95	8
<u>How often do you attend religious services? 'Attend at least weekly'</u>	81	91	10
<u>Do you believe in God? How certain are you in this belief? 'Believe, absolutely certain'</u>	95	95	0
<u>Is the Koran / Bible the word of God? Is it to be taken literally, word for word? 'Literal word of God'</u>	79	76	3
<u>How often do you pray? 'daily'</u>	77	92	15
<u>Have you experienced or witnessed a divine healing? 'yes'</u>	46	75	19
<u>Have you experienced or witnessed the devil being driven out of a person? 'yes'</u>	57	83	26
<u>Do you believe in the evil eye - that certain people can cast spells and curses? 'yes'</u>	74	79	5
<u>Do you believe that juju, shrines, or other sacred objects can protect you from harm? 'yes'</u>	87	91	4
<u>Do you ever participate in traditional African ceremonies to honor ancestors? 'yes'</u>	79	76	3
<u>Do you or your family ever use traditional religious healers? 'yes'</u>	84	91	7
<u>Do you or your family ever use traditional religious healers? 'yes'</u>	78	85	7

Other factors held constant, relationship between faith and practice can be studied (Sean Easley, 2009). In this study, God is

considered to be the provider of human need to those who believe. The study assumes that Christian participants believe in God and

apply their faith in God to get what they need (Matthew 7:7-8). The researcher's observation of religious interest in Kenya in the press and media suggested there was need to develop an innovative dimensional strategy as a viable approach to more comprehensive religious research in postmodern world. The relationship between what one believes and associated practices as an indicator of Christian commitment to God and people using selected variables can be investigated as implied in this theory.

Methodology

Descriptive survey design was used to collect religious data from five groups of Christian participants in selected locations and convenient samples. As semi-structured questionnaire and semi-structured interview guide were used as research instruments.

Location of the Study

The specific schools where samples were studied were Ndaragwa Girls Secondary, Kigumo Mixed Secondary in Murang'a and

Mount Kenya University, Thika Campus. Churches studied were Covenant Revival Altar, Greenhouse Church and Deliverance Church Kimbo. The target population was secondary school, university students and churches. Specifically the participants were Christian students with no leadership position, student leaders, Christian religious education teachers, Church leaders and pastors.

Sample Size and Sampling Procedures

Simple random sampling procedure was used for selection of members who participated in the study. Purposive sampling was used for selection of leaders who were interviewed. According to Gay (1976) a sample size of 10% to 20% of the population is adequate for survey study though the bigger the sample the better. Each of the target groups was automatically selected for its unique contribution to the research. The summary is shown in table 2 below.

Table 2: Sampled participants in Churches

Research	Sampling	Population	Selected	Percentage
Participants		in each Church	Sampling size	
GHC	Selected	47	14	30%
CRA	Selected	70	14	15%
DCK	Selected	55	11	15%
KMS	Selected	47	14	30%
DG	Selected	40	12	30%
MKUCU	Selected	125	25	20%
Total		384	90	15-30%

Key: GHC = Greenhouse Church in Kahawa Sukari estate, Kiambu County, CRA= Covenant Revival Center in Mwiki, Kiambu County, DCK = Deliverance Church Kimbo in Githurai, Kiambu County, KMS = Kigumo mixed Secondary in Muranga County, NG = Ndaragwa Girls in Nyandarua County, MKUCU = Mount Kenya University Christian Union

Data Analysis Procedures and Interpretation

Data analysis was done using Statistical Package for the Social Sciences (SPSS) and descriptive narratives. The data obtained is summarized Table 3. The correlation value r ,

varied from weak negative relationship (-0.185) to strong positive relationship (0.832). This wide range reflected the diversity of

relationship between beliefs and practices among the same participants depending on the dimension of religion investigated.

Variable	Intelcom	Spiritcom	Fellocom	Servecom	Devotcom	givecom	holycm	Evangelcom
Data station	r-value	r-value	r-value	r-value	r-value	r-value	r-value	r-value
CRA	0.823	-0.185	0.338	0.512	0.386	0.470	0.161	0.245
GHC	0.845	-0.096	0.467	0.143	0.000	0.039	-0.309	0.062
MKU	0.195	-0.350	0.023	0.352	0.089	0.024	0.349	0.251
KMSEC	0.131	0.232	0.635	0.667	0.227	0.397	0.348	0.022
DCK	0.301	0.116	0.472	0.123	-0.306	0.354	0.778	0.031

The table 3: Summary of correlations in between belief and corresponding practice as an

Variable sets	r- value as correlated between oc and op for each set.	Interpretation, meaning of correlation values	Interpretation, meaning as observed in the life and practice of the church.
intercom	0.832	Very strong positive relationship	The church members are almost perfect in living out what they believe.
Spiritcom	-0.185	Weak negative relationship	The church has low negative tendency towards loving God for what He does rather than who He is.
fellocom	0.338	Weak positive relationship	Members have strong belief in fellowship but low in attending the same.
servecom	0.515	Moderate positive relationship	The church is a serving church on average.
devotcom	0.386	Weak positive relationship	The church is weak in devotional aspects of their spirituality
givecom	0.470	Moderate positive relationship	Fairly a giving church
holycm	0.161	Weak positive relationship	
Evangelcom	0.245	Weak positive relationship	

Table 4: Sample/demonstration CRA church (case1) outcome of improved Glock's model.

Key: Intelcom=Intellectual commitment. Spiritcom= spiritual commitment. Fellowcom= Commitment to fellowship. Sercom= commitment to Christian service. Devotcom= devotional commitment to God. Givecom= commitment to giving and tithing. Holycom= commitment to holy life. Evangelcom=commitment to evangelism.

Although religious commitment can be measured using different strategies, this study selected eight variables to measure

Christian commitment to God and people. The eight variables mainly fit in one of the five dimensions used by Glock in his 1962

religious research model- the consequential dimension, which is an indicator of transformations of religiosity (Pickel, G. and Sammet, K. (2012). Some practices are indicated as negative in relation to their

independent variables. There might have been stronger resistance by intervening variables to their response to their independent variables. A follow-up interview was needed to establish such.

Table 5: Deliverance Church Kimbo. Selected Data (case 2) Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
intelcom	9	2.00	5.00	3.8889	1.05409
intelcom	9	2.00	5.00	3.7778	1.09291
spiritcom	9	4.00	5.00	4.5556	.52705
spiritcom	9	1.00	5.00	3.4444	1.58990
fellocom	9	2.00	4.00	3.1111	.60093
fellocom	9	1.00	5.00	4.0000	1.32288
servecom	9	3.00	5.00	4.3333	.86603
servecom	9	3.00	5.00	4.1111	.78174
devotcom	9	1.00	5.00	4.0000	1.22474
devotcom	9	4.00	5.00	4.8889	.33333
givecom	9	3.00	5.00	4.6667	.70711
givecom	9	4.00	5.00	4.3333	.50000
holycm	9	1.00	5.00	4.2222	1.30171
holycm	9	3.00	5.00	4.5556	.72648
evangelcom	9	2.00	5.00	3.5556	1.01379
evangelcom	9	4.00	5.00	4.7778	.44096
Valid N (listwise)	9				

Discussion: Variations in opinions

High standard deviation is an indicator of high fluctuations of participants' opinion around their normative response. A high value is also an indicator of range of responses of participants. In the case of Deliverance Church Kimbo, responses on commitment to evangelism had minimum of 4 and maximum of 5, mean of 4.7778 and standard deviation of 0.44096. A contrast appears in another variable, commitment to fellowship, which had a maximum of 5 and a minimum of 1, mean of 4.000 and standard deviation of 1.32288. A frequency distribution

helped to the researcher to explain actual number of each score along the Likert scale. Taking commitment to evangelism, for example, sample was 9 church members, 2 agreed, 7 strongly agreed. The researcher used measures of central tendency and measures of spread in order to study a wider variety of details of beliefs and practices of participants as illustrated in the two variables and one group of participants.

Table 6: Below is a summary of five of the most and least cited missing variables.

Group of participants	Most cited variable by each group.	Frequency of each variable.	Least cited variable by each group.	Frequency of each variable
GHC	Bible reading	10	Evangelism	4
CRA	prayer	9	Fellowship	5
DCK	Prayer	8	Missions	3
MKU CU	Missions	12	Evangelism	3
KMS	Praise	9	Giving and tithing	4
NG	Praise	10	Giving and tithing	2

Key findings

The findings revealed that there was a wide range of correlation values between groups of participants and within members of the same group concerning various aspects of Christian commitments. Biblical beliefs held by participants (orthocardia) scored higher on the Likert scale than their corresponding Christian practices (orthopraxy) according to the opinions of participants. The leaders across the board expressed stronger beliefs in all the institutions surveyed as compared with their members.

Missing variables

Missing variables in Glock's dimensional model as a viable strategy for conducting religious research emerged from participants' responses in question 17 where they were asked to suggest other indicators of their love for God and people. The open ended question which Glock did not give opened up a whole world of diversity in understanding what it meant to love God and people. In their own words, indicators included: Loving one another; forgiving one another. Serving. Praying for one another. Fasting. Visitation.

Praying. Commitment. Praying for others. Caring for one another. Serving God. Fellowship. Interacting with others. Reading the Bible. Praying. Intercession. Going to church. Listening and watching godly programmes. Witnessing. Praying for believers. Helping others. Praying for others. Serving in church. Helping the needy. Telling others about God. Serving God and His people. Giving of spiritual and material blessings. Tithing and giving offering. Participating in church events. Encouraging people. Encouraging those who are discouraged. Serving in Sunday school. Rejoicing in God's presence. Helping the needy and disabled.

The researcher noted that majority (70%) of the participants did not have specific ways of expressing their love for. Variables they gave were interchangeably used as indicators of different dimensions of religion.

On other variables from leaders in the interview guide, responses of participants were diverse as well. A summary table (Table 7) captures some direct words and phrases of participants.

Findings from interview guide.

Table 7: Main actual statements from participants.

Q. 1. Intelcom- Using Bible to give solutions to problems. Attending Bible study sessions.

Spiritcom- Preaching the Gospel. Evangelizing.

Fellocom- Frequent visits to the needy. Helping those in need.

Servecom- Doing away with ungodly behavior. Taking part in missions.

Devotcom- Helping the needy. Doing as the word of God says.

Givecom- Helping the needy. Taking part in church activities.

Holycom- Speaking the truth all the time. Doing good for others. Praying. Reading the Bible. Hating evil.

Evangelcom- Teaching others about God's will for their lives. Committing my resources to God by giving for use in preaching the Gospel.

Q. 2. Mysteries influence on Christian practices- Yes.

Q. 3. Challenges on doing right things as one believes. – Discouragement from friends. General weakness of the body.

Q. 4. Suggestions to minimize challenges cited. Praying. Reading the Bible. Choosing good friends.

Q. 5. Two recommendations for application of suggestions cited and sustainability of the same in an increasing.

Continue praying and relating with right people.

Challenges and ways to minimize them

Leaders identified challenges in fulfilling their devotional and ministerial commitments, suggested ways of overcoming them and made recommendations for continuous improvement. Strategies of minimizing challenges included regular prayer, fasting, (CRE class). The outcomes are useful to a CRE teacher, School chaplains, and school principal. As a needs assessment tool, the people who are interested in theological well-being of the students can teach differently based on the findings.

Ndaragwa Girls: Biblical orthodoxy (believing what the Bible teaches, orthodoxy and doing it, (orthocardia). This data center was used

for study of doctrinal dimension to illustrate variations in one dimension only for purposes of in-depth study. The self-report from a Christian Religious studies (CRE) class is summarized as follows:

Believing in divinity of Christ. Only 37% of the participants strongly agreed that Jesus is God. This reflected a Christological issue. Have no doubt God lives. Asked whether they believe that God lives, only 37% strongly agreed. It was a class of Christian religious education. It reflected that doctrinal dimension was weak. There is life after death for every human being. The participants were very strong believers in life after death (81%). Satan exists because God created him. Participants had a poor

understanding how Satan became the devil and that he was not created as the devil. The Bible is the Word of God. Participants who agreed and strongly agreed that the Bible is the word of God were 55%. This suggested that Bible lessons they received in class were received as scholarly content but not to create faith in God.

Low percentages of those who believe what the Bible teaches present several possible interpretations: The CRE class was not necessarily composed of Christians. It was a Mixture of Christians and non-Christians. Data suggests that students doing CRE do not necessarily believe the Bible is the word of God. The data further suggests that high performance in CRE in Ndaragwa Girls is a reflection of intellectual dimension although the percentage of orthocardia (heart belief) content is not easy to measure in religious research.

Ndaragwa Girls variations in spirituality of the students: Descriptive Statistics are useful for pastoral care, specifically spiritual nurture. Extremes reflected by their religious behavior indicates Good for psychologists, sociologists as researchers, CRE teachers, school principals, parents, chaplain.

Descriptive Statistics--- useful to a variety of scholars, clergy, school principals and other interested stakeholders who need to help the students to participate more in community service.

Selected Descriptive Statistics- a measure of holiness, holiness indicators for Ndaragwa Girls.

In response to the same dimension, the behavior varied between participants. Variations were also observed between practices.

	N	Minimum	Maximum	Mean	Std. Deviation
Holobservance	16	1.00	5.00	3.7500	1.18322
Holobservance	16	2.00	5.00	4.1875	1.10868
Holobservance	16	3.00	5.00	4.3125	.87321
Holobservance	16	2.00	5.00	4.1875	.91059
Valid N (listwise)	16				

Table 8: Extremes reflected in religious behavior alone.

Conclusions, Summary and Recommendations

Conclusions

Religious beliefs and practices can be correlated. A variety of intervening and moderating variables are assumed. Like other variables in social sciences, internal aspects of religion can only be self-reported by the participants. The integrity and accuracy of the participant in isolating the influence of faith in God from other motivating factors behind reported behavior is also assumed. A scientific approach to religious research using dimensional strategy is a viable option for religious researchers of the 21st century.

Summary

Biblical beliefs held by participants (orthocardia) scored higher on the Likert scale than their corresponding Christian practices (orthopraxy) according to the opinions of participants. The leaders across the board expressed stronger beliefs in all the institutions surveyed as compared with their members. Church and student leaders identified challenges in fulfilling their devotional and ministerial commitments, suggested ways of overcoming them and made recommendations for continuous improvement.

Recommendations

Clarity of variables is needed in order to increase objectivity of findings. When asked for indicators of love for God and people, some participants (70%) gave vague answers such as 'Serving' as an answer to express ones love for God. Similarly, 'fellowshipping" was also an answer. The leaders of the church needed to train members to specify and clarify meaning of words which address specific aspects of Christian faith and practice.

Christian Religious Education leaders, pastors, other church ministers and religious researchers in general need skills on use of dimensional strategy to religious research in order to be able to make informed decisions in leadership and provide relevant religious services to those they serve.

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An Evaluation of 360-Degree Feedback on Employee Development: A Case Study of Kenya College of Accountancy University In Nairobi, Kenya

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Abstract

The purpose of the study was to evaluate the influence of 360-Degree Feedback on employee development. The study sought to establish the influence of appraisal on lecturers' development, to determine the influence of students' appraisal on lecturers' development, to identify the influence of supervisor's appraisal on lecturers' development and finally to examine the influence of self-appraisal on lecturers' development at Kenya College of Accountancy University (KCAU). The study employed a descriptive design. The sampling technique that was employed for the respondents was a census. It involved all the thirty nine (39) permanent lecturers. The study utilized one instrument-The Lecturers Multisource Feedback Questionnaire (LMSFQ). The test-retest method of assessing reliability was used to assess the reliability LMSFQ. A reliability coefficient 0.89 was obtained and therefore the instrument was accepted. The analysis considered the inferences that were made from the opinions of the respondents. It was narratively presented and where possible in tabular form and in frequency tables. The study found that 80.6% of the lecturers felt that peer appraisal had an impact on a lecturer's development while all the lecturers (100%) felt that students' appraisal had an impact on their development. The study also found out that 88.9% of the lecturers felt that appraisal by their supervisors had an impact on their development while 97% of lecturers felt that self-assessment had an impact on their development. The study concluded that peer, student, supervisor and self-appraisals greatly impact on a lecturer's career development. The study recommends that further studies be carried out to establish the impact of 360 degree appraisal on employee performance.

Keywords: *360 degree appraisal, Employee performance, performance appraisal*

Introduction

The 360 degree feedback is a relatively new feature of performance management that enables individual employee to receive feedback on their performance, usually anonymously, from all major constituencies they serve: supervisors, peers and customers (Armstrong, 2006; Nystrom, 2001). It often incorporates a self-appraisal for comparison.

It is widely accepted that multi-source appraisal enhances two-way communication in the host organisation (London and Beatty, 1993; Garavan et al., 1997; Bernardin and Beatty, 1987). London and Beatty (1993) argue that 360° feedback can call attention to important performance dimensions neglected by the organization

and at the same time convey organizational values to employees. They argue that 360° feedback can build more effective work relationships; increase opportunities for employee involvement; uncover and resolve conflict and demonstrate respect for employee opinions on the part of top management.

Garavan et al. (1997) highlight some other organisational and individual benefits of the 360° feedback process. Organisational benefits include employee involvement and better working relationships within the organisation. Essentially, the organizational benefits revolve around an improvement in employee relations. Where the individual recipient of the feedback is concerned, it is espoused that the feedback data will be

more valid, fair and reliable because they come from a number of sources. As a result of the 360° feedback, the individual may have a better guide for his/her career development because the feedback that the recipient receives increases his/her self-awareness and this enhanced self-awareness is an initial step in the career development process (McCarthy and Garavan, 1999).

Hazucha et al. (1993) highlight some of the advantages of feedback from an individual perspective. They suggest that recipients receive valuable information which they may use to identify and address their weaknesses. Feedback helps the recipient to identify strengths which he/she can build upon. The use of 360° feedback instruments provides peers/co-workers with the opportunity to praise or criticise their colleagues anonymously. A number of studies have been undertaken to assess whether productivity and performance actually improve as a result of adopting a multi-source assessment system. Edwards and Ewen (1996) report that there were productivity improvements among university faculty and improved customer satisfaction ratings following the implementation of 360° feedback. Bernardin (2007) suggest that a multi-rater system that incorporates a number of raters such as one's boss, subordinates and peers is more useful for the feedback recipients than only one source of feedback. The aim of this research was to explore the attitudes of supervisors to subordinate appraisal and they found that several of the managers who participated in the study argued that subordinate appraisal can only be clearly interpreted in the context of other information such as appraisals from other sources. Therefore, it follows that, if an organization has subordinate appraisal or peer appraisal in operation, a more useful and more effective system of feedback is a 360° process involving a number of raters rather than relying on one source.

The Handy et al. (1996) study found that users of the 360° feedback process were positive about the tool's value reporting that 75 per cent of respondent organizations judge it to be successful. Of managers who

had experienced the 360° feedback process, 92 per cent found it helpful because it is a more effective form of performance appraisal than the traditional top-down model. They conclude that 360° feedback can address some of the deficiencies which impede the effectiveness of the top-down approach to performance appraisal. Hoffman et al. (2000) enumerates several reasons why companies should adopt 360° feedback. These include an increased focus on customer service, the promotion of team-building and team-work, the creation of a high-involvement workforce, the detection of barriers to success; assessment of developmental needs, the identification of performance thresholds; and the definition of corporate competencies, thereby highlighting what the organisation values and rewards. However, these espoused advantages of 360° feedback have not been empirically tested.

From the foregoing, 360° feedback brings with it a number of advantages which range from more open communication channels at an organisational level to an excellent career development strategy at an individual level. Despite the popularity of 360-degree feedback, there exists very little research on how this process is linked to Individual development (Brutus et al, 1999). The link between the collection of performance ratings from multiple constituents and development process needs to be investigated (Brutus, et al., 1999; Waldman, 1998). This forms the basis for the current study.

At KCAU, the Lecturers are appraised by their peers. A group of four Lecturers in a department appraise a fellow colleague on a given set of performance or personal characteristic using a rating. The lecturers are also appraised by their students at the end of a unit. In addition, they are also appraised by their supervisors at the end of the year. Finally, the individual lecturers also rate themselves. This forms a kind of 360 degree feedback. With the use of 360-degree feedback at KCAU, there was need to establish its impact on employee development. Thus, the study sought to establish the impact of 360-degree feedback

on employee development at KCAU, Nairobi. The study sought to evaluate the impact of student, peer, self, supervisor appraisal on lecturers' development.

Methodology

Kenya College of Accountancy University (KCAU) is a non-profit making institution, founded as Kenya College of Accountancy in July 1989 by the Institute of Certified Public Accountants of Kenya (ICPAK) to improve the quality of accountancy and financial management training in the country. On 26th July 2007, CHE (full) awarded KCA a Letter of Interim Authority (LIA). KCA University then began its operations. Presently, KCA University trains over 15,000 students annually within the Faculties of Commerce and Distance Learning, Science and Information Technology, School of Professional Programmes (SPP) and Institute for Capacity Development (ICAD). The study used a qualitative case study design. It targeted all the thirty nine (39) permanent lecturers at KCAU, Ruaraka. A list obtained from the Human Resource Office (2009) showed that the University has seventeen (17), fifteen (15) and seven (7) Lecturers in the faculties of Commerce and Distance Learning, Science and Information Technology and School of Professional Programmes (SPP) respectively. The study used the Lecturers Multisource Feedback Questionnaire (LMSFQ) to collect data. The pilot study was conducted at KCAU in the month of January.

Results

The study found out that 55.6 % of the faculty felt that appraisal by peers had been useful for their personal and professional development. It also established that of the 36 lecturers who participated in the study, only five lecturers (13.9 %) were found to have not been rated as deficient in the performance dimensions. The other 31 lecturers were found to be deficient in one or more performance dimensions. The study found out that 74.19% were rated as deficient in the area of timely assessment and giving of feedback. In addition, 29.3%

of the lecturers were also rated as lacking punctuality. The study further investigated whether the lecturers sought development on the areas they were rated as deficient by their peers. The study found out that 83.87% of the lecturers sought development in the areas they were rated as lacking by their peers. Only a paltry 16.13% of the faculty did not seek development in deficient performance dimensions as rated by peers. The study also found out that 80.6% of the lecturers felt that peer appraisal had an impact on a lecturer's development. However, the level of impact differed. For instance, only 16.7% of the lecturers felt that peer appraisal very greatly impacted on their career development. In addition, only 19.4% of the respondents felt that peer appraisal has no impact on their development.

The study also established that 83.3 % of the faculty felt that appraisal by their students had been useful for their personal and professional development. The study also found out that 75% of the faculty also felt that their performance had improved because of the appraisal by their students. Out of the 36 lecturers who participated in the study, only three lecturers (8.33%) were not rated as been deficient in their performance by students. The other 33 lecturers were found to be deficient in one or more performance dimensions. The study found out that 60.6% and 78.8% of the lecturers were rated as deficient in the areas of punctuality and timely assessment and giving of feedback respectively. The study went further to establish the Lecturers' response following the appraisal on their performance by students. The study found out that 95.65% of the lecturers sought development in the areas they were rated as lacking by their students. Only a mere 4% did not seek development in areas they were rated low by their students. The study finally sought to establish the Impact of students' appraisal on lecturer's development. The study found out all that all the lecturers felt that student appraisal had an impact on their development. However, the level of impact differed. For instance, 48% of the lecturers felt that student appraisal greatly impacted

on their career development.

The study found out 63.8% of the respondents felt that appraisal by their supervisor had been useful for their personal and professional development. It also found that 48% of the respondent felt that appraisal by their supervisor had an impact on their development. A similar percentage also felt that their performance had improved because of the appraisal by their supervisor. The study further sought to establish the lecturers' deficient Performance Dimensions as rated by the Supervisor. Only six of the 36 lecturers involved in the study (16.6%) were not rated as been deficient in their performance by supervisor. The other 30 lecturers were found to be deficient in one or more performance dimensions. The study found out that 46.7% and 63.8% of the lecturers were rated as deficient in the areas of punctuality and timely assessment and giving of feedback respectively. The study found that 80% of the lecturers sought development in the areas they were rated as lacking by their supervisors. Finally, the study went sought to establish the Impact of supervisor appraisal on a lecturer's development. The study found out that 88.9% of the lecturers felt that appraisal by their supervisors had an impact on their development. However, the level of impact differed. For instance, 36.1% of the lecturers felt that appraisal by their supervisor greatly impacted on their career development.

Finally, the study found out that 83.33% of the lecturers felt that their self-assessment/appraisal had the greatest impact on their development. Among the lecturers, 80.3% felt that where the self-ratings compare with others ratings, there has been a greater impact in their career development. Further the study sought to establish the Impact of Self-Assessment/Appraisal on a Lecturer's development. The study found out that 97% of the respondents felt that self-assessment had an impact on their development. Only three percent felt that self-assessment did not have an impact on their personal and professional development.

All the raters: Students, Peers and Supervisors identified punctuality and timely assessment & feedback as the most deficient performance dimensions.

Discussion and Conclusion

Peer appraisal was found to be useful for personal and professional development of an employee. This is because they are familiar with each other's work and therefore can result in accurate assessment of performance. According to G'omez-mejia et al. (2004), review by employees familiar with each other's work can result in an accurate assessment of performance. Peers work closely with the appraisee; they have many opportunities to observe their behaviour and possess the knowledge to accurately evaluate these behaviours. According to Murphy & Cleveland (1995), the peer appraisal represents the single best informed source about a peer's strength and weaknesses. In a study, Druskat and Wolff (1999) report that respondents indicated that peer feedback was not beneficial for their personal development. According to them, peer appraisal does not predict change but rather awareness of the desired behaviours on the job. Punctuality and timely assessment & giving of feedback are the most deficient performance dimensions of Lecturers. The study also concluded that employees seek development in areas pointed as deficient by their peers. In addition, majority of the employees felt that peer appraisal had an impact on their development. However, among the various sources of 360-degree feedback, peer appraisal is ranked as one with the least impact on an employee development.

The study concluded that Appraisal by student (client) had the greatest impact on employee development. In addition, it also concluded that employees seek development in areas rated as deficient by their clients. Student appraisal also called Client or Upward or Subordinate appraisal has the greatest impact on a lecturer's career development. In educational institutions like Institute of Information Management Systems in India, students not

only evaluate their faculty, but also publicize their results of their evaluation so that it has public accountability and control value (Rao & Raju, 2005). This also provides motivational value for the teacher. Student feedback plays the most important part of the growth and development of the teacher. In Britain, the appraisal of teachers was introduced as a legal requirement in 1991 (Bartlett, 2000). One of the official aims of appraisal in Britain was to assist school teachers in their professional development and career planning. In a study on the teacher appraisal in the Kenyan context, 23.5 % of the 153 secondary school teachers involved indicated that they would prefer to be appraised by their students (Odhiambo, 2005).

Appraisal by supervisor is also useful for the personal and professional development of an employee. The supervisors are also well positioned in rating the performance of an employee. This is because they are aware of the tasks and the performance indicators of a position. Majority of the employees seek development in areas they are rated low by their supervisors. Majority of the employee felt that supervisor's appraisal had an impact on employee development. However, among the four sources of 360-degree feedback, supervisor appraisal was rated last after the student and peer appraisal. These results agree with those of Brutus et al. (1999) who found out that supervisory ratings were the least important source of performance information, while the most important rating source was subordinates, followed by peers and self.

Self-assessment or self-appraisal is also useful in the personal and professional development of an employee. Majority of the lecturers felt that self-assessment had the greatest impact on their development. This finding agrees with that of McCarthy & Garavan (2001) and Rao & Raju (2005). They observed that self-appraisal can be used to identification of training and development needs and for evaluating performance. This is probably because at their level they have set well-defined development goals. Self-assessment was

rated second among the four sources.

In general peer, student, supervisor and self-appraisal have an impact on an employee development. Student appraisal also called client or subordinate appraisal has the greatest impact on a lecturer's career development. This is followed by peer appraisal with supervisor appraisal having the least impact on a Lecturer's development. In addition, the lecturers' were found most deficient in the areas of punctuality and timely assessment and feedback.

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The Level of Adequacy of Sanitary Facilities for Girls in Primary Schools of Nakuru Municipality, Nakuru County, Kenya

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Abstract

The adequacy of sanitary facilities is a critical issue in a girl's life. Studies have shown that most aspects of a girl's life are affected by lack of sanitary facilities thus lowering the girl's esteem and confidence. The study sought to establish the level of adequacy of sanitary facilities for girls in primary education in Nakuru Municipality in Nakuru County, Kenya. A descriptive survey design was used as the preferred research design. The study targeted the 59 public primary schools in Nakuru Municipality comprising of 1100 girls, 59 Head teachers and 271 female teachers. Simple

random sampling was used to select the 18 Schools and purposive sampling to get a sample size of 428 respondents comprising of 330 girls and 80 female Teachers. The main research instruments used in this study were questionnaires, interview schedules and an observation check list. Piloting was done in two schools which were not included in the sample. The findings would be useful in establishing the level of adequacy of sanitary facilities. The study found out that although the primary schools in Nakuru municipality own variety of sanitation facilities they are highly inadequate and greatly affect girls' participation in education. Most of the schools cannot cater for the high number of pupils and the few available sanitary facilities are old or below the recommended and acceptable standards. School administrations need to prioritize the aspect of sanitation and hygiene. Proper legislation by the government officers and introduction of penalties to defaulters is vital. Offering incentives and rewards to pupils, teachers and head teachers for keeping good sanitation will also help in maintaining high standard of adequacy, in addition to building new and modern sanitary facilities.

Key words: Sanitary facilities, girls, primary schools, level of adequacy, participation in education

Introduction

Sanitary facilities are very important especially for girls who have attained the age of puberty or are at the adolescence stage. This is because issues like menstruation, lack of sanitary facilities and privacy may seriously affect the girls' attendance, attention and achievement in school activities. Absence of clean and private sanitary facilities may discourage girls from attending school when menstruation is on, if they do not have the facilities, (Word Bank 2005). Burrows et al (2005) asserts that millions of young girls in underdeveloped countries worldwide face a far greater problem simply because they cannot afford sanitary protection. Menstruation is universal for women regardless of culture or the circumstances; yet too many adolescents girls are stigmatized as unclean during their menses. This serves as a significant impediment to education because families cannot afford sanitary supplies hence, girls must miss a week of school each month.

According to Children's Commission for Wales report (2004) on BMJ products in United Kingdom, 90.1% of the girls could obtain sanitary towels but only from adult teachers. 14% of the schools had a machine in the girls' toilet where sanitary towels could be obtained unobtrusively. Disposal facilities were available within an individual cubical in 43% of the girls' toilets. This means that the sanitary facilities are not adequate for girls in school and should be made accessible.

About one out of ten school age African girls do not go to school, UNICEF (2005). This is because of lack of the required sanitary facilities which include clean water, toilets, sanitary towels and clean wash bins. These girls might opt to stay home until the end of the menstruation period which takes three to six days in every month. In Southern Sudan, refugees and internally displaced persons (IDPs) may not afford the cost of commercially produced sanitary pads or rags and even sometimes homemade materials. President Jacob Zuma of South Africa also acknowledged the need for pads in schools with a proposal that free sanitary towels should be provided to school girls. Steps have been taken to address the need for sanitary pads although details of the provision remain unclear.

In East Africa a new exciting project combines sustainable enterprise employment and education to address the lack of affordable and environmental friendly sanitary care. Unimpressed by the results, Elizabeth Scharpf has set up in Rwanda what she hopes will be an eco-system for the local economy to tackle women's sanitary needs once and for all (Jenara, 2010). Elizabeth Scharpf, founder of Sustainable Health Enterprises (SHE), is partnering with networks of women in Rwanda to make and sell sanitary pads made from banana leaves. Eighteen percent of girls in Rwanda miss, on average, 35 days of school every year (and up to 50 days of school or work each year) due to their periods, ineffective pads, the

embarrassment and ridicule that result. Scharpf told *Fast Company* that menstruation is one of those things that people don't really want to have anything to do with and that Most of the population is left hanging after donation supplies run out.

UNICEF (2008) has provided water to increase girls' free time and boost their school attendance. They are also trying to provide "girl friendly" schools with clean toilets and running water. WHO (2010) states that special steps are being taken to accelerate and coordinate progress on water, sanitation and hygiene programmes in school. This is because lack of sanitary and hygienic learning environment in schools has stronger negative impact on girls than on boys. FAWE (2007) reveals that lack of sanitary pads coupled with other factors like the absence of water or separate toilets facilities is responsible for the dropout rate in Uganda.

The situation in Kenya is even more appalling. About two thirds of all schoolgirls in Kajiado, predominantly Maasai, are absent from school on a regular basis. Research (Aid link 2011) has indicated that this is largely due to insufficient sanitary facilities in the schools to address the needs of a menstruating girl. Inadequate toilet facilities and an inability to afford sanitary towels have resulted in many girls staying at home during menstruation. A girl who is absent from school for 4 days in a month, loses 2 weeks of learning in every school term. Over the duration of a school year she loses a full 6 weeks of learning time. Within the 4 years of high school, this same girl loses the equivalent to almost 6 whole months of learning - around two thirds of a school year. As a result, girls were falling behind in their studies and many dropped out.

The Girl Child Network (GCN) is committed to advancing the rights of girls in Kenya, in particular their rights in accessing education. The GCN introduced and implemented the Kajiado School Sanitation Programme. This programme is far reaching in its long term affects on the place of the girl child in Kenya. The programme provides schools with water

tanks and girl friendly latrines, provides girls with sanitary towels and underwear, and trains girls and boys on sexual maturation, HIV/AIDS, life skills, and the rights of the child. The programme strives to retain girls in education but it also has the effect of reducing the practice of Female Genital Mutilation (FGM) and early marriage .Through GCN, Kajiado School Sanitation Programme is operational in 66 schools (out of a target of 130 schools) and provides sanitary towels and underwear to over 3,855 girls to increase their participation in education. Latrines have been constructed in 42 of the target schools. Cases of absenteeism of adolescent girls have reduced by an average of 65-70% in the project schools and enrolment has increased by 25%. Water tanks were constructed in 31 schools with over 10,000 members of the school community now having direct access to clean and safe water. 47 girls who had previously dropped out of school enrolled back into school as they feel they are now more comfortable to participate in education. As a result of the School Sanitation Programme, the Kenyan Government in 2011 has now pledged to provide each school with a budget for sanitary towels.

In an article by Gacheiya *et al.* (2008) on implementation of urine-diversion dry toilets in schools in Nakuru, Kenya, schools have been chosen as institutions for constructing ROSA pilot units. Schools have been identified as good invention points for introducing sanitation systems. A huge number of persons can be reached as a big number of students are using the toilets in the school and further students bring the news about their new school sanitation system home to their families. On the other hand, there is a huge lack of sanitation facilities in schools and it has been reported that lack of toilets disadvantages girls. In the case where the school has no toilets, girls do not attend school during their menstruation periods resulting in a loss of weeks attending school and finally, less success in school.

Statement of the Problem

In Kenya, as in other developing countries, girl's participation in education is low. In a

study conducted in Kibera (AMREF 2009), the school dropout rate for girls was over 50% by the end of standard six. The situation in Nakuru County may not be any different. From a report obtained from the Municipal Education Officer's (MEO's) office on enrolment of pupils in primary school in Nakuru Municipality, girls are more than boys in lower classes but boys outnumber the girls in upper classes (MEO enrolment records; 2012). Studies have shown that girls are disadvantaged from participating in education owing to various factors like cultural practices that favour the education of boys to that of girls. Such cultural practices include early marriages, female genital mutilation, childbearing and attending to parental responsibilities, which are heightened by extreme poverty (Institute of Economic Affairs 2008).

Studies have shown that most aspects of a girl's life in school are affected by lack of sanitary facilities to allow smooth and uninterrupted studies, thus lowering the girls esteem and confidence. As a result, this hinders the girls' participation in primary education. However, for most research on sanitary facilities for girls has centred on the provision of sanitary towels. The real issue is that the problem goes beyond the provision. Yes, girls have been provided with the sanitary towels; but do they even have other sanitary facilities like a private hygienic place to change, washrooms and water to clean themselves after changing and even a place to dispose the used towels? Consequently there has been no conclusive evidence on the effect of these sanitary facilities, their adequacy and privacy, on girls' participation in education. Thus, this study intends to ascertain how the adequacy of sanitary facilities affects girls' participation in primary education in Nakuru Municipality, Nakuru County, Kenya.

Objective of the Study

To establish the level of adequacy of sanitary facilities for girls in primary schools of Nakuru Municipality, Nakuru County, Kenya.

Research design

A descriptive survey design was used in this study. According to Gay (2002) descriptive research involves collection of data in order to answer questions concerning the current status of the study.

Location of the Study

The study was carried out in Nakuru Municipality, Nakuru County. Nakuru Municipality is a cosmopolitan area, a tourist destination and industrial centre. It also has a wide range of learning institutions which include campuses of several Universities, a National high school, Provincial high schools, several private and public secondary schools, public and private primary schools and ECD centres. The researcher chose Nakuru Municipality to be the area of study because it is a cosmopolitan area hence the girls under the study are going to be representative of many other girls in the country.

Population and Target Population

The study targeted the 59 primary schools in the Municipality comprising of 1100 girls in class 6-8, 59 Head teachers and a total of 271 female teachers. The targets for the study were girls from class six to eight (6 to 8). This was a total population of 1430.

Sample Size and Sampling Procedure

Sample Size

Sample size is a small part of the population to be studied and sampling procedure is the process by which samples are selected in a study (Kothari, 2007). According to Gay (2003), a sample size of 30% of the total population or less is adequate for a study in descriptive research. Therefore, the study used 30% of the total number of school to get 18 primary schools. Simple random sampling was used to select 18 schools hence the 18 head teachers, 80 female teachers and 330 pupils, out of the total 59 head teachers, 271 female teachers and 1100 pupils. Purposive sampling technique was used to select only girls in standard 6 to 8.

Sampling Procedure

Sampling means selecting a given number of subjects from a defined population to be

representative of that population. Any statement made about the sample should also be true of the population (Orodho, 2002). The schools to be studied were selected using simple random sampling. However, purposive sampling was used to

select the respondents of the study who are female teachers and girls. The respondent sampling matrix is shown in the table 1.

Table 1 : Respondents Sampling matrix

Respondent	N(total population)	n(sample size)
Number of head teachers	59	18
Number of teachers	271	80
Number of pupils	1100	330
Total	1430	428

Instrumentation

The main research instrument to be used in this study was questionnaires, interview schedules and an observation check list. There were two distinct questionnaires; one for pupils and the one other for teachers. The questionnaires were used to investigate effects of availability of sanitary facilities on their participation. In developing the questionnaire items, the fixed choice and opened-ended formats of the item were used. An interview schedule was used to collect data from the head teachers to establish the adequacy of sanitary facilities in the schools and strategies employed to enhance girl's participation. The head teachers were interviewed face to face by the researcher on a scheduled program. For information that was not captured by the questionnaire and the interview schedule, an observation check list was used to solicit for more information.

Validity

According to Patton (2000) validity is equality attributed to preposition or measures of the degree to which they conform to establish knowledge or truth. An attitude scale is considered valid, for example, to the degree to which its results conform to other measures of possession of the attitude. Validity of the instrument was determined, where the response of the respondents was

checked against the research objectives. This also gives a reason as to why content was used. For a research instrument to be considered valid, the content selected and included in the questionnaire must be relevant to the variable being investigated.

Reliability

The same tests (questions) were used in all the schools to maintain consistency and enhance reliability. The interview with the principals was modelled in away to ensure that they give own honest responses. In order to test the reliability of the instruments to be used in the study, the test-retest method was used. Piloting was done in two schools which were not included in the sample. The questionnaires were administered twice within an interval of two weeks. The results obtained from the pilot study assisted the researcher in revising the questionnaire to make sure that it covers the objectives of the study (Fraenkel & Wallen , 2000).

Data Collection Procedures

The researcher visited the sampled schools to administer the questionnaire. Further, an appropriate date for collecting the completed questionnaire was arrived at. The quantity, quality and state of the available facilities were assessed. Various questions were

posed to the respondents to facilitate this investigation.

Data Analysis and Presentation

The data collected was both qualitative and quantitative. Statistical methods were employed in analyzing quantitative data where frequencies and percentages were used in interpreting the respondent's perception of issues raised in the questionnaires so as to answer the research questions. Content analysis was used to analyse qualitative data. The researcher used tables, graphs and charts in data presentation.

Ethical Considerations

To enable anonymity, the respondents were not required to write their names. The researcher explained to the respondents that their non-response were not to be used in the findings. The participants were also informed that any information collected from the institution and students would be treated confidentially.

Results and discussion

The level of maintenance of the sanitary facilities was investigated. The findings are indicated in Table 2.

Table 2: Level of Maintenance

FACILITY	well maintained	Averagely maintained	Poorly maintained	Not applicable	TOTAL
TOILETS	2.4%	16.6%	81%	0	100%
WATER	30%	19%	49.4%	1.4%	100%
BATHROOMS	2.1%	19%	59.8%	18%	100%
DISPOSAL BINS	7%	28.5%	62%	1.6%	100%
SANITARY PADS	17.8%	28%	53.9%	0	100%

A survey of the toilets gave the following results, 81% of the respondents felt that the toilets were poorly maintained, while 16.6% said they were averagely maintained. Only 2.4% of the respondents felt the toilets were well maintained. On the issue of water, 49.4% said water was poorly maintained, 19% averagely maintained. It was encouraging to note that 30% of the respondents felt water was well maintained. An examination of bathrooms indicated that 18% did not have these facilities. 59.8 % felt they were poorly maintained, 19% were averagely maintained, while only 2.1% felt they were well maintained .The maintenance of disposal bins and sanitary pads was also investigated.62% of the respondent said their disposal bins were poorly maintained,28.5% said they were averagely maintained while

only 7% were said the disposal bins were well maintained. Sadly 1.6% of the respondents did not have the disposal bins in their school. Majority of the respondent 53.9 % of the respondents felt that sanitary pads for girls in their schools were poorly maintained. 28 % however felt that the same was averagely maintained while 17.8 % said they were well maintained .These findings justify earlier findings by UNICEF (2009) that many schools have very poor sanitation facilities, which are mostly inappropriate. This is as a result of poor maintenance in terms of cleaning and repairing of the facilities.

Level of adequacy

The researcher sought to establish the level of adequacy of the sanitary facilities. The findings are indicated in Table 3 below:

Table 3: Level of adequacy

STATEMENT	SA	A	U	D	SD	NA
The number of sanitary facilities available is directly proportional to the number of girls	0	0	19.1%	31%	46%	0
The number of wash room in my school are adequate	0	2.1%	19%	30.8%	29%	18%
The sanitary towels provided to girls in my school are adequate	13%	17%	20.5%	22.8%	28.5%	0
The number of Disposal bins in my school are adequate	0	7%	28.5%	30%	32%	1.6%
The number of toilet facilities in my school is adequate	6%%	9.8%	23.3%	28.7%	32%	0

On the level of adequacy of sanitary facilities 46% of the respondents strongly disagreed that the number of sanitary facilities available is directly proportional to the number of girls in their schools. 31% disagreed while 19.1% were uncertain of this proportionality. 30% of the respondents felt that the number of washrooms in their school is adequate. 29% said the same were not adequate while 19% were not certain of the adequacy. 18% said that there were no wash rooms in their schools while 2.1% were agreed that the bathrooms were adequate. On the adequacy of sanitary towels, a big majority confirmed that the sanitary towels provided for girls in their school were not adequate, whereby 28.5% strongly disagreed, 22.8% disagreed while 20.5% of the respondents were uncertain of the adequacy of bathrooms. The remaining 17% agreed while 13% strongly agreed with the adequacy in provision of sanitary towels. The research also established that majority of the schools did not have organised and adequate disposal bins. This was depicted by the 32% strongly disagreeing, 30% disagreeing, 28.5% uncertain and only 7% of the respondents agreed with the adequacy of the number of disposal bins in their school. A similar concern is seen on the number of toilet

facilities in the schools with 32% strongly disagreeing with the number, 28.7% disagreeing, and 23.3% uncertain. However 9.8% of the respondents agreed while 6% strongly agreed that the number of toilet facilities is adequate. These results are summarised in Table 3.

These findings are in agreement with AMREF (2009) findings that the National latrine coverage was 90% in the 1960s, but dropped to 30% in the 1980s and only rose to 47% in the 1990s. Given that these figures include infrastructure in educational institutions, primary schools are not exempted. The values presented above indicate big deficits of sanitation facilities and materials in the sampled schools of Nakuru Municipality. The ratios imply that the state of sanitary facilities is poor and there is a lot that needs to be done so as to rectify the situation.

Given that sanitary facilities are visible objects the researcher went ahead to find out whether the sampled primary schools have these facilities through observations and inquiries with administrative authorities the researcher. Table 4 below summarises the data regarding the actual sanitation facilities and materials available in the sampled schools.

Table 4: Observation check list

OBSERVATION		Frequency No. of Schools 18	Percentage
Availability of latrines/Toilets	• Available	16	86%
	• Not Available	2	4%
Type of toilets	• Pit latrines	6	33%
	• Flash toilets	12	67%
Bathroom Facilities	• Available	7	39%
	• Not available	11	61%
Functional level of Bathroom facilities	• No water and no sign of recently being used	3	43 %
	• There is no water and looks of recently used	3	43%
	• There is water	1	14%
	• There is water but no sign of recently being used	0	0%
Level of privacy of Sanitary facilities	• Facilities have doors	6	33%
	• Facilities have no doors	3	17%
	• Doors are lockable	5	28%
	• User is completely invisible from outside	10	55%
	• Located in hidden area	7	38%
General appearance of facilities	• Generally clean	2	25%
	• Generally well maintained	3	17%
	• Appears safe to use	6	33%

From table 4, it can be observed that 88% of the school had at least toilet facilities in form of latrines or flash toilets. Only 6 schools of the 18 representing 33% had pit latrines while the 12 schools had flash toilets. Worryingly, only 7 schools out of the 18 sampled had washroom facilities. These represent less than half i.e. 39% of the total. A further examination of the available washroom facilities indicated that 43% neither had water nor a sign of recent use, 43% had no water but showed signs of recently used while only 14 % indicated presence of running water in the washrooms. An observation on privacy of the sanitary faculties indicated that 33% had doors, 17% had no doors, 28% of the ones with doors were lockable, at least 55% of the facilities

allowed the user to be completely invisible from outside while 38% were located in hidden area. On general appearance 33% appeared safe to use, 25% were generally clean but on 17% of the facilities were generally well maintained. In a study done by AMREF (2009) in primary schools in Kibera, Nairobi, it was revealed that the latrine to a pupil ratio in most schools is 1:50 compared with the recommended public health standard of 1:25 for boys, 1:30 for girls. The finding of this study confirms this fact is true also in Nakuru municipality. Through observation, it was clear that the facilities in most schools were not in good condition. For instance, in two primary schools, the walls looked quite old and dirty signalling that the latrines were old. Besides, some of the doors that had

been fixed in the entrance to ensure privacy had been broken and some had been completely removed thus defeating the overall purpose.

Conclusions and recommendations

The study drew the conclusion that there is generally inadequate coverage of sanitary facilities in the schools in Nakuru Municipality. The phenomenon is exacerbated by the ever increasing population due to Free Primary Education. School administrations seem to find a big challenge with increasing the quantity of the facilities since it required relatively large budgets to set-up the facilities. There is considerable congestion for students trying to access school latrines in most of the schools in Nakuru Municipality. This leads to unhygienic conditions and greatly increases the risk of cross contamination and infection. This also affects the girls' participation because the girls may opt to stay home during their menses since the sanitary facilities are not adequate in terms of state, number and maintenance level.

Recommendations

The Ministry of Education should conduct regular monitoring and evaluation of school sanitation and hygiene standards as part of its regulatory roles. Schools which do not meet the standards should be closed until they upgrade to desirable and acceptable sanitation standards

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- i) Regular cleaning of the latrines and other sanitation facilities should be ensured especially in the morning and evening hours of the day. Regular maintenance should also be ensured by the school administrations to avoid possible breakdown of the facilities which would comparatively make repairs more costly than maintenance.
- ii) School administration should design sanitation and hygiene policies and programs to groom students and general school population into practically responsible citizens with good knowledge and practices as far as sanitation and hygiene are concerned.
- iii) Head teachers especially male, should be trained on aspects of girls sanitation to be better placed to handle the girls' sanitation needs not to hinder their participation.
- iv) It is expected that the increase in enrolment comes with increase in income to the schools. It is therefore strongly recommended that a separate budget is put aside and strictly observed by the schools to cater for this indispensable service in the schools.
- v) Key stakeholders such as N.G.Os, C.B.Os, Health groups, Sanitary manufacturing companies and P.T.A should be involved in enhancing the adequacy of sanitary facilities for girls in primary schools.

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Sexual Perversions: A Socio-Psychological Crisis in Kenya

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Abstract

Kenya is one of the developing countries whose social and economic institutions have been adversely affected by sexual perversions. The media, religion, academic, police and legal reports indicate shocking revelations on sexual perversions in Kenya. Rape, bestiality, pedophilia, incest, sex-oriented violence and insults characterize the social landscape of the country, with dire implications on the family, health, religious, economic, political and other vital institutions of the society. Cases of priests/pastors/*imam* defiling their 'flock'; teachers sexually assaulting their students; prostitution and promiscuity; fathers raping their daughters; jobs being awarded on sexual advances, are not uncommon. Consequently, people are dying of sex-oriented diseases; hospitals are full of sex-based health problems; families are breaking because of sex and sex-based challenges; streets are full of abandoned children; professionalism has waned because sex has replaced merit; the environment is polluted because of sex; even religious books warn that many

may miss the Kingdom of God because of sex-based sins. Sex is everywhere on television, movies, billboards, office buildings, hotels, kitchen, cars, classrooms, in the field, corridors, in conferences, toilets, churches, mosques, streets, and in bush, just to name a few of the spaces. This paper provides some empirical and conceptual observations, which suggests 'a sex crisis' that is reflected in the kind of sexual patterns observed in the Kenyan society today. The paper recommends a reflection on what actually happened to the sex moral values in Kenya and suggests what the society's leadership should do to inform policy-oriented strategies that can tame the current situation.

Keywords: Sexual, Perversion, Crisis

Introduction

In the African tradition, sex and sex-related issues have for long time been regarded as adult affair and handled with severe caution on confidentiality, anonymity, and secrecy. However, with the rapid socio-economic and political changes taking place in the world; the process of globalization and global integration; multicultural and multinational contacts, sexual attitudes have changed in the last 50 years. In fact, not so much sexual behavior, but society's attitude towards it has changed. This is why there is a strongly sexual movement in the name of rights, recognition and legal debates for sexual behaviour that were traditionally prohibited.

Historically, it was until after the World War II and in the 1950's, that sexual behavior was a taboo-subject and not openly discussed. Sex was conducted behind closed doors and in the confines of marriage. However, in 1960's sexual attitudes undoubtedly became more permissive and brought openly-declared attitudes in line with the realities of sexual behavior. The sexual revolution (the 1960-1980), also known as the time of sexual liberation, was a major social movement in most Western Nations led by Britain and North America. These social movements challenged the existing order of society. This was evidenced by decay of existing sexual norms, free love and pre-martial sex, which resulted in acceptance of intercourse outside monogamous marriage, heterosexuality, increased individual freedom and feeling of less deviant, all of which have been adopted in the modern times. In America for instance in the 1970s, New York's Gay Activist Alliance (GAA) was the leading radical gay organization. A year or two earlier, the Gay Liberation Front (GLF) had been the most

vocal organization, and they had sponsored the first Gay Liberation March (not parade) in the city. But GLF broke up rather quickly due to internecine warfare about their goals. GAA replaced them and devoted itself to fight only for gay rights (Kimmel & Lesniak, 2011).

The authors argue that a person liable to sexual perversions is fully preoccupied with thoughts of goal achievement, forgetting about moral behavior and possible responsibility before the law. All other kinds of sexual activity lose any sense for him/her. For instance, homosexuality is not a recent phenomenon, four decades ago, Weinberg and Williams (1974) did a study on homosexuality in America and found three characteristics among individuals who were well adjusted as gay men: first they rejected the idea that homosexuality was an illness; they had close and supportive associations with other gay people; and they were not interested in changing their homosexuality. According to Kimmel (2011), for one to pursue this life [gaysim], he has to develop the internal sense that "it's normal for me" in spite of the bigoted attitudes of others...and "Serendipity"-the opportunity [other gay mentors] that emerges and yields significant benefits.

When Sigmund Freud in 1896 (Holland, 1990) postulated the psychoanalytic theory and claimed that human nature is influenced by sex instinct, there were so many reactions to his ideas that many people thought he was immoral and crazy. However, as we write this paper, we wish to thank Freud for his postulation that is being fulfilled today in our Kenyan society. In this society, men and women are consistently preoccupied by sex instinct and have gone lose to engage in

sexual activities in disregard of the moral values that surround sexuality in the African society.

In Kenya, issues to do with sex and sexuality have raised heated debates among human rights activists, and shocking revelations among the religious, moralists, politicians, the rural and urban segments of the population, and policy planners with dire consequences on the socio-economic development of the nation. The current state is that most Kenyans are witnessing various sex-related pervasions that we are referring to as “sex crisis”, which have been blamed for increasing cases of insult against minors and women, deaths of victims, HIV infections, sex-oriented jobs, corruption, denial of rights and opportunities, breakdown of families, breakdown of the traditional values and morals on sex and sexuality, increased prostitution and promiscuity, and the moral decay in the society.

This paper seeks to elucidate the phenomenon of sexual perversion as a moral issue in our society. The authors begin with a section on the foundation of sex and sexuality issues as part and parcel of human nature, but closely guarded by normative sentiments that are based on the people’s cognitive behaviour. Sex is therefore, sanctioned, approved but also, guarded by religious teachings, human dignity, and societal norms and values. In the subsequent sections, the authors delve into sexual crisis brought about by rapid changes in the Kenyan society.

Foundations of Sex and Sexuality in Humanity

From a theological perspective, the Biblical book of Genesis Chapter One presents the story of the creation of the world by God that man was created in God’s own image. God further saw that man was lonely and so created the woman out of man’s flesh. This saw the theological origin of sex and sexuality in humanity. From this moment, the subsequent stories are about the fall of man from God’s love into sin. Adam and Eve engaged in a sexual relationship that condemned them into a life punishment for them and their future generations from God

(Genesis: Chapter one). Throughout the Holy Bible, especially the Old Testament into the New Testament, there is a consistent illustration of sex oriented sins, evils, condemnations, and redemption of humankind with the coming of Jesus Christ.

The theological origin of human sexuality presents a divine intention to create sex, which is good for humanity, but was mismanaged by human greed, lust and desires. According to the Book of Genesis 2:24, “Therefore, a man should leave his father and mother, and shall cleave unto his wife: and they shall be one flesh.” This is the deepest physical and spiritual unity of man and woman and holds up monogamy: restricting sexual activities to only one spouse, before the world as the form of marriage ordained by God. Consequently, various sexual relationships were also prohibited including, adultery (Exodus 20:14), incest (Leviticus 18:6-17), prostitution (Leviticus 21: 7), rape (Deuteronomy 22:28-29), bestiality (Leviticus 18: 23), homosexuality (Leviticus 18:22) and polygamy (Leviticus 18:18).

From the genetic/biological point of view, in sexually reproducing organisms, no domain is more closely linked with the engine of the evolutionary process than sexuality (Buss, 1998). Men and women over human evolutionary history have confronted different adaptive problems in the sexual domain. This biological perspective was influenced by the works of Charles Darwin (1859:1) who argued that:

Because reproduction is central to evolutionary process, domains closely linked with reproduction should be focal target of selection processes and hence, loci for evolved mechanism or adaptation. No domain is close to reproduction than sexuality...

These ideas offer an account of sexuality-related adaptive problems and present a view of human sexual psychology as a rich repertoire of mechanisms that have evolved as adaptive solutions. A host of specific predictions about human sexuality follows from this analysis, including an account of sex differences in the desire for sexual

variety, the qualities preferred in short-term and long-term mates, context-dependent shifts in mate preferences, the nature of sexual jealousy, the tactics that are effective for attracting and retaining a mate, and the causes of sexual conflict between men and women (Buss, 1998).

These two main perspectives, theological and biological, influenced the interest in studying and controlling humankind's most basic drive: sex. From a chronological point of view, the desire to break that traditional silence about sex in human societies has been influenced by the crises that the world has been facing over time. In 1830s, the focus was on the issues of "self pollution" characterized by the immense masturbation, which was responsible for everything from warts and constipation to insanity and death (Cornblatt, 2009). Health reformers in 19th century in America, associated bodily discipline with ideal manhood, and used sex education manuals to propagate that message.

The rapid urbanization of the late 1800s and early 1900s was accompanied by an increased interest in organized sex education. As people in America, Europe and other developed societies moved from farms where children might politely observe the mating of the family livestock to cities rife with temptation, public officials began to see a greater need for classroom instruction about the facts of life. In America, the National Education Association first discussed the subject in 1892, passing a resolution that called for "moral education in the schools"(Cornblatt, 2009:1).

In 1913, Chicago became the first major city to implement sex education for high schools. Later on, it took rampant Sexually Transmitted Diseases (STDs) during World War I (WWI) to get the federal government involved in sex education. In 1918, the Congress passed The Chamberlain-Kahn Act, which allocated money to educate soldiers about syphilis and gonorrhea. During this time, Americans began to view sex education as a public-health issue. The earliest sex-education film, *Damaged Goods*, warned soldiers of the consequences of syphilis. In the film, a man has sex with a

prostitute the night before his wedding, gets syphilis, passes the disease on to his newborn baby, and then commits suicide. When the HIV and AIDS scourge emerged in early 1980s, proponents of sex education found their position strengthened. By the mid-1990s, every state had passed mandates for HIV and AIDS education, sometimes tied to general sex education and sometimes, not.

Outside of Western Europe and the United States, sex education remained largely informal until concerns over a population explosion and the HIV and AIDS crisis prompted international organizations such as the United Nations to become involved in educating residents in Africa and South Asia particularly, about contraception and prophylaxis. Although existence of religious opposition has been muted, educators have often been met with resistance from some governments unwilling to admit that their populations were experiencing problems related to HIV and AIDS, and from male traditionalists, reluctant to allow women greater control over their own sexuality.

Studies conducted for example (Haselton & Gangestad, 2006) indicate how an array of factors among individuals displays relationship maintenance biases. For example, the likelihood of infidelity is determined in part by the sexual attractiveness of one's current partner relative to alternatives. The reproductive benefits of staying committed to a long-term relationship partner may also depend on other factors such as the length of the relationship and whether or not the relationship has borne offspring. There are reproductive tradeoffs associated with monogamy, and mating decisions likely weigh both the costs and benefits associated with staying committed to a long-term monogamous relationship. Cognitive biases for relationship maintenance are displayed primarily when the benefits of maintaining the relationship outweigh the costs.

Sex, Sexuality and Sexual Perversion Sex and Sexuality in the Kenyan-African Context

Kenyan is one of the African countries that boasts of a rich cultural orientation. The

country has over 42 ethnic groups that have continued to experience and express rich cultural heritage. In virtually all these ethnic groups, sex and sex-related issues are confined to the institution of marriage. Consequently, the sanctity of marriage as experienced in the traditional-customary setting is well defined and the place of sexuality is core because it is geared towards procreation and continuity of the society. However, in African societies, sex is not used for biological purposes alone. It also has religious and social uses. There are African people, for instance the Akamba ethnic group, among whom rituals are solemnly opened or concluded with actual or symbolic sexual intercourse between husband and wife or other officiating persons (Mbiti, 1959). "This is like a solemn seal or signature in which sex is used in and as a sacred action, as a 'sacrament' signifying inward spiritual values" (Mbiti, 1959:146).

Culturally, all human societies have norms and values that direct and control the sexual acts among their members. To ensure the sustenance of this 'deified arena,' taboos are sounded and expressed to caution members. It does not give room for the situation we are faced with today where sexual licentiousness is promoted and adorned with pride. In fact, sexual organs were considered pathway to life in traditional societies. For instance, Mbiti strengthens the fact that sexual organs are the gates of life and for many African people, the genitals and buttocks are the parts of the body that must carefully covered; their lack of covering constitutes 'nakedness' in the eyes of traditional Africans (Mbiti, 1969). A phenomenon that is worth preserving today considering the influx of media appeals to the discomfort of seeing our women and young girls almost nude in the name of new-wave fashion.

Moreover, there was the procreative emphasis of sex in marriage itself, which the social structures of traditional African society, especially the family and community made adequate provision for. Consequently, sexual deviation was indeed a threat to these structures. It became apparent that youth were to be trained for reproductive life in conformity to the structure through social

initiation rites. Sexual morality was safeguarded by the societal structures, more than by individual personal responsibility. Sexual activity was the subject of much ritual symbolism. It was frequently dramatized in dances and arts, and was surrounded by many taboos, a typical example which was avoidance relationship (Shorter, 1999; Okong'o, 2010).

Fornication, incest, rape, seduction, homosexual relations, incest, and sleeping with domestic animals, children watching the nakedness and genitals of the parents, all represented sexual felonies in a given community. Society deal variously with these felonies and African people are very sensitive to any deviation from the accepted norm concerning all aspects of sex. This is a fundamentally religious attitude, since any felony upsets the smooth relationships of the community, which includes those who have already departed. For this reason the offences must be followed by a cleansing ritual whether or not the offenders are physically punished, otherwise misfortunes may ensue (Shorter, 1999).

Further, Kyalo (2012) observed that:

Be that as it may, virginity was held to be a good thing insofar as it is a promise of a harmonious marriage. If a girl is chaste before her wedding she will probably be faithful after it. Adultery is vicious because it not only steals the wife fertility, but kills the marriage. The bride price does not buy a woman, but rather compensate her family for her fertility.

In general, Moler (1982) asserts that a man marries for life. Above all this applies to the first marriage; children cement the relationship, for their presence indicates that the contract has been fulfilled. I have continually contended that African traditional marriage system contained the proper ingredient to a healthy marriage.

These ideas imply that Africans understood marriage and sexuality and had a way of upholding the richness of the value of marriage. When we talk of values in sex and sexuality we refer to interests, pleasures, likes, preferences, duties, morals, obligations, desires, wants, needs, aversions and attractions and many other modalities of

selective orientation expressed by members of a given society in relation to how they sexually attract or respond (William, 1968).

Sexual Perversion: The Emerging Trends in Kenya

According to the American Academy of Clinical Sexologists (1929) sexual perversions are conditions in which sexual excitement or orgasm is associated with acts or imagery that are considered unusual within the culture. Perversion is present where the orgasm is reached with other sexual objects (homosexuality, paedophilia, bestiality, among others) or through other regions of the body (such as anal coitus), where the orgasm is subordinated absolutely to certain extrinsic conditions, which may even be sufficient in themselves to bring about sexual pleasure (fetishism, transvestitism, voyeurism and exhibitionism, sado-masochism). According to Koenig (2012), Sex perversion is a pretty good barometer of demonic activity and of the moral state of a society. Therefore, perversion implies the sum-total of the psychosexual actions that are an adjunct to such non-conforming ways of obtaining sexual pleasure.

People who are sexually pervasive tend to have their passion or sexual desire peak early in a relationship (Aron & Aron, 1991; Berscheid, 1985). This is why for them; sexual desires do not express natural love that comes in a relationship. Thus, their sexual orientation deviates from the societal expectations.

Sex and sex-related perversions are part and parcel of the day-to-day social facts and events in Kenya. Every new day comes with an emerging issue that depicts the society as both immoral and out of control. This is widely evident in media, police, and witness accounts of what actually takes place. Practical observation in the country has shown women and men [both married and unmarried] engaging in casual sexual activities with their bosses and juniors; lady students in schools, colleges and universities engaging in sexual activities with their male lecturers for marks; choirmasters dating their members; church leaders engaging in sexual activities with their

members of the “flock” including underage boys and girls; as maids continue to be sexually exploited by their male employers, and so on. In 2005, a lady student in Egerton University flogged her male lecturer for having had sexual relationship with her and refusing to award her high marks in his course (*The Standard*, November 12, 2005).

Brothels and massage parlours are the order of the day in most affluent parts of the main towns in Kenya (*The Nairobiian*, 5th of July 2013). In fact, in a country where over 56% of its population is living in abject poverty, men and women are spending close to Ksh. 100,000 per night in exchange for sex (Ibid). Reports and incidences of infidelity are like the order of the day. Just like politics, sex and sex-related perversions receive daily coverage in all the main newspapers with some like *The Nairobiian* running weekly headings on matters of sexual perversions. In Nairobi, taxi men are now lured into sex by their female clients as payment for the transport services offered, while prostitution and wife-swapping are common among the middle class and those with money. Cases of high-profiled personalities being found in sexually compromising situations and infidelity are not new. In fact, men and women are spending a lot of cash in exclusive sex dens in the City. Moreover, it is now women, who own the rooms and invite their men clients for sex at a fee (*The Nairobiian*, 1-7th July, 2013). This is one of the greatest challenges in the fight against HIV infection. The current statistics indicate that Kenya has almost 40% of new infections among stable couples (Ibid).

In Mombasa, strip clubs in the larger north coast; brothels and massage parlours; open prostitution and promiscuity in the streets; sex-tourism; and pornographic shooting including human-animal movies are not new to the residents. The most recent case was when over ten university students were caught engaging in sexual acts with dogs at a fee in Nyali, while six other women were arraigned in a Kilifi court for striping in a club within Mtwapa area (*Citizen TV* June, 2013).

In central Kenya, cases of rape, incest and bestiality are reported on daily basis. For

instance, in the last week of June 2013, six cases of bestiality were reported in Kiambu County alone. Men being the main victims were found engaging in sexual act with cows and sheep in particular. These are just some of the cases that are reported. During the same time in the same County, two men were jailed for defiling their own daughters (*Nation TV* June, 2013).

Across the country, one of the most talked about social issues of concern is the emerging sexual trends in Kenya. Men and women of the same sex have been witnessed seeking recognition from the government and their rights from the general public; other seeking legal redress to change their bisexual conditions for instance changing identity such as from Audrey to Andrew (*Citizen TV* June 2013). This is motivated by the perceived setbacks for recognition, which (Budge et al., 2008; Lombardi et al, 2001) assert that transgender individuals experience extensive rejection and discrimination. For instance, the impact of male privilege for female to males may be that the added discrimination and difficulty that male to females experience during their transitions indicate a more complex process for their coping and well-being; and it is also possible that the process is just as complex for FMT individuals (Budge, 2010).

A study conducted by Budge et al (2010), on Well-Being in the Transition Process: The Role of loss, community, and coping among the transgender, indicates that there may be a moderating effect of assigned sex and facilitative coping with regard to levels of depression and anxiety. The gender queer individuals who were assigned a female sex at birth used more facilitative coping mechanisms as their anxiety and depression increased. However, this was not true for those who were assigned a male sex at birth. Perhaps gender queer individuals assigned a female sex at birth were socialized to cope with depression and anxiety in a way that helps them deal with distress.

In the Kenyan urban streets, prostitutes have been demonstrating in major towns seeking recognition, fair treatment and rights of operation from the government and their

clients. Prostitution is illegal in Kenya, and commercial sex workers face arrest and dehumanised for their activities. This places the women at a severe paradox situation when dealing with their clients. Similar to the Kenyan commercial sex workers, O'Donnell et al. (2002) in his study in Binga Zimbabwe narrates that:

If a man refuses to pay after sex [as commonly occurs] then the worker has no redress. More seriously, police are said not to be sympathetic towards cases of violence against commercial sex workers. The women report that beatings are practically a daily occurrence for them, yet if they report them to the police at best, they can receive a recommendation to seek treatment at the hospital, and at worst they can end up being fined or made to do community service.

All these are just indicators of some of the social sexual revolutions taking place in Kenya. In fact, the cultural silence that existed about sex and sex-related matters has been replaced by more vocal, open and exposed sexual scenes, uncensored materials, and public tolerance to the new habits.

Sexual perversions have been linked with the level of moral decay in the society and thus, when perversions are on the rise, the society, Kenyans in this case, are viewed as if they no longer care much about the sanctity of their bodies as sacred and uniquely human, and sex as exclusive. Instead, men and women are out to explore their bodies sexually. The popular nude culture among the urban men and women is a major moral issue of concern. In fact, nude and vulgar dances like strip and bend-over dances are the trend. In every Friday, *The Standard* newspaper for instance, has a full page under the *Pulse* pullout dedicate to “*caught out through pulse lens*”. This page usually shows how men and women are publicly sexually-indulging. That is why the camera has captured and exposed them (*The Standard*, July 5, 2013, *Pulse*: pg.5).

One may be tempted to think that sexual perversions are a preserve of the urban folks in Kenya. However, this is not true. The difference is actually in the types of perversion taking place in the two settings.

For instance, cases of infidelity, incest, bestiality and adultery are largely associated with rural cases, while wife swapping, pornography, prostitution, brothels, massages, and sex for jobs is common in urban settings. In Nyanza for instance, there have been reports of young men in villages competing to impregnate people's wives (Sorre and Akong'a, 2009). Various circumstances have been blamed for sexual perversion in Kenya. Sorre and Akong'a (2009) discussed power, status, access to resources, deprivation, psychological rewards, culture of silence, weak social control, and socialization as the underlying reasons as to why sexual perversions are common in the Kenyan society.

One may also think that the Kenyan society is not keen in handling some of these incidences. However, the Kenyan law has been very clear and strict on sexual offences including rape, sexual insults, incest and bestiality. For instance we have the Sexual Offence Act 2006, which has spelled stringed penalties including life sentence for rapists. The law is also clear on incest and it argues in part that the court will enter a conviction of incest irrespective of whether or not there was consent. However, the legal provision may only operate well with the support of the public, especially when the victims are willing to report and culturally supported to do so.

Conclusion and Recommendation

The paper observes that sex crisis evident in the Kenyan society is detrimental to the future generations in terms of their socialization, morals and personality development, which would affect our national character. Therefore, we recommend that the society should invest in restoration of the lost sex norms and values to save the nation from moral damnation and the spread of consequences of sexual perversion to other aspects of societal development. This can be achieved through collective efforts by various institutions including the Communication Commission of Kenya fighting media pornography; the police and judiciary implementing the laws especially in safeguarding evidence and prosecution of offenders; communities speaking and acting

against the vices; and most important, the government coming up with sex and sexuality-related legal frameworks that safeguard morals in the society.

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Enhancing Excellent Customer Care Services in The Media Industry

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Abstract

Customer service is a core business process, which entails all the activities involved in making it easy for customers to reach the right parties within the company and receive quick and satisfactory services, answers and resolutions of the problem. Indeed, good customer service is the bread and butter of any business. This study was carried out in order to determine the factors that enhance Excellence customer Care service affecting the media industry in Kenya. The objective of the study was to find out customer retention policies and customer satisfaction factors that affect excellent customer care operation. This could add value to the media industry, the learners and future

scholars. This research study was conducted out within limit of certain limitations and delimitations. However, the researcher relied on literature review on the independent variables. This study applied a purposive research design and sampled Nation Media Group. The researcher used stratified random sampling technique to select the sample of 30 respondents from a target population of 100. The data was conducted by administering questionnaires. The researcher used structured and non- structured questionnaires for the analysis of the data which was analyzed using tables, bar graphs and charts. The study recommended that Quality service has a link to market growth and profitability resulting from loyal customer base. In order to deliver quality customer service, there is need to understand service quality from both the customer and service providers perspective. There is also need to understand the means of measuring, recording and monitoring the service quality. An organization should be able to always adopt the changing customer needs and indeed identify areas of improvement so that it can offer quality excellent customer service. The mission statement and the organizational vision should be clear, focused and strategic.

Key Words: Customer Service, Media Houses, Quality Service, customer loyalty

1.0 Introduction

Customer service is a core business process, which entails all the activities involved in making it easy for customers to reach the right parties within the company and receive quick and satisfactory services, answers and resolutions of the problem. Indeed, good customer service is the bread and butter of any business. Many companies are realizing that the key to success in this era of increased competition and notable environment is to focus more on the one who puts bread on the table, the customer. Customer transactions consist of known situations that can be understood and managed. Handling them well consist of structured communications skills that are not human nature, but grow with training and practice.

Customer satisfaction is the ability of the organization to constantly and consistently give customers what they need. It is the ability of an organization to consistently exceed the customer's expectations. Many businesses today profess to provide good, if not exceptional customer service. However, their customers rate them considerably lower. Providing exceptional customer service is hard work. Unfortunately, it doesn't just happen.

Providing exceptional customer service is not the sole responsibility of the individual who is the direct contact with the customer even though their role is significant. In today's marketplace, customers have greater and easier access to products and services.

There are very few times people" have no other choice" The customers choose to purchase your product or service.

One key to providing exceptional customer service can be summed up in one word **ATTITUDE**. Customer satisfaction is directly proportional to the provider's attitude about quality service. In this research therefore, we endeavor to investigate into the indicators of poor customer service with a view to making recommendations on the best practices in excellent customer service. We focused on corporate customer care service taking The Nation Media Group as the case study.

1.1 Definition of key words

Customer- is a person or organization that buys from a shop, store or from a business (McIntosh, 2007)

Competition – is the rivalry between many organizations towards acquiring and retaining a big market share in the same market. (Derrick, 2009)

Marketing – this is the flow of goods and services from the producer to the consumer. It is based on relationship and value. It is actually the sales and distribution of goods and services (Kotler, 2006)

Advertising – this is the act of telling the public about a product or service in order to persuade people to buy or use it (McIntosh, 2007).

1.2 The Nation Media Group

The Nation Media Group was incorporated in 1962 as a holding company for East African

newspaper limited which had acquired the Taifa newspapers title in 1959, weekly publication in Kiswahili language. Thereafter, other newspaper titles were launched namely, the Daily Nation, The East African and the Business Daily. Radio and television broadcasting stations were also launched. In 1973, His Highness the Aga Khan, who was the founder and sole proprietor of the company, offered for sale 40% of the issued share capital of the company on the Nairobi Stock Exchange. In 1988, the Aga Khan sold a further 30% of the issued share capital of the company through the Nairobi Stock Exchange. Finally, in 2003 the Aga Khan transferred his remaining shares, which were registered in personal name, to The Aga Khan Fund for Economic Development, a company registered in Switzerland.

NMG is the largest independent media house in East and Central Africa. It has been quoted in the NSE since 1973. As the leading Multimedia house in the East African region, it has print, broadcasting and internet operations which attract regular readership and viewership, which is unparalleled in the region. Since 1959, The Nation media Group has been the “the first with the news” for all people of all walks of life. The group has over the years endeavored to educate, inform and entertain using different media platforms to deliver to any audience in Kenya, Uganda, Tanzania, Rwanda, Burundi and the republic of Southern Sudan. The Nation Media group reaches its customers through various platforms that is through newspapers where the group delivers a literate and informed audience who are opinion leaders, early adopters and “heavy” consumers of different brands and services in the market.

Radio stations deliver a mass market audience ranging from upwardly mobile to the lower/middle class who are the mainstay of the Kenyan economy and TV provides an urban/ peri- urban audience who control over 50% of the country's economy. Digital Medium allows one a window into the world; it is the most cost effective way to reach anybody “out there” (both local and international) with an interest in the Kenyan and East African Market. The company has continuously impressed modern Marketing strategies in penetrating new markets and

growing its Markets share. The Market/ product grid has proved to be one of the most effective ways of analyzing and checking on the business growth. This study aimed at finding out factors that can enhance effective customer care in order to attract more customers and efficient services.

2.0 Statement of the Problem

Though the Mission statement and Corporate Vision were noble, the company recognized that customers can turn to other media platforms such as billboards and outdoor advertising if the customers were not satisfied with the services offered. The company in the recent years had reported losses in market share to other media houses (weekly business analysis) and also public image especially in the advertising department where long procedures were required before accepting advertisements.

When service takes too long, things don't get delivered when and as promised, there were too much bureaucracy to make a situation right, etc., no amount of interpersonal skills training can create great service – and in fact, the “system” may wear down your team's enthusiasm for great service .Currently this seems to be the problem at the Nation Media Group.

Providing excellent customer service was about assuring satisfied customers that had customer loyalty to continue to return. It is also about being creative in customer relations techniques such as add-on sales, reminding customers of specials, giving special promotional pricing, advertising, marketing, in – store signing and the many related activities that help you increase the overall volume and the average “paper circulation” or sale price of merchandise. These were some of the other major ingredients that the organization lacked.

Christopher et. al. (1991), view customer service as concerned with the building of bonds with customers and other markets or groups to ensure long-term relationships of mutual advantage. He notes that provision of quality customer service involves understanding what the customers buy and determining how extra value can be added to the product or services being offered.

3.0 Purpose of the Study

- i. To determine whether customer retention improved excellent customer service
- ii. To evaluate the effects of customer loyalty on excellent customer care
- iii. To assess the effects of customer relations techniques and how it improved excellent customer care service

4.0 Significance of the Study

The results of this study will help the NMG and other media houses in understanding what customers regard as quality service. Efforts could then be made to match the expectations of customers with resources channeled to revamp the areas of weakness while sustaining the strong points.

The results could be used to help NMG identify its areas of weakness and strategize on the best way of improvement so as to enable it meet its objectives of ensuring excellent customer care services and develop a culture of courtesy.

The Ministry of information and communications as a stake holder of the media industry could find the study useful in understanding the determinants of excellent service quality from the customers' perspective. This could facilitate their effectiveness in their surveillance and regulatory functions of the industry.

The study was of significance to media houses that undertakes their operations in the country since the documented factors that enhance excellent customer care were also experienced by other media houses. The research would help the media houses to clearly understand the prevailing challenges in current business environment and guide the media houses on how to design their services so as to distinguish them from those of other media houses in the target market

The research could be used by other researchers interested in the factors that enhance excellent customer care service in the media industry and its relations as researchers.

5.0 The Scope of the Study

The study was undertaken at the Nation Media group limited offices situated at the Nation Centre, Kimathi street Nairobi. The study covered all the functions and processes that are directly related with execution of customer care service. The study involved all the staffs who are directly or indirectly concerned with the formulation and execution of the customer and customer service policy implementation

The target population was 100 where 30 respondents were selected to represent the total target, of the customer service employees working especially in the front office desk at the ground floor of the Nation Centre building. This also involved some of the sales executives within the city center and some from the branches. Administration staffs were also given an opportunity to respond to the questionnaire.

6.0 Literature Review

6.1 Customer care concept

Adam Smith's famous Wealth of Nations (1776) states that a few customers want to do business with a firm that cares little about customers, their comfort and also their concerns. If a firm owner or manager wants to be successful, that person needs to be very involved with meeting customer needs, or the customer will go elsewhere. Therefore, profit seeking firms, regardless of their true motivation, are forced by the nature of the marketplace to treat customers with respect and seek their loyalty and return business. Customer service is almost synonymous with customer loyalty and customer satisfaction which is also linked in a broader chain. Customer service is that which creates customer satisfaction, and in turn, creates customer loyalty (Ngahu 2001).

Kotler (1998) described customer care as a service in any activity or benefit that one party can offer to another that is essentially intangible and does not result in the ownership of anything. According to Ngahu (2001), customer care can be defined as any good service rendered to a customer in the process of selling a product or service. Ngahu further explains customer care as the "activities" which are offered to sale or are provided in connection with the sale of

goods. According to Balunywa (1995) any service rendered to a customer is the one referred to as customer care. Indeed so many scholars have attempted to describe customer care but the gist of the whole concept of customer care from such definition above is that any one in business must not only concentrate on the product he or she is offering, but must accompany it with great service to the targeted customers. Balunywa (1995) observed that the concept of customer care is still new and most managers are yet to embrace it. Mbonigaba (1995) wrote that there is need to make customers satisfied since they help business to earn. In most offices, customer care starts with the front office clerks. The secretaries at the front office should be made to appreciate the importance of customer care because this is the best chance for any business to create the first impression of good service to its customers. Kotler (1998) observed that customer satisfaction depends on the extent to which customer's expectations about the services are fulfilled and these expectations are not static. Kotler further noted that good customer service among other things entails keeping the promises made to customers, and not guaranteeing things that cannot be possible given the nature of the operating environment. To provide an excellent service to customers, the organization should deliver beyond the expectations of the customers. Santon (1999) argues that, to provide good customer services, the organization in designing must focus wholly on the customer. This brings us to who actually is the customer. A customer is an individual or organization that makes a purchase decision. Drucker (1994) identifies customer creation as one of the major objectives of the business. Without a customer, other components of organization will not be viable for long. Organizations therefore design customer care programs seeking to acquire new customers, provide superior customer satisfaction and build customer loyalty (Caryforth Otal 1990). According to Bara (2001), the only reason for businesses to exist is to serve a customer. A customer is a person who enables people to earn a living and also

enables government to exist and function. Therefore, there is need to have quality customer service to satisfy the customers. Quality customer care is associated with an attitude; a way of thinking and a philosophy of doing business that emphasize a strong commitment and sincere dedication to satisfying customers. Ngahu (2001) advocates for making customer satisfaction a priority of the company. It calls for the adoption of a customer orientation. Ngahu (2001) and Balunywa (1995) agree that, the main reason customers choose one product over another is probably because it better meets their need in such a way as ease of use, service, or ability to do what it promises to do. Ngahu (2001) further noted that another reason to become customer driven is to build market share. Research shows that you cannot maintain market share with unique features alone, as your competitors will imitate you.

Sustainable market share growth is achieved through loyal customer and excellent service. To be customer driven means to position customers at the heart of your operations and to let their needs guide all your decisions, policies and strategies. According to Zike (2001), in his study of what makes a company excellent, he interviewed 43 high performing companies. He wanted to find out what makes them so successful in an increasingly changing environment where many companies are facing closure. He found out that all high performing companies share a set of basic operating principles, some of which emphasized customer driven service. He found out that excellent companies provide unparalleled customer service, quality and reliability. Moreover, they exhibit a strong commitment to customer satisfaction and tend to stick to the business they know. Customer orientation is reflected in the quality that customers get at all levels of the company (Ekpei 2001).

Customer care helps to enhance the corporate image, customer relations, operational efficiency, competitive advantage and profitability. Moreover, it enables to cope with a rapidly changing environment and highly demanding customers. These are

realized because the company that is customer oriented emphasizes the provision of what customers' need that is quality and efficiency in service. According to Mulwana (2002), in paper presentation at Uganda manufacturer's seminar, he noted that customer service is a major tool for market penetration. Mulwana like Balunywa (1995) noted that businesses always look forward to win, to increase their turnover every other time and that this necessitates basic strategies that can attract and retain customers and the major tool is high quality customer services. Mulwana emphasized that high quality customer care delights and satisfies customers and the biggest benefit is that it creates loyal customers. Mulwana therefore noted that the process of customer care means delivering quality service that can satisfy the customer. However, companies often fail to recognize the importance of staff care, who are also company customers (Balunywa 1995).

Balunywa identified two types of customers who enjoy the organizations services that is, the external people who buy from the business and those internal to the organization, who are the employees, those that can make things happen in the organization and deal with the external ones. Balunywa called the first type "kings" and the second type as "royalty". He said that the winning organizations are characterized by a committed customer base, healthy profits and happy people. Balunywa further noted that customers are likely to receive good service if the staffs delivering them are happy with their work. Employers who treat their staff like kings are more likely to have a motivated and committed workforce that is interested and willing to deliver quality service. Customer service leads to customer loyalty. This is done through what customer relations expert Maxine Kamin calls the "equation of fantastic service." The first step is to greet the customer, making him feel welcome and at home. Then the client's specific needs must be determined. Third, those needs must be met efficiently. The purpose here is to create a friendly and personal relationship that

provides positive associations between the customer and the establishment. Those met needs need to be checked and rechecked to make sure nothing was left out. Finally, fantastic service "leaves the door open," making sure the client has an incentive to return. The benefit to the customer is a pleasant and efficient experience, and the firm has just recruited a loyal customer.

6.3 Facts about customer care

It costs 6 times to attract customers than it does to keep an old one. A typically dissatisfied customer will tell between 8-9 people about his problem with the organization. Seven out of ten complaining customers will do business with you again if you resolve the complaint in their favor. If the complaint is resolved on spot, 95% will do businesses with you again of the customers quite, 68% do so because of an attitude of indifference by the company or the specific individual.

(<http://returnonbehavior.com/2010/10/50-facts-about-customer-experience-for-2011>)

6.4 Benefits of customer care

Hasket Otal (1994) says that growth and profits are stimulated primarily by customer satisfaction which has a large bearing on customer loyalty. Customer loyalty is a direct result of customer satisfaction that is largely influenced by the value of customer care provided along or with product or service to the customer. A satisfied customer is one whose expectations have been met and with such a customer organizations tend to benefit in the following ways: Positive word of mouth: customers are more likely to recommend a high service to their friends, relatives and colleagues. The business will thus; thrive on credible and positive image, Create a competitive edge, offer excellent customer care and a much greater competitive edge than competitors largely because positive service differentiation entails improving all the people aspect of business like training, and motivation which are all difficult to copy and achieve. Job satisfaction, a pleasant and conducive atmosphere emanates from good customer care and improved moral commitments but also improved customer satisfaction hence

fewer complaints. Good customer care would reduce labour turn over, Cardiac symptoms and absenteeism (Ekpei 2001).

6.5 Attending to customer complaints

Customer complaints naturally reflect customer dissatisfaction and service deficiencies. Encouraging customer complaints is of strategic importance and should be handled with great attention and care. A research of customer complaining behavior done in the USA had the following results (Miner 1992, Muchinsky 1993, Pearn and Kandala 1993).

7.0 Variables that Guided the Study

According to Kotler, (2006) customer retention is perhaps the best measure of quality – as service firm's ability to hang on its customers depends on how consistently it delivers value to them. Service companies want to ensure that customers will receive consistently high – quality service in every service encounter. According to Pritchett (www.pritchettonline.com) customers measure the quality of the firm by the quality of the service the employees offer. It is therefore important to empower frontline service employees- to give them the authority, responsibility and incentives they need to recognize, care about and tend to customers' needs. Top service companies should be customer obsessed and set high service quality standard. Good Service Company should communicate their concerns about service quality to employees and provide performance feedback.

According to Kotler (2005) the basic issue in marketing is creating a category you can be first in. It is in the law of leadership: it's better to be first than it is to be better. It's much easier to get into the mind first than to try to convince someone you have a better product than the one that did get there first." Organizations should strive towards offering excellent customer service the first time so that they can retain the customers and controlling the market share.

According to Kotler (2006) customer service is a core business process, which entails "all the activities involved in making it easy for customers to reach the right parties within the company and receive quick and satisfactory

services, answers and resolutions of the problem". Initially, marketing as a discipline developed in connection with selling of physical products. However, through the years, as the economies have grown more and more complex, it has become necessary to look at marketing from broader view point of the marketing of service.

Christopher (2001) view customer service as a concern with the building of bonds with customers and other markets or groups to ensure long term relationships of mutual advantage. He notes that provision of quality customer service involves understanding what the customers buys and determining how additional value can be added to the product or service being offered.

Quality service has a link to market growth and profitability resulting from loyal customer base. In order to deliver quality customer service, there is need to understand service quality from both the customer and service providers perspective. There is also need to understand the means of measuring, recording and monitoring the service quality. According to Massie, (2003) once the areas for improvement are identified, the strategic planner seeks to answer the questions, what activities should the organization perform in order to improve those areas? The mission of organizations is the specific and well defined roles and activities on which the organization elects to concentrate its efforts; it determines the scope of planned activities. The degrees of specialization, diversification and issues that affect the mission of the organization"

With a clear understanding of where it is headed (goals) and what scope of activities it will engage in (mission), management needs to select the routes and common threads of its approach for its decisions. Management has many alternatives of routes and directions available for reaching its goals. The choice of a mission is itself a strategic choice but in addition, management must seek an appropriate group of guidelines for laying out the route for performing its mission.

Customer satisfaction is a pillar to the success of any business organization. This is easily forgotten in times that place acquiring a new customer into the Centre of business and marketing strategies. A high customer

satisfaction will bring loyal customers and therefore a huge potential: they buy more often, with a higher order value and they are likely to bring new customers.

Customer Retention

For a company to be successful, the company needs to be very involved with meeting customer needs, or the customer will go elsewhere. Therefore, profit seeking firms, regardless of their true motivation are forced by the nature of the market place to treat customers with respect and seek their loyalty and return business. This can greatly improve customer retention. Firms should strive to strengthen the bond by adding value to every contact. A well – handled complaint can actually become a positive experience in the eyes of the customer. Customer focused programs that help to enhance customers brand experience should be encouraged which results to return business.

Customer Loyalty

Customer service leads to customer loyalty. This is done through what customer relations

expert Maxine Kamin calls the “equation of fantastic service”. The first step is to greet the customer, making him feel welcome and at home. Then the client’s specific needs must be determined. Third, those needs should be checked and rechecked to make sure nothing is left out. Finally, fantastic service “leaves the door open” making sure the client has an incentive to return. The benefit to the customer is pleasant and efficient experience, and the firm has just recruited a loyal customer.

Customer Relations Techniques

Providing excellent customer service is about assuring satisfied customers that had customer loyalty to continue to return. It is also about being creative in customer relations techniques such as add-on sales, reminding customers of specials, giving special promotional pricing, advertising, marketing, in – store signing and the many related activities that help you increase the overall volume and the average “paper circulation” or sale price of merchandise.

Figure 7.1 Conceptual Frame Work

The conceptual framework is used to show the relationship between the research variables

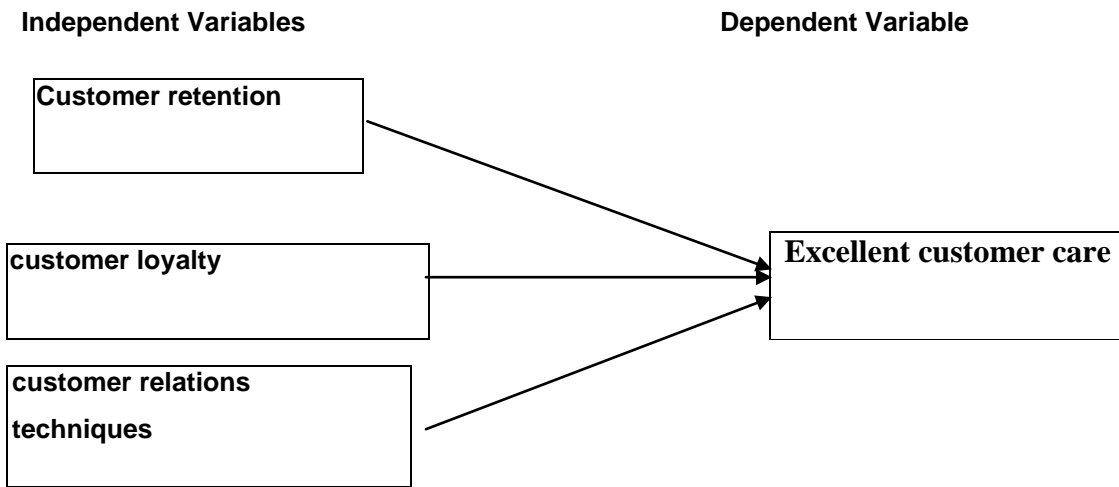
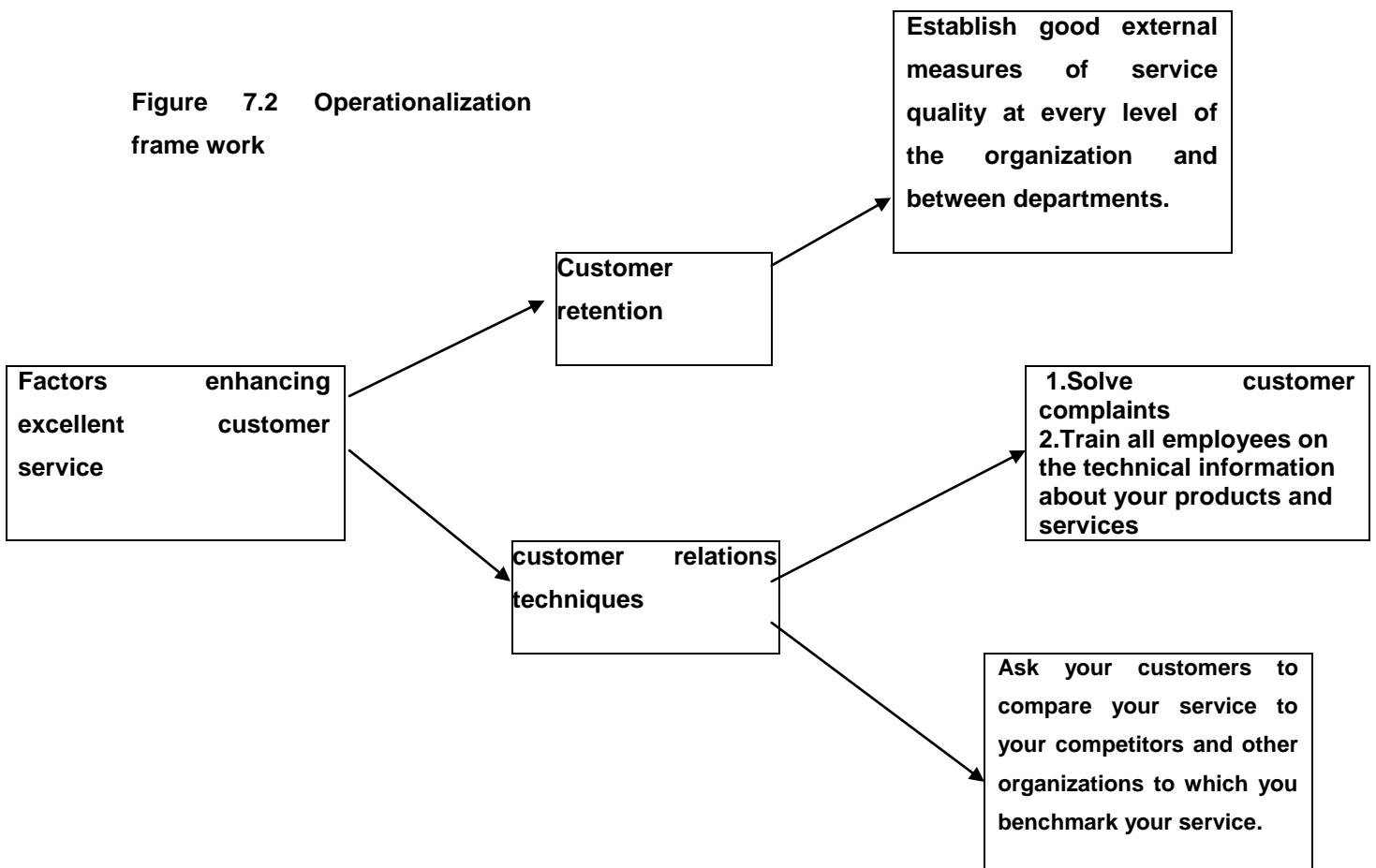


Figure 7.2 Operationalization frame work



8.0 Methodology

The study adopted a descriptive research design which was used to obtain information concerning the current status of the phenomena with respect to variables (Mugenda and Mugenda, 2008). The study found this design appropriate since it aimed

to gather information describing the nature and characteristics of the factors enhancing excellent customer care. The study targeted the staff and customers at the Nation media group headquarters. A total population of 100 was targeted and 30 respondents selected which was 30% of the total target.

Table 3.1 Table showing Target population

Category	Population Frequency	Sample size	Percentage
Customer service Executives	40	10	30
Customers	60	20	70
Total	100	30	100

Data was collected using a uniform questionnaire with structured and unstructured questions as to be able to ensure qualification of responses. It was administered after gaining permission from the NMG management to conduct the research. Questionnaire was easy to administer and economical in terms of money and time. Interviewing was also extensively used where low literacy levels of customers were guided in the questionnaires.

9.0 Findings

The analysis of the response rate was as follows;

The study sought to know the gender of respondents. From the findings, the study found that majority of the respondents as shown by 71.7% were male, while 28.3% were female, this information shows the non biasness displayed in the study.

Table 9.1 Table showing Response rate from employees of the Nation Media Group

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Male	21	71.7	71.7	71.7
Female	8	28.3	28.3	100.0
Total	30	100.0	100.0	

Table 9.2 Customer Care Complaints

	Frequency	Percent	Valid Percent
Valid Few	8	26.7	26.7
Very few	4	13.3	13.3
Undecided	3	10	10
Many	3	10	10
Very many	12	40	40
Total	30	100.0	100.0

The researcher as shown in table 9.2 above wanted reactions on the number of complaints at NMG and 26.7 % indicated as few, 13.3 very few, 10 undecided, 10 many

and 40% indicated very many. This meant that customer care remained very important factor that could enhance excellent service.

Table 9.3 Organizational Comparison on Customer Care Service

	Frequency	Percent	Valid Percent
Valid Fair	12	40	40
Good	3	10	10
Undecided	2	7	7
Same	3	10	10
Poor	10	33	33
Total	30	100.0	100.0

According to table 9.3 above it is clear that the company has average customer care at

50% of the respondents indicated. 33% however felt that it was poor.

Table 9.4 The extent to which customer retention, loyalty and techniques affect Customer Care Services at NMG

	Frequency	Percent	Valid Percent
Valid Small extent	5	17	17
Lager extent	20	66	66
No answer	2	7	7
Same	3	10	10
Total	30	100.0	100.0

According to table 9.4 above it was noted that more than 66% value loyalty, retention and customer relations techniques while only

10% feel that the same trend will take place even if those variables are adopted

Table 9.5 Extent to which the following factors influence customer care

scale: 4= large extent, 3= Normal, 2= Small extent, 1= No answer

NO.	Category	4	3	2	1
1	Staff Motivation	x			
2	Free Magazines		x		
3	Incentives	x			
4	After sale service	x			
5	Subscriptions		x		
6	Client Visits		x		
7	Giving free samples	x			
8	Introducing new products			x	

10.0 Conclusion and Recommendations

10.1 Conclusion

Based on the study, the results will assist the NMG and other media houses in understanding what customers regard as quality service. Efforts could then be made to match the expectations of customers with resources channeled to revamp the areas of weakness while sustaining the strong points. The Ministry of information and communications as a stake holder of the media industry could find the study useful in understanding the determinants of excellent service quality from the customers' perspective. This could facilitate their effectiveness in their surveillance and regulatory functions of the industry. The research would help the media houses to clearly understand the prevailing challenges in current business environment and guide the media houses on how to design their services so as to distinguish them from those of other media houses in the target market.

10.2 Recommendations

Quality service has a link to market growth and profitability resulting from loyal customer base. In order to deliver quality customer service, there is need to understand service quality from both the customer and service providers perspective. There is also need to understand the means of measuring, recording and monitoring the service quality. An organization should be able to always adopt the changing customer needs and indeed identify areas of improvement so that it can offer quality excellent customer service. The mission statement and the organizational vision should be clear and focused placing the customer any other interests.

According to the findings it was noted that more than 66% of customers value loyalty, retention and customer relations techniques. This was as a result of immense competition from other houses both national and international.

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Human Resource Strategies on Retention of Faculty in Private Universities in Kenya: A Case of Daystar and Pan Africa Christian Universities. Faculty Retention Gap

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Abstract

A study on human resource strategies and relationship to faculty retention was carried out in private universities in Kenya. It was specifically conducted as a case of Daystar and Pan Africa Christian universities for the purpose of exploring various human resource strategies geared

towards retention of full time faculty in these respective universities. The target population was full time faculty, heads of departments and deans in three departments common to both universities, namely, biblical studies, counseling and business; and human resource managers. Data was collected using questionnaire, interview guide and document analysis and analyzed using Statistical Package for the Social Sciences (SPSS) and descriptive narratives. The findings revealed that strategic human resource managers in both universities had some strategies in place for retention of faculty. The participants, especially deans, heads of departments and lecturers without administrative tasks, proposed ways of improving the existing strategies to enhance faculty retention. They also raised challenges they considered to be faced by SHRM in their efforts to retain faculty and ways to minimize the same. In summary, monetary challenges were more than non-monetary according to opinions of participants. The strategic human resource managers in both universities therefore needed to utilize the expressed dissatisfaction, cited ways of improving retention by facing challenges through their professional expertise, suggestions of research participants. Based on research findings, the researcher concluded that; there were differences of opinions among lecturers, heads of departments, academic deans and strategic human resource managers on the best strategies to retain faculty. A dean had expressed the same thing while referring to heavy administrative responsibilities as a challenge to research. It was therefore necessary for the strategic human resource manager to consider hiring more teaching staff to share extra workload so that the university would grow through research, writing and publication. The management needed to provide a climate which would make exchange of views between lecturers and management on the best strategies each university needed to configure in order to retain their valuable faculty.

Key words: Strategic Human Resource Management, Faculty Retention Gap, Private Universities

INTRODUCTION

This paper discusses a specific feature that emerged within a larger and more comprehensive study on relationship between faculty retention strategies utilized by strategic human resource in order to gain competitive advantage over other universities. It focuses on divergence in perceptions regarding the effectiveness of the role played by each of the selected strategies in retaining full time faculty. The divergence of opinions was studied among key groups among staff involved in the process of retention of needed faculty. At the top of the selected groups was the human resource manager, followed by deans of Schools, heads of departments and rest of the teaching staff without administrative tasks. Specific strategies were studied, analyzed and key findings used as the basis for summary, conclusions and recommendations. Appropriate theoretical framework was used to guide the study. Among the critical literature reviewed, review of similar study done in European Business Schools informed the study done in Kenyan universities and gaps were identified.

Strategic Human Resource Management (SHRM) can be defined as the linking of human resources with strategic goals and objectives in order to improve business performance and develop organizational culture that foster innovation, flexibility and competitive advantage (Welbourne, 2003). SHRM was concerned with “the contributions Human Resource Management (HRM) made to organizational effectiveness and the ways in which these contributions are achieved” (Ericksen and Dyer, 2004). These contributions led to competitive advantage. According to Dadwal (2003), competitive advantage was the benefit that the private universities would get from retaining faculty members who had “high value, are rare and unavailable to competitors, are difficult to imitate and can be organized for synergy” (Dadwal, p. 9). Daystar and Pan African Christian universities would have secured and sustained competitive advantage through the use of SHRM strategies such as recruiting, selecting, training and rewarding personnel (Hollenbeck & Wright 2008, Hollenbeck, 2006). This would have further enhanced faculty retention if applied strategically by SHRM.

Statement of the Problem

The two universities, Pan Africa Christian University (PACU) and Daystar University (DU) were unique in that they are among faith-based universities that insisted on admitting students and faculty on the basis of profession of Jesus Christ as personal Lord and savior according to scriptures in addition to other requirements professional and academic requirements needed for Kenyan universities. The researcher was interested in finding out the human resource strategies used in the two universities for the purpose of retention of full time faculty because two lecturers had left Daystar for better opportunities in other universities within a space of four years and it was. With the increase of other universities in the city of Nairobi competing for the same faculty that the two universities needed, could there have been faculty retention problem? The researcher intended to explore this. Decline in student enrollment was a challenge which was likely to create funding problems, paying salaries to lecturers included (Naris and Ukpere, 2009). The main source of funding for the said universities was the students' fees. The ongoing trend of decline in student enrollment in the two universities may have led to poor salary for their faculty members in the two universities or inability to maintain current pay rates as already expressed in the strategic plans of the two universities (Daystar strategic plan, 2011-2016 & PACU strategic plan, 2011-2015). The researcher wanted to find out whether there were faculty retention strategies in place or upcoming in response to this trend. In that year alone (2011), six full-time lecturers left PACU. Two of them had HOD status (Faculty Recruitment Memo, August, 2011). In the same year, two lecturers had left Daystar University. According to Daystar's 2011-2016 strategic plans, the success of the University was dependent on, among other things, availability of highly skilled and motivated staff that would ensure smooth operation of the University's activities and programs. Thus, the University needed to attract and maintain adequate and high quality staff capable of supporting the diversified programs and services on offer.

According to views expressed by university management, appropriate human resource strategies, policies and procedures needed to be implemented at all times to meet the need for faculty retention (Daystar strategic plan, 2011-2016). One of the main objectives in Daystar plan was "To attract and retain high quality human capital", (p.25). Two threats noted would lead to brain drain and competition from emerging universities (Daystar strategic plan, p.27). The Commission of University Education (CUE) had insisted that faculty needed to be PhD holders in their teaching areas (Commission of University Education handbook on processes for quality assurance in Higher Education in Kenya, 2008). In the light of the foregoing challenges, the researcher wanted to explore the strategies in place to retain existing faculty.

Theoretical Framework

A theoretical framework guides your research, determining what things you will measure, and what statistical relationships you will look for. It also provides analytical structure within which to locate a particular form of argument to provide clarity. The theoretical framework of this study was based on configurationally theory (also called resource-based theory) to Strategic Human Resource Management (SHRM) as identified and advanced by Boxall (1996) and Wright (1998). Configurationally theory best fitted this study because it emphasized that SHR practices, also here called strategic human resource management strategies, were considered critical towards achievement of competitive advantage that institutions needed to have so that they would effectively compete with other similar universities in around the world. Further, various studies had found significant increase in productivity and decrease in turnover rates (Becker and Huselid, 1998; Guthrie, 2001) when HR employed this theory in management. The theory promoted a system of SHRM that could be customized to provide both vertical (how top management works with those people down the hierarchy, faculty included) and horizontal fit (how human resource strategies harmonize with the other practices and policies).

Uniqueness of the abilities of SHRM to configure these managerial units in order to retain faculty was a source of competitive advantage potentially. Human resource characteristics that provide a competitive advantage if incorporated strategically would help reduce faculty turnover and at the same time benefit from the good will of the employees to market the institution. It was evident that with the increasing demand of higher education in Kenya and upcoming of private universities to help supplement the government effort to provide quality education, institutions needed to employ strategies to recruit and retain trained quality faculty. This called for human resource management to both ensure the vertical and horizontal aspects of management were effectively managed. A specific application of Configurational strategies in the said universities meant that universities' top management divisions such as human resource, finance, academic and research needed to consult frequently, plan certain aspects of faculty retention as a team and harmonize with teaching and learning environment where quality, as well as technical skills were needed and constantly changing (Cambre, Fiss, & Marx, 2011). Looking at an application of vertical fit, it meant that the top management would lead together with members of lower ranks in respective universities. Possibly this strategic approach to leadership would have promoted sense of ownership of the universities by more members than otherwise.

Critically looking at configurationally theory, it may be said that resources within the universities under study cannot in themselves be the only source of competitive advantage in this time of global exchange. Intervening variables such as e-commerce and impact of media presented challenges of using single theory. Human resource styles of management therefore needed constant review in order to address these changes both vertically and horizontally. Need to provide new directions in the world where competitive advantage was sought would not have been underestimated. Since it was not easy to reduce the current global dynamics into a single theory and research required a single theory for guidance, configurationally

theory was considered by the researcher to be the best in explaining the different variables in the study. It was selected from among the three theories with widespread use in the field of strategic human resource management (Delery, J. & Doty, H., 1996). The other alternative theories take a universalist and contingency perspective. The universalist theory is based on the premise that there are universal HR strategies which work best in all organizations to yield best performance (Delaney, Lewin & Ichniosky, 1989, Huselid, 1993, 1995, Osterman, 1994, Pfeffer, 1994; Terpstra & Rozell, 1993). Contingency theory was based on the premise that HR strategies should be designed to fit the environmental uncertainties (Bakin & Gomez-Mejia, 1987, Begin, 1993; Gomez-Mejia & Bakin, 1992; Schuler & Jackson, 1987). The last two theories proposed variables which are not easy to identify and manipulate in the study.

Conceptual Framework

In light of the strategic HRM of Harvard University discussed in detail in chapter two and findings of other education researchers in the field under study, the researcher formulated a conceptual framework to help summarize the study. The variables selected in the framework were based on the concept that effective SHRM strategies which were widely used to enhance retention of faculty and therefore expected to provide university-wide benefits.

Shown below is a representation of the SHRM strategies (independent variables such as staffing, training and development, job designs, job promotion, job security and information sharing and collaborative leadership). These strategies, if well configured by SHRM, would have led to high faculty retention, high employee's satisfaction, high productivity and proper service delivery. The variables cited above were explored through the research process to find out the influence they were related to retention of full time lecturers. It was hoped that independent variables such as job security as a SHRM strategy would create a strong sense of ownership in faculty and so make lecturers want to stay long and make

positive contributions towards growth of the university.

According to Mugenda and Mugenda (2003), a variable is a measurable characteristic that assumes different values among the subjects (p.11). Speaking in terms of cause and effect, independent variable is the characteristic which causes change in behavior of another variable. The characteristic that changes as a result of the causative characteristic, such as retention, is the dependent variable. In this

study, some of the common independent and dependent variables regarding faculty retention are diagrammatically conceptualized as shown in figure 1.

Intervening variables- qualities which work with stated independent variable to positively affect dependent variable. Adequate staffing for the said universities may work with appropriate gender, tribal and age mix for it to promote high overall performance

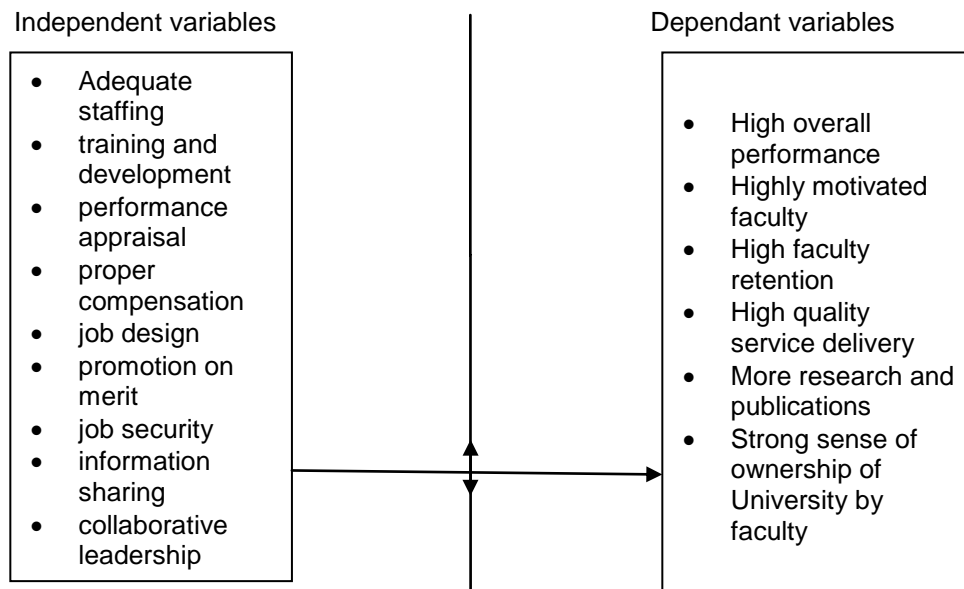


Figure 1: Possible Factors Influencing Faculty Retention

Moderator variables- Job appraisal, for example has to be well received by faculty appraised for it to promote high performance. Qualities of innovative (fresh looks) appraisal include, but not limited to, objectivity and transparency.

Discussion of independent, dependent, moderating and intervening variables

In any particular study, variables can play different roles towards faculty retention in the said universities. Specifically, there is only one dependent variable, and it is the outcome variable, faculty retention. The indicators conceptualized are highlighted in the conceptual framework to predict.

The study treated activities of strategic human resource manager as independent

variables in faculty retention and responses of faculty to SHRM strategies as dependent variables. The selected variables were related to faculty retention. Adequate staff would promote overall in the said universities through reduced workload, more time for research, writing, publication and consultancy. Regular training of staff through skill imparting seminars and workshops would lead to a highly motivated faculty through increased work related confidence. Performance appraisal would possibly lead to faculty retention in that each lecturer would voluntarily set his or her own goals to achieve over time as a stakeholder in respective universities.

Proper compensation would lead to provision of high quality service as most lecturers

would value their work more. If SHRM would design jobs in ways that promote research, it would enable upward mobility of the lecturers and promote growth of the university in researcher's goal to explore existing strategies in the said universities with above strategies in mind.

Critical Review of Selected Empirical Literature and Retention Gap

One previous study was reviewed because it best informed the study in the private universities in Kenya among previous studies available. It was a research project for Doctor of Philosophy in Business Studies carried out in European Business Schools by Moratis, Baalen, Teunter, and Verhaegen (2005). They reported their findings from a survey of a PhD research project that was conducted in 2003-2004 among European Business Schools on faculty and deans to find out ranked faculty retention factors from each group using top ten ranks for faculty and comparing each rank with corresponding deans' ranks on the same variable. The purpose of the research was to study the differences in perception of retention factors between junior faculty and their deans on retention factors for junior faculty. Junior faculty here refers to full time teaching faculty who are neither HODs nor deans. A survey method in which a questionnaire whose category (key areas of HR practices) and factor examples was used.

All the participants were asked to respond to 42 factors and seven broad categories under which related factors were listed and later scored. Individual differences in perception on factor ranks were noted between faculty and deans in their responses to the same items. Classification of questions included categories such as age, gender, background and school characteristics for faculty motivation, which, in turn determines faculty retention. A paper-based survey form was sent to 181 Deans and 69 responded from 18 countries. Online options were used with 243 faculties from 38 schools and the response rate was higher. Top ten retention factors ranked according to faculty and deans (Table 1). Averages of differences were also

several ways including increase of university professors. Collaborative leadership would potentially instill a sense of ownership of the universities by their faculty members. It was calculated and first three scores are indicated in the table in each case (for faculty and deans).

Faculty Retention Gap in European Business Schools

Faculty rank and dean's rank differences as retention gap in managerial decisions and associated outcomes that affect faculty retention provides a useful insight in this aspect of education planning and administration. Taking a few extremes from Table 1 showing the divergence of opinions regarding the strength of each strategy towards enhancing retention of faculty, different interpretations may be made. To the deans, reputation of the school in the academic community ranked 3rd while the same variable ranked 10 among the faculty without administrative posts. This suggested that deans were more proud about their university, perhaps with a stronger sense of ownership. Comparing deans' rank with faculty rank of 3rd, geographical location of the schools were as important to faculty as reputation of the university to the deans. It may suggest that faculty lived outside the university while deans lived in the university. It may be that both categories of staff lived outside the university. Without additional information from the demographic information of the participants, it is hard to give a conclusive statement about positive correlation between places of residence and importance of each variable to each category of identified participants. Academic freedom ranked nearly the same for both categories of participants, suggesting that freedom may have been a high value for retention to both groups. On innovation and progress of the school as one the 42 selected and ranked, deans were quite high (2) while faculty remained low (9). This disparity might have reflected the differences between deans' high commitment to institutional goals in comparison with faculty.

Table 1: Divergence in Perceptions on Faculty Retention Strategies between Faculty and Deans

Variable ranked	Faculty ranking	Dean's ranking	Retention gap
Acadef	1	3	2 down
Reseti	2	10	8down
Gelosch	3	12	9 down
Stipeco	4	1	3 up
Oprodev	5	13	8 down
Reres	6	4	2 up
Reclisch	7	17	10down
Reprofa	8	14	6 down
Inprosch	9	2	7 up
Repuacad	10	7	3 up

Key: Acadef = Academic freedom; Reseti=Research time; Gelosch=Geographical location of the schools; Stipeco= Stimulating peer community; Aprodev= Opportunities for professional development; Reres=Recognition for research achievements; Reclisch= Recognition for research achievements; Reprofa=Resources for professional activities like conferences; Inprosch=Innovation and progress of the school; Repuacad=Reputation of the school in the academic community.

Methodology

Survey method and naturalistic designs were used in this study. Survey design is where different groups of people are studied at one point in time and hence all observations can be completed relatively quickly (Lerner, 2002). Survey method was the most suitable for this study because it served researcher's purpose which was to explore faculty retention strategies available in PACU and DU, suggestions for improvement, challenges, and recommendations. Population was fairly large. The design was naturalistic in that it was carried out with participants in their natural working routines and environment. The main purpose of doing survey was to determine the current status of that with respect to variables and acquire information about people's characteristics, opinions, attitudes, or previous experiences (Mugenda and Mugenda, 2003, Leedy and Ormrod 2005). The data collected was to be analyzed using techniques which were

largely narrative and visual in nature (Gay, Mills, and Airasian, 2006). Characteristics of such data are quantitative, characteristics of research as naturalistic, descriptive, concerned with process as well as product and inductive analysis of data (Fraenkel and Wallen, 2006, Melter and Charles, 2008, Creswell and Miller, 2000). Chris (2009) adds that benefits of survey design as a case of two universities would serve as a good source of ideas about behavior, good opportunity for innovation, good method to study rare phenomena, good method to challenge theoretical assumptions and good alternative or complement to the group focus of psychology.

Target Population

According to Mugenda and Mugenda (2003) target population is that population to which a researcher wants to generalize the results of a study. The target population of the study consisted Deans, Human Resource

Managers, Heads of Departments and full time lecturers in DU and PACU in biblical studies, counseling and business departments.

Universities

The two universities were purposively sampled because of their recruitment procedures that their faculty members must possess and practice the sponsor's faith. In their article Statistics Glossary v.11, Easton and McColl (n.d.), Statistics Glossary v1.1, simple random sampling is the basic sampling technique where one selects a group of subjects (a sample) for study from a larger group (a population). Each individual is chosen entirely by chance and each member of the population has an equal chance of being included in the sample. Every possible sample of a given size has the same chance of selection. However, the sampling technique used was non probability sampling.

Deans and HODs

The deans were automatically included because they played leadership roles and duties in the process of implementation of SHRM faculty retention strategies. Their opinions about various variables studied were also useful to the researcher for analysis and recommendations. They were further involved in formulating and implementing academic policies and guidelines. HODs were automatically selected as the immediate supervisors of faculty and mediators between management and faculty. They implemented policies by working with faculty who are actual implementers at classroom level through teaching. The HOD's position and roles therefore allowed them to be in touch with activities of faculty on daily or weekly basis, an experience which Deans and SHRM may not have. The researcher benefited from such a variety of experiences and opinions on SHRM strategies to be used in data collection and analysis.

Human Resource Managers

Human resource managers were included because they were only two and each of them played a major role in leading their

human resource departments in attraction, recruitment and retain desired employees. They were therefore the most resourceful people to interview. They advised management on the best practices for management of human resource to help the university remain competitive concerning faculty retention strategies.

Lecturers

The lecturers were crucial in implementation of policies and teaching in the university, primarily through their teaching roles. Out of 120 lecturers in Daystar University, 30 were purposively sampled because they belonged to the three departments available in both Universities. Out of 15 lecturers at PACU, five were selected because they belonged to the selected departments. The part time lecturers were not considered for participation in the research because they had brief contracts of three months. The researcher was not sure of accessing them for data collection, neither were they appropriate to talk about retention strategies which were not applicable to them.

Description of Sample and Sampling Procedures

Non-probability (purposive type) procedures were used to select the sample size. No basis for probability that each item in the population of interest was to be selected (Kothari, 2009). In this case, the strategic human resource managers, deans, HODs and full time lecturers were all included as the only ones who met the researcher's requirements. Specifically, the automatically selected participants consisted of two (2) human resource managers, three (3) deans in Daystar and one (1) in Pan Africa Christian University, three (3) heads of departments in each university, thirty (30) lecturers in Daystar and five (5) in Pan Africa Christian University. According to Gay (1976) a sample size of 10% to 20% of the population is adequate for survey study though the bigger the sample the better. Each of the target groups was automatically selected for its unique contribution to the research.

Research	Sampling	Population	Sampled	Percentage
Participants		in each University	Sampling size	
Universities	Selected	2	2	100%
Deans	Selected	5 in DU	3	60%
Deans	Selected	1 in PACU	1	100%
HODs	Selected	14 in DU	3	19%
HODs	Selected	3 in PACU	3	75%
HR managers	Selected	1 in each University	2	100%
Lecturers	Selected	120 in DU	30	25%
Lecturers	Selected	15 in PACU	5	33%
Total		153	46	30%

Table 2: Sampled Participants at DU and PACU

Description of Research Instruments

The researcher obtained official clearance from the Catholic University of Eastern Africa before proceeding to ministry of education for permit to conduct the research in 2011. Permission from universities where the research was conducted was sought by the researcher and granted. Thirty five self-administered survey questionnaires were distributed to all full time faculty and deans in both universities. They were anonymously completed in hard or soft copies and returned to the researcher directly or through the office personnel at 100% response rate in Pan Africa Christian University and 89% response rate in Daystar University. Questions used were proof read by a professional in the field of research for clarity and supervisors in order to increase their reliability and validity by correcting any ambiguities before using them with actual respondents. Pre-testing the instruments was not possible because the participants were few. Document analysis guide was used to enable the researcher to do basic analysis of the documents related to faculty retention through personal interviews with each human resource manager in the two universities. Personal interviews were

conducted by the researcher with the Strategic Human Resource Manager, Dean and HODs by use of interview guide in both universities.

Analysis of Faculty Retention Gap in DU and PACU

The findings were analyzed within each university across four levels of participants (SHRM, Deans, HODs and faculty). Within each group, between groups and between the two universities, variations on contribution made by each strategy to faculty retention as well as divergence in proposed strategies were identified. Summaries, shared opinions and diverging opinions were analyzed.

Responses of Deans and HODs on Faculty Retention Strategies in DU and PACU

There were similar but slightly different responses to the same issues are summarized in table 3 below from deans and HODs from both universities concerning existing strategies to retain faculty. The findings were processed from responses in the interview guide on the same questions. Each group gave opinions on what they felt

about effectiveness of each strategy towards improvement of faculty retention. A percentage of total participants in each case

were computed in each case as an indicator of divergence of opinions, which was called retention gap by the researcher.

Strategy	Summary statements of Deans and HODs in both universities.	Shared views on retention power.	
		Deans	HODs
Salaries and benefits	'Average, not as competitive. Five (5%) annual increase was okay.'	3 (75%)	4 (67%)
Motivation to teach	'On average efforts are made by HR. Motivation is good.'	2 (50%)	4 (67%)
Teaching load	'I motivate my lecturers verbally'.	3 (75%)	5 (83%)
Research support	'Overloaded, 9 hours preferable. Heavy, feels overworked'.	4 (67%)	5 (83%)
PhD scholarship	'Low funding and no time. Insufficiency of faculty, more work'.	3 (75%)	6 (100%)
	'Self-sponsored PhDs, not supported. Few bonded PhDs. No time for study'		

Table 3: Rating of five existing top strategies by Deans and HODs in DU and PACU in terms of relative improvement made by each strategy on faculty retention

The actual statements of majority participants (over 50%) were summarized in the table 3. It was observed that there was a divergence of opinions between the two groups of HODs in both universities. The HODs at PACU gave a consensus that salaries were low, workload was high, research funds available in principle rather than in practice. On a positive note, they observed that a PhD scholarship of 40% of tuition was available to all lecturers at all ranks. This was a better response in this one strategy compared to Daystar University. The deans, HODs at Daystar did not comment much about salaries as what would cause them to leave. As indicated before, other factors such as lack of teaching facilities which were under service delivery were more critical. Their only dean was neutral in most of the comments. He emphasized the need to teach as a calling from God. Comparing Deans with HODs in the two universities while assuming intervening variables, retention gap was identified as the differences in opinions

concerning the extent to which each strategy studied enhanced retention of faculty. In Daystar and Pan Africa Christian Universities, SHRM highlighted three challenges their offices faced regarding faculty retention as follows; "Availability of committed Christian professionals, competition from emerging universities, and the balance between cost and quality". He raised two measures being taken by the university to minimize the effect of these challenges on faculty retention, namely, yearly reviews for equitable pay and an active policy of recruitment. Their strategies for retention were geared towards minimizing the three challenges. This variation among them (SHRM, Deans, HODs and faculty) was a dynamic and complex gap in each university. Asked whether the university had strategies in place towards minimizing turnover of faculty, the SHRM cited them as; "enhancing entry point for all lecturers, tuition waiver on dependents of lecturers taking academic programs in the university, and sponsoring PhD studies for lecturers." When

invited to evaluate how the services they were receiving from management as lecturers was motivating them to remain in the University, their ratings of service delivery were diverse and rather low as the results obtained from the analysis of the responses based on their experience of various aspects investigated by the researcher's research instrument is shown in the table below according to SPSS outputs from both Universities.

Retention Gap between Universities for based on Faculty

The faculty between universities varies by age, gender, level of qualification, number of years in the profession and number of years in the same university. It is outside the purpose of this study to study the influence of age, gender and other factors which may positively or negatively influence a lecturer to remain in the same university or to move to another. Researches in variables have been done or can be done in the said universities but it was not the interest of this study. Universities also differ in terms of university cultures, size, philosophy, size and location

and more. Assuming all such intervening variables were not influential on response of lecturers in both universities regarding service delivery, the table 3 indicated retention gap. The table is an SPSS output based on a likert scale on a scale of 1-5. The raw data was coded to convert it to inferential statistics for use with SPSS as a code book. The results in the table were discussed in reference to faculty retention gap.

Variables investigated as indicators of service delivery (SPSS output simplified).	Percentage (%) toward 'excellent' PACU DU		Mean PACU	Std Deviation PACU	Mean DU	Std. Deviation DU
	Working conditions	72	62	3.6000	.89443	3.1053
Current salary	56	58	2.8000	1.30384	2.8947	.73747
Public relations with employer	72	64	3.6000	.54772	3.2105	1.08418
Lecturer-management relations	68	56	3.4000	.89443	2.7895	.91766
Effectiveness of service delivery	48	58	2.4000	1.14018	2.9474	.91127

Table 4: Analyses of Lecturers' Responses in PACU and DU on Service Delivery

The Key used in the research instrument to evaluate service delivery to the lecturers was; 5 for Excellent; 4 for Good; 3 for Average; 2 for Poor and 1 for Very Poor= 1. The

responses of each lecturer to each variable were fed into SPSS for processing of detailed analyses and results were combined in table 3.

Based on the average ratings in the summary table of selected variables which were investigated using likert scale, a general observation was made. Working conditions were rated higher (72%) in PACU than in DU (62%), seconded by public relations between the lecturers and the SHRM as the employer. Retention enhancing relationship between lecturers and the employer was rated third while lowest ratings (58% and below) were assigned to effectiveness of service delivery by management to lecturers and the salaries which the lecturers received then. Generally speaking, ratings were slightly higher in PACU than in DU. Means presented from SPSS output represented the closeness or distance from excellent service delivery in each variable. Standard deviations indicated divergence of opinions among the lecturers over the strength of contribution of each variable towards faculty retention.

Standard deviation statistic was computed because it was useful in the study as an indicator of divergence since it measures divergence from the mean, a measure of spread of individual results around a mean of all the results. In this group of scores, standard deviations in the table reflect measures of dispersion from the average rating meaning that some lecturers gave high ratings and others low ratings on the same variable. Higher values of standard deviation indicated greater the diversity of opinions about the influence of a particular variable from average, hence higher retention gap. The average value was used to give an impression on how the findings were closer to the highest possible score (5) for 'excellent' which would have indicated that the variable's motivation to lecturers' propensity to stay was a 100%. In such a case, there would have been no need to improve strategies or discussion about SHRM challenges to retain faculty. The SHRM would have worked hard to maintain the existing perfectly retentive variables or strategies.

Responses of Faculty in DU and PACU Regarding Strategies for Faculty Retention

In the report and discussion that follow, responses of lecturers without administrative positions were found to be insightful. The structured and semi-structured questionnaire administered to full time lecturers in three departments in Daystar University provided useful information on their being retained. The responses from semi-structured items were summarized in the same pattern of selecting the top five based on criteria such as frequency and details supplied in the statements made.

The top five faculty retention strategies raised as 'I like best' by the majority participants (over 50%) were: "Benefits of car loan, university lap top to full time faculty, Christmas bonus, medical benefits and University Sacco".

Other retention strategies rated below top five included, but not limited to, the working relationships and collegiality and integration of faith with learning as the Christian philosophy of the founders of the university. Over fifty percent (50%) of the participants recommended improvement on; "Clear leadership structure, flexible time schedule, departmental level support, better work-family policies (maternity leave, tuition waiver for lecturers' dependents)." The top five self-reported statements under 'I like least' category were highlighted by majority lecturers as follows:

Criteria for promotion is unclear and based on subjective staff appraisal. Unfair placement methods. Salary review criteria were unclear to the participants. Lack of dialogue between administration and workers over critical decisions affecting lecturers. Lack of workers' organization to air grievances. Heavy workload.

Other statements expressed by majority faculty rated below top five dissatisfies were included, but not limited to, the following:

No room for research. Grapevine rather than official communication often provide distorted messages and lead to different interpretations. Lack of coordination.

Bureaucracy in decision-making. Promotion of lecturers is not a priority to SHRM. Lack of enough offices for faculty and teaching facilities such as projectors and computers.

Faculty Retention Strategies used by Strategic Human Resource Management and Retention Gap

The research question on strategies used in both universities was thoroughly explored through the research tools. On a positive note, lecturers generally expressed that they had useful working relationships at collegial. On the other hand, they expressed dissatisfaction with less than desired salaries, lack of clear leadership structure, flexible teaching time, heavy workload, and lack of research support, bureaucracy in decision making, lack of promotion for lecturers and lack of administrative support. The lecturers seemed not to be conversant with the criteria for promotion, which primarily academic growth. The deans and heads of departments had slightly diverging views from those of lecturers without administrative tasks. They emphasized the need for academic growth through research support but they did not recommend much change on workload to allow for viability of their proposals. In general, this group of participants seemed more satisfied than lecturers without administrative tasks.

Strategic Human Resource Management Strategies to Improve Faculty Retention

All participants expressed that various SHRM strategies needed improvement. One lecturer in PACU recommended that “clear policy on faculty promotion was needed” as well as “better remuneration”. Speaking on the same need at Daystar University, one lecturer emphasized what some others were saying that there was need for “continuous salary reviews”. The researcher was quick to note a rare strategy raised by a lecturer for promotion of community building thereby enhancing retention through “sports facilities for faculty and staff”, “encourage staff-student fellowships” and “facilitate communication between faculty and administration”. There

was a dean for community life and perhaps such ideas were an eye-opener to that office. The researcher considered this to be a rare yet important strategy toward building a retentive climate not only for lecturers but for non-teaching staff and increased benefits of students- lecturer’s friendships that would enhance learning and potentially promote enrollment. The human resource manager in Daystar recommended “yearly salary reviews for equitable pay” while the human resource manager at PACU proposed a more comprehensive improvement based on “better terms and conditions of service”. A dean in Daystar proposed “constant review of salaries”

Challenges Faced by SHRM in Retention, ways of minimizing the Challenges

Besides the challenges of retention gap, there were other challenges regarding faculty retention. One HOD in Daystar noted that “salaries were the biggest challenge” and same observation made by dean when he responded during interview that low salaries were “one of the biggest threat” to faculty retention. A lecturer in Daystar observed that salaries were “a major challenge in that the rates were below market rates” for the same quality of faculty and so “one needed a high level of commitment to the university” in order to remain there. The researcher observed that human resource managers in both universities right documents in place regarding faculty retention but implementation was a challenge though none of them raised it. One HOD at PACU submitted that “faculty turnover has been high”. The foregoing excerpts, challenges to faculty retention were varied and numerous cited.

Conclusions

Based on the research findings, the faculty retention gaps within homogeneous groups, across groups in the managerial ranks and between universities were evident. The research achieved the intended purpose by answering the research questions adequately as indicated through the foregoing faculty retention gap analysis.

Recommendations

After considering various SHRM strategies suggested in data collection and review of related literature on faculty retention, the research came up with several recommendations, which if implemented, would have enhanced retention of faculty in Daystar and Pan Africa Christian Universities. Lecturers were asked same questions as Human resource managers, deans and HODs although there were additional items unique to each group of participants. There was a retention gap because the recommendations made by lecturers in included statements as “give education loans to lecturers, give reduced workload to lecturers, and consult with employees in decision making’ while those of SHRM at PACU included “improved staff development” and “reward for scholarly publication” among others. The SHRM in Daystar recommended “fast tracking promotion process for the lecturers” without pointing out much on how to do it. Use of an objective measure of productivity to recognize faculty was needed. Salary rates needed to be based on qualification and experience of each lecturer. It was necessary for SHRM to make the upward mobility of the faculty clear, objective and operational. A well defined leave policy covering annual leave and sabbatical leave may have been there, according to results from interview and document analysis but needed to be implemented.

Public relations office reflected university goals, mission and vision. Treatment of customers (primarily students in this case) was instrumental to reputation of the universities studied and a marketing strategy for the university. Motivation of faculty needed to be intentional, clearly and regularly communicated to the faculty. Policy guidelines on how to effectively resolve conflicts between lecturers and middle level management was necessary. Worship attendance needed to be optional while efforts to inculcate Christian values for integration of faith and learning would have helped towards university communities want to attend chapel services. Annual pay raise policy and processes might have been in

place but lecturers indicated that SHRM needed to inform and educate some lecturers on their compensation rights. University library resources needed to be updated and added. It was necessary for SHRM to provide scholarships for further studies for their lecturers.

SHRM needed to see the need of working with lecturers as faculty retention strategy and incorporate it into other HR practices to guide lecturers’ contribution and performance in a desired direction. This integrative approach to SHRM called for retention of faculty in such a way that HR leaders would and value their own role, strategic partners would bring know-how about ways of changing university and human capital developers would recognize people as critical assets for a successful future.

Retention gaps were noted by the researcher in perceptions between HODs and deans after responding to the same SHRM strategy through interview guide and questionnaires in the said universities. Having earlier defined retention gap as divergence of views among research participants concerning which retention strategies would work best to effectively enhance retention, a disagreement challenge among these implementers would be minimized by holding regular consultative planning meetings among SHRM, deans, HODs and full time lecturers as a collaborative leadership strategy. If this recommendation was implemented, other related concerns such as “lack of open office approach” voiced by a lecturer in Daystar, would be addressed.

The research findings provided evidence that the leading challenge to faculty retention was low salaries. Bench marking with other surrounding to negotiated. The recommended that constant bench marking on salaries and other retention-related strategies in order to make informed decisions on remuneration policies and procedures.

Many recommendations were proposed by different participants on how the retention of faculty was to be enhanced. The summary

included provision of research funds. The researcher therefore recommended that the SHRM leadership of the two universities hold regular meetings with their lecturers to dialogue on various grievances raised by lecturers. This forum would be educational to both SHRM and lecturers on matters related to retention.

The findings of the study provided a variety of meanings to the researcher. There were SHRM strategies for faculty retention but not really clearly communicated to the deans, HODs and lectures by the SHRM as goals of the university. The small group of lecturers, five (5), automatically selected at Pan Africa Christian University gave less reliable percentages for comparison with Daystar's group of nineteen. The comparison of SPSS outputs between the two universities might therefore have been used as a general indicator of general impression on how faculty retention variables in the two universities impacted different lecturers differently. It further meant that SHRM needed to use different strategies in each university in order to retain lecturers. The retention gap consultation among members of the management and faculty was necessary in order to determine the best ways of retaining faculty in each university. It also meant that there was no group of SHRM strategies that would have satisfied the lecturers across the board. There would always have been divergence in satisfaction. The SPSS outputs which were generally rated average indicated that retention strategies explored by the researcher had room for improvement. The challenges raised by each group of participants were considered by the researcher to be indicators that SHRM strategies were dynamic and therefore needed constant review, consultation within the said universities and benchmarking with similar universities.

Areas for Further Research on Faculty Retention Gap

The study surfaced other areas of educational research through literature review and findings. First, the human resource managers would have been interrogated further to find out why strategies were in place but according to the comments

given by lecturers, implementation was minimal. Probably there were some factors beyond the human resource managers' ability to implement. Second, the idea of retention gap was not included in the research instruments but it came up as a discovery of the researcher through close scrutiny of the differences in opinions among various participants. Third, the faith-based element and its possible influence on retention can be investigated further. Fourth, variables included in the demographic information of the participants may need further investigation by including related items in the questionnaire and interview guide. Fifth, this research was not intended to explore the multiplier effects that would flow out of the possible relationship between retaining good faculty, university reputation and student enrollment.

An illustrative example was the decision to pay faculty according to the number of students they taught, having normal teaching load as sixteen students for a new class to be considered cost-effective. In such a case, a declining enrollment in a University would be a message to teaching faculty that they needed to look for the next university to go to since number of students in each intake positively or negatively influenced faculty retention.

It was not clear to the researcher whether the SHRM retained master's degree holders for economic reasons or the lecturers did not have much ambition to pursue PhD. Other researchers may investigate the reasons behind lecturers staying in Daystar University at one academic level. There might have been other factors which outweighed their lack of opportunity to pursue PhDs.

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Resource Management for Disasters in Secondary Schools in Ruiru Division, Thika District, Kenya

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Abstract

A survey was conducted to determine the preparedness of the secondary school in Ruiru division of Thika District Kenya. Interviews were conducted from a total of 120 respondents using a simplified and closed ended questionnaire, in-depth interview and observation check list. The study targeted the students, teaching staff and the supportive staff from Ruiru Division Secondary Schools. The findings of the study were designed to benefit the school administrators, disaster managers, researchers, scholars, policy makers and the funding Agencies with an aim of improving the health and safety of the Secondary School community and those living in the schools environs and spare the already strained economy of this country. The data obtained was entered and analyzed using statistical package for social sciences (SPSS) version seven. The results of the study confirmed lack of preparedness for disaster management in secondary schools. The respondents did not know how to use the first aid kit element. Lack of knowledge on use of first aid elements was significantly high among the respondents which also reflected lack of skills to manage minor incidences. Lack of knowledge on where to keep the first aid kit was significantly high among the respondents. The respondents confessed to lack of preparedness for disasters in their schools. Therefore information education and communication (IEC) can play a big role in disaster management because there was a significant relation on (IEC) and knowledge about specific disasters. The respondent knew the common disasters in Ruiru Division. The study highlights the need for the Ministry of Education to adopt a wide range of strategies to mitigate and prepare for disasters in schools by increasing the knowledge and skills of the communities within the secondary schools and their environs.

Introduction

Disasters are an increasing Global health concern with an average of one disaster per week requiring external and international assistance, this emphasizes mankind vulnerability to disasters and the necessity for preparedness (Lloyd, 2005). Recent disasters throughout the globe have shed new light on the vulnerability of life on earth. Whether caused by natural or technical hazards they have become part of our everyday experiences sparing no communities in our increasingly

interconnected world (UNDRO, 1998). The devastating disasters that afflicted numerous communities in 2004 and 2005 were the killings in Beslan, Russia, The Indian Ocean tsunami, the earth quake in Pakistan, and the damaging hurricanes along the Gulf coast (Nonny, 2006).

Kenya has experienced simple and complex disasters caused by drought, fires, floods, industrial accidents, the HIV/AIDS, traffic accidents, terrorist attacks, and collapse of building among others. Disasters constitute

to real threat in every sphere of human development.

The causes of disasters can be divided into two distinct categories: those due to manmade hazards and those due to natural hazards. Natural hazards are principally the result of geophysical interactions between atmosphere, hydrosphere and lithosphere. Any changes in these interactions may lead to changes in the normal frequency and cause disasters of high magnitude.

Disasters are low-probability events caused by the interaction of social processes and the physical environment. They compete for attention with priorities of daily living (Mutisya, 2004). The poor are more vulnerable to disasters than the rich because they live in unsafe areas such as flood plains, slopes of steep hillsides and river beds and their daily struggle to survive takes priority over investment in mitigating the impact of potential disaster events (Alcira and Margaret 2002).

One of the serious and growing problems in the secondary school was the increase of disasters. Records showed an increase in the number of fires, rape, collapse of buildings, roof blown off by wind, floods, drought and HIV/AIDS which was declared a national disaster in 1998 by the then President of Kenya. Systemic assessment of losses, social and economic impact of disasters and particularly mapping of risks are fundamental in understanding where to take action (Valancy, 2004).

Disaster management is a planned, deliberate, organised, directed and visualised effort to mitigate, prepare for, respond to and recover from a disaster or emergency situation or its effect. Disaster preparedness involves an integrated combination of planning, training personnel qualification, drills, acquisition of equipment and standard certification (WHO, 1999).

Planning is how personnel, equipment, and other resources are used to support incident management and emergency response activities. Plans provide mechanisms and systems for setting priorities, integrating

multiple entities and functions, and ensuring that communications and other systems are available and integrated in support of a full spectrum of incident management requirements.

Equipment Acquisition and Certification is necessary for emergency responders to perform their work effectively. A critical component of operational preparedness is the acquisition of equipment that will perform to certain standards, including the capability to be interoperable with similar equipment used by other jurisdictions. Reducing disaster is possible not only by modifying the hazard but by reducing the vulnerability (Varley, 1994).

Problem statement

Disasters cause a lot of damage and they are expensive to manage, they strike quickly without warning. Records have shown an increase in the number of disasters in Kenyan Secondary Schools causing deaths and a lot of suffering (Lumbasio, 2004). At Bombolulu high school, twenty six (26) girls perished in a fire inferno and hundreds of others got maimed. In Nyeri High School four (4) prefects died in unexplained fire inferno in 1999, and in Kyanguli high school sixty eight (68) students perished in a fire inferno leaving hundreds maimed (Lumbasio, 2004). Students of Gateway High School, (one of the sampled secondary school) salvaged whatever remained of their belongings after a fire gutted down their dormitories and although nobody was injured property worth thousands of shillings was destroyed by fire (Avuyefu, 2007).

A disaster event in a Kenyan Secondary School would affect quite big a population and destroy infrastructure like classrooms, roads, dormitories, sewer systems, lighting systems, water systems etc. The destruction might be so severe that recovery may take time or it may become irreparable depending on the economic powers of the managers and the associates of such a school. The school would also get stigmatised.

A host of records in the problem statement has shown an increase in the number of disasters in Kenyan Secondary Schools in the recent past, the commonest being fire

which has caused a lot of deaths and destruction of infrastructures like the classrooms, dormitories, office blocks and water sewage systems among many others.

Disasters have a negative effect in any country and they interfere with the economy of the affected countries where resources must be diverted to meet the sudden demand raised by the disaster effect. They cause trauma, loss of life, loss of work and study hours, and property damage, raises court cases and affects the reputation of the affected organizations (WHO, 1999).

Children are the nation's most valuable assets; this fact places a tremendous responsibility upon us all to provide safety to the children (Florio *et al.*, 1999). No school is immune to disasters; therefore it is important that each school establishes administrative procedures for handling emergencies (Minnesota health council, 1964).

Disaster activities require carefully managed resources (personnel, time materials) if the needs of the affected are to be met. Disaster resource management should be flexible and scalable in order to support any incident and be adaptable to changes. Effective preparedness for disasters is of paramount importance if reduction of the suffering and deaths of the students, teachers and the supportive staff among others is to be achieved and tragedies will not be catching us flat footed in future (Kabaria, 2009).

Materials and methods

Study area

The study was carried out in Ruiru Division of Thika District, in Central Province, Kenya (appendix i). The other Divisions of Thika District are, Thika municipality, Kakusi, Gatundu north, Gatundu south and Gatanga. Administratively the Ruiru Division is divided into two locations namely Ruiru and Juja.

The division has eight Secondary Schools. One of the schools is for boys; two for girls and five are mixed, that is for boys and girls. Four of these Secondary Schools are privately managed and the other four are Government managed (Muthoni, 2006). Ruiru division has many industries and most of the industrial workers are from within this

division, which is in the outskirts of Nairobi with most of its residents working in the city.

Sample size determination

A sample is part of the target population that has been procedurally selected to present that particular population (Oso and Onen, 2005). To obtain a representative sample, the method recommended by Mugenda and Mugenda (1999) for social sciences, Fisher *et al.* (1998) standard formula was used:

$$N = \frac{Z^2 Pq}{d^2}$$

Where, N = maximum sample size required

Z = standard normal deviate (1.96) which corresponds to the 95% confidence interval.

p = 0.1 proportion of respondents with the desired characteristics

q = 0.9

d = degree of accuracy set at 0.05

$$N = \frac{1.96^2 \times 0.01 \times 0.09}{0.05^2} = 138$$

Sampling technique

Sampling technique is a strategy used by the researcher to select representative respondents from the target population for this study (Oso and One, 2005). A stratified random sampling was employed to identify the various Secondary School communities in Ruiru Division which are managed either by private administrators or by the Government officers.

This sampling procedure was used which made the existing sub-groups in Ruiru Secondary Schools population reproduced in the sample (Mugenda and Mugenda, 1999). This method made the researcher get the right proportions from each Secondary School community. The eight Secondary Schools were also exposed to site assessment and spot check using an observation checklist (O. C. L) where the availability of disaster management

equipment and their serviceability was assessed.

For proportional distribution from the eight (8) Secondary Schools, 138 participants were divided among the 8 giving sixteen participants for each school which was then divided by 3 giving five for each sub group. A simple random sampling was used to get the equal number of teachers, students and support staff from each secondary school by having five (5) folded papers with yes and the rest with no, depending on the number of teachers, students and the support staff in each Secondary School. A sample size of one hundred and twenty (120) was realised. More information was gathered from six (6) secondary schools managers and sixteen (16) community representatives who were selected as key informants for an in-depth interview. Snowball sampling was applied to get the secondary school administrators while two (2) community representatives were also selected from each Secondary School environs through snowball sampling to participate in this study.

Research instruments

The instruments used to elicit relevant information from the participants were, a pre-tested structured questionnaire which was divided into five (5) sections namely: common disasters, lessons on disaster management taught, available facilities to counteract disasters, level of knowledge and skills among the communities in secondary schools in Ruiru Division.

To observe what was on the ground for disaster management, an observation check list was used to compliment the questionnaire and an in-depth interview was carried out on key informants guided by secondary school health and safety guidelines helped the researcher to gather relevant information which gave a clear lack of preparedness for disasters in secondary schools.

Pre- testing

Pre-testing of the questionnaire was done in two secondary schools where the questionnaire was administered to five students for validity and reliability. Validity is concerned with the extent to which a technique measures what it is intended to

measure (Borg and Gall, 1989) and reliability is a measure of the degree to which a research instrument yields consistent results after repeated trials (Gitonga, 1999).

The observation check list was also tested in the two secondary schools. These two secondary schools were excluded from the study. Omissions and corrections from the pre-testing exercise were incorporated in the final questionnaires and the observation check list for improvement.

Data collection methods

To asses' disaster preparedness and resource utilisation in the secondary schools, the researcher gathered detailed information about disaster management from the hundred and twenty respondents (120). Methods used were administration of detailed questionnaire which had questions based on the specific objectives.

An in-depth interview was done under the guidelines in appendix 6, on the key informants who included the District education officer (D. E. O), Provincial Education Officer (P. E. O), National Disaster Coordinators, Ministry of Education officials, Occupational Health and Safety officers, the National Environmental Management Authority (N. E. M. A) official and the community representatives.

Data entry and analysis

All of the responses to the questionnaires were entered into a computer spread sheet, Data was analyzed using statistical package for social sciences and the analyzed data was presented in bar graph, pie charts, tables, percentages, frequencies and statements.

Descriptive statistics was used to summarize the data. This included frequency distribution tables which were used to give a record of the times a response occurred, mean, range, percentages. Inferential statistics particularly chi-square was used to establish relationship between variables such as availability of guidelines, level of training, availability of supplies and equipments. This helped the researcher to draw conclusions and make recommendations on the study.

Results

Socio-economic demographic characteristics

The demographic characteristic of the respondents included: level of education, profession, age and sex and marital status.

Education level

The level of knowledge was looked at, with the hope to establish whether people of higher education had more knowledge on disaster management. The study had 29 (24.17%) graduates, 24 (20%) diploma holders and 20 (16.67%) certificate holders. The rest 40 (33.3%) were form two students.

Sex, marital status and age of the respondents

Gender age and marital status were looked at to establish whether there was any category that would have been more knowledgeable in disaster management. It came out clearly that majority (Eighty eight (73.3%) of the respondents were female while thirty two (26.7%) of the respondents were male. Forty four (36.7%) respondents were single while seventy six (63.3%) were married. It was also observed that forty (33.3%) of the respondents were teenagers while eighty (66.7%) were adults.

Resource management

Respondents trained in First Aid

There were no lessons taught on disaster management to Secondary School community in Ruiru Division. The researcher looked at first aid training which was expected and almost all the respondent 102 (85%) were not trained in first aid and 18 (15%) have had the training with no refresher courses. Of the 18 (15%) who were trained 8 (44%) were supportive staff 6 (33%) teachers and 4 (22%) students. Elements in the first aid kit were known by 45 (37.5%) whereas 75 (62.5%) did not know them.

Use of First Aid Kit elements

First aid kits and their elements are important in institutions like secondary schools where a big number of people life and knowledge on their proper use is of paramount importance.

It was shown that 75 (62.5%) of the respondents had never used a First Aid kit while 45 (37.5%) of the respondents had used a First Aid kit.

Location of First Aid kit

A first Aid Kit should be kept in the open where it can be used in case of an emergency. Fifty two (48%) of the respondents indicated that the First Aid kit should be stored in a locked cabinet while sixty two (52.0%) indicated that the First Aid kit should be stored in the open (table 4.6). There was a statically significant relationship between the location of a First Aid kit and the knowledge of disaster preparedness which includes knowledge of the ideal place for a first aid kit. Respondents who cited location of a First Aid kit in a closed cabinet were less likely to be knowledgeable about disaster preparedness.

Location of a First Aid kit against the different categories of respondents

Among the teachers 19 (15.8%) thought that the kit should be located in the open while 12 (17.5%) felt that it should be located in a locked cabinet. Nineteen (15.8%) of the students felt that the kit should be located in the open while 21 (17.5%) thought that it should be locked in a cabinet. Among the support staff, 20 (16.7%) thought that the kit should be located in the open while 20 (16.7%) felt that the kit should be located in a locked cabinet.

Facilities to counteract disasters if they occurred in Ruiru Division Secondary Schools

Objective three was to establish the availability of facilities to counteract disasters in Ruiru division Secondary Schools which were to be known by the respondents. The aim here was to see what was in place and their efficiency to have bases for recommending additional replacement or even rehabilitation. Through observation check list most of the schools did not have the facilities to counteract disasters if the occurred and where the first aid kits were present the respondents were informed on their uses.

School disaster preparedness

Seventy five (62.5%) of the respondents rated their school disaster preparedness as poor, 37 (30.8%) rated their school disaster preparedness as good while 8 (6.7%) rated the preparedness as excellent (table 4.8). There was a statistically significant relationship between rating the schools' disaster preparedness as poor and the knowledge on disaster preparedness.

Firefighting equipment

Out of the 120 respondents, only 9 (7.5%) were able to identify two of (sand, blankets, carbon dioxide) as firefighting materials while 61 (50.8%) named only one of firefighting materials and 50 (41.7%) could not name any.

Securing disaster sites

Almost all the respondents 101 (84.2%) articulated that they would use barriers (tape/rope) to keep off the crowd from a disaster site where as 13 (10.8%) indicated that they would use a bus to ferry the onlookers. Only 6 (5%) would use a bulldozer to keep off the crowd.

Attitude of the respondents towards disaster management

The importance of disaster management among the secondary school communities was sought by use of a questionnaire seeking the communities' perception of the following parameters.

First Aid Kit

It was indicated that 94 (62%) of the respondents thought that it was very important to have first aid kit in the schools, 40 (33%) felt it was important to have first aid kit in schools and only 6 (5%) felt it was not important.

Trained First Aid Personnel

It was indicated that 90 (75%) of the respondents thought that it was very important to have trained first aid personnel in the schools, 30 (25%) felt it was important to have trained first aid personnel in schools and none felt it was not important.

Include disaster management in Secondary Schools curriculum.

It was indicated that 62 (52%) of the respondents thought that it was very important to include disaster management in secondary schools curriculum, 48 (40%) felt it was important to include disaster management in secondary schools curriculum and 10 (8%) felt it was not important

Three in every four 90 (75%) indicated that curriculum workload contributes to stress which sometimes lead to unwarranted actions that lead disasters in secondary schools whereas 30 (25%) disagreed with the same. Three in every five 72 (60%) could identify at least three great challenges that could hinder them in managing a disaster situation, whereas 18 (15%) named two and 30 (25%) indicated none. All the respondents indicated that kiosks and bars should be nowhere near the schools in bid to fight drug abuse, which contribute to strikes that leads to disasters in schools.

Install firefighting equipment in Schools.

It was indicated by 80 (67%) of the respondents who indicated that it was very important to include disaster management in secondary schools curriculum, 30 (25%) felt it was important to include disaster management in secondary schools curriculum and 10 (8%) felt it was not important.

Discussion

Common disasters in Ruiru Division

Sixty three which was (53%) of the respondents could not name any of the disasters that had occurred in Ruiru Division within the last five years, thirty five which was (29%) could name at least 3 while twenty two which was (18%) named less than 3. This finding indicated that the level of knowledge regarding disasters was low. This observation was supported by the finding that the respondents who were knowledgeable about the common disasters were likely to be prepared against disasters.

Disasters have been occurring in this division but due to lack of knowledge, the respondents could not remember them. This observation revealed that the respondents were vulnerable to future disasters. This calls for rapid measures to educate the Ruiru Secondary School community on disaster management. An in-depth interview of a senior quality assurance and standards officer brought to light that, though there were measures to be undertaken to ensure health and safety in education institutions as per legal notice number 56 of 13th March 2001 (Kosgey, 2001).

The Minister of Education administrators recommended all doors to open outward in all dormitories, windows to have grills, laboratories and kitchen to have fire fighting equipments, story buildings to have staircase as an escape routes, all food handlers to have varied medical certificates among others.

Negligence by the administration to implement the safety measures, lack of qualified personnel to carry out standard assessment of the schools and the lack of resources to implement the measures were cited as the major challenges for implementing health and safety programs in schools (Maluki, 2007).

Lessons Taught on Disaster Management to Community of the study area

There were no lessons taught on disaster management to secondary school communities in Ruiru Division. However despite first aid training being a basic component in disaster management and preparedness, 85% of the respondents was not trained.

This finding indicated the need to offer basic disaster management training in schools as a measure of creating awareness (Achoka and Maiyo 2008). They emphasised on disaster reduction initiatives to be rooted in schools and communities. However, an in-depth interview of secondary schools managers revealed that including disaster management in secondary schools would increase the work load to the students and the teaching staff who are already overwhelmed by the examinable subjects.

Curriculum workload contributed to stress which sometimes lead to unwarranted riots that lead to disasters in secondary schools. It was also clear that there were intensions to train disaster managers for schools but training dates are not yet known (Maluki, 2007). It was also clear from the findings that, 62.5% of the respondents had not used a First Aid kit which indicated a high level of knowledge deficiency in the area of disaster preparedness.

This observation was supported by the finding that the respondents who had never used a first aid kit were less likely to have knowledge about disaster preparedness. It was also revealed that respondents who cited location of a First Aid kit being in a closed cabinet were less likely to be knowledgeable about disaster preparedness. Although the first aid kit should be kept in the open where it can be accessible when needed, these respondents seemed not to be aware about this. They had fear that it would be vandalised by the students and some staff.

This indicated that education regarding disaster management was a necessity. An in-depth interview of a secondary school manager positioned as a district officer one in the provincial administration and internal security revealed that there were organisations which could respond to disasters one of them being Thika Municipality which was ranked the best compared to the police force during a hospital disaster mock in 2007. Gatundu town caught fire in 2007 and Thika Municipal staff responded within 30 minutes (Shizue, 2005).

Challenges in the Municipals office were lack of enough trained personnel, lack of resources to maintain the available machinery, lack of awareness by the public to pass the information using police or the council's hotlines and lack of knowledge to use the available resources and not to cause problems of overcrowding in a disaster site where they would cause blockages (Mwenda, 2007).

Facilities to counteract disasters if they occurred in Ruiru Division secondary

Majority of the respondents (62.5%) rated their schools' disaster preparedness as poor. The finding showed that the respondents who rated the state of disaster preparedness in their schools as poor were less likely to be knowledgeable on disaster preparedness. This finding indicated that majority of the Ruiru Division Secondary Schools community were highly vulnerable to future disasters due to lack of the basic facilities to counteract disasters.

The country lacked policies to address the increasing incidences and emergencies which resulted into serious human distress and suffering, destruction of property and infrastructure, disruption of environment and overall welfare of the society (Cheruiyot, 2002).

Level of Knowledge with study area community on Disaster Management

Majority of the respondents (94.2%) knew collapse of a building along Ronald Ngala Street was a disaster. This observation was supported by the finding that the relationship between knowledge about disaster preparedness and the knowledge of whether collapse of that building was a disaster was not statistically significant.

However, different opinions were presented with regard to understanding whether disasters were a major problem. (75%) indicated that disasters are made to happen, they don't just happen. It was noted that all support staff found no benefit of disaster management program in schools to reduce disasters and disaster effect. This observation indicated that the support staff should also be a primary target in disaster management, training programs. Knowledge is a precious national resource that can facilitate the process of disaster prevention, preparedness and response in cost effective participatory and sustainable ways (Durgadas, 2008).

Level of skills the community had on disaster victims

The findings indicated lack of basic skills in managing the disaster victims. Majority of the

respondents (78.3%) had no idea of arresting bleeding, 56% had no idea of managing an unconscious patient, 75% had no idea of managing a victim with a broken bone, 90% had no idea of managing a victim who was caught up in a building that was on fire while 62.5% of the respondents indicated that a bulldozer could be used to manage any disaster.

This was a clear indication that the skills of the respondents were far below any desired standard. Education and awareness seemed to be a necessity in order to reduce the vulnerability of the society to future disasters (Josefani, 2008).

Conclusions

There were no lessons taught on disaster management to Secondary School community in Ruiru Division. Despite first aid training being a basic component in disaster management and preparedness, 85% of the respondents did not have this basic training. Respondents who had never used a first aid kit were less likely to have knowledge about disaster preparedness. The study also revealed a number of respondents who cited location of a First Aid kit to be in a closed cabinet. These were less likely to be knowledgeable about disaster preparedness and the schools lacked facilities to counteract disasters if they occurred.

More than half of the respondents (62.5%) rated their Secondary schools' disaster preparedness as poor. These respondents were less likely to be knowledgeable on disaster preparedness. Majority 94.2% of the respondents (94.2%) knew the collapse of the building along Ronald Ngala Street was a disaster. This showed a positive relationship between knowledge about disaster and highlighting about disasters through proper information education and communication. This was supported statically by a chi result. The findings also indicated lack of basic skills in managing the disaster victims. According to the study findings, the researcher rejected the null hypothesis and concluded that the respondents were less knowledgeable about disaster preparedness in Ruiru Division.

Acknowledgements

The research division Mount Kenya University who made the researcher and the supervisors go back to work done and prepare for a presentation for the international conference which the university facilitated. We would like to acknowledge Mr. Ibrahim Ochieng of Kenyatta University for statistical help and all the respondents who participated in this study.

Competing interests

The authors have no financial or personal interests that might have inappropriately influenced them in writing this article.

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Granger Causality and Error Correction Models in Economics: A Simulation Study

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Abstract

Generalized Auto Regressive Conditional Heteroskedasticity (GARCH) models are usually used to analyse time series data with high volatility clustering. In this paper, we analyse the suitability of Granger Causality Model (GCM) and Error Correction Model (ECM) in analysing a time series and accordingly, we simulate two series of data using the GARCH model which are used for the analysis. The choice of the simulation model is based on its ability to capture volatility and heteroskedasticity. GCM and ECM models' parameters are investigated for adequacy. Results from Augmented Dickey Fuller (ADF), Phillips Perron (PP) and Kwiatkowski Phillips Schmidt Shin (KPSS) tests indicate stationarity in the data as expected. GCM is built to demonstrate all the long term relationships. The two series Granger caused each other. A linear ECM is also fitted and there is evidence that a short-term relationship exists between these two series. A high threshold value exists at the second lag, an indication of simple smoothing in the data. The residual deviance was greater than the degrees of freedom asserting that the model perfectly fit the data, supported by high R^2 value of 0.871. Residuals from the fitted linear model are also stationary. The study concludes that ECMs and GCMs are appropriate in analysing time series. It is recommended that a similar study be undertaken but with a combination of Auto Regressive Moving Average (ARMA) Process and GARCH models. Further study should also be conducted on tail clustering analysis.

JEL Classification: C580

Keywords: Granger Causality, Error Correction Model, Simulation, Economics

Introduction

Escalation of interest rates and exchange rates in Kenya has been a common phenomenon. Its random inter-data movements lead to the subject of volatility. It has formed the basis of most researches in time series analysis, with several scholars building various models in the attempt to exhaustively examine the sources of these volatilities and its predictions. Unfortunately, no particular scholar has been able to exhaustively determine the sources of volatilities, neither have they settled on any particular optimum model. Nevertheless, Leykam (2008), Zhongjian (2009), Musyoki *et al* (2012), amongst others, concur that modelling of these volatilities are vital for the health of an economy. It has been pointed out that the most important aspect in any volatility analysis, including others, are to be able to; predict the future volatility behaviour, and at least establish the risk attached to these movements.

Volatility can be defined as the periodic displacement of a time series from its long-term mean-level. Forces that displace these time series from its mean-level are of great importance. The displacements as well occur in phases, as suggested by the definition; the short term and the long term. Most scholars have not yet done concurrent short term and long term analysis. However, there is a great need to analyze these shocks in two phases, the short and long-term, in order to capture the movements exhaustively; where imputation of the two relationships can be analyzed. Granger (1986) first proposed a procedure, called granger causality, which analyses the long-term movements. On the other hand, an ECM, introduced by Granger (1986) in his work and analyses a short-term relation in existence. He was analyzing a balance in an ECM where he realized that there was an imbalance in $I(0)5$ and $I(1)6$ series (Granger, 2010).

Earlier, Fung and Hsieh (2004) had used co-integration on their study on hedge funds. They criticized the conventional approaches of model constructions for asset-class indices to be applied in hedging. Seven factors were identified from which a model was built. On analysis of parameter stability, Fung and Hsieh (2004) apply the cumulative recursive residual method and plots on a time scale to investigate the reversion of the model parameter in the risk factor model. The factors are co-integrated and hence

influence each other's performance. Fung and Hsieh (2004) finally proposed a seven factor model to be applied for hedging.

Later, Leykam (2008) in his work on cointegration and volatility in the European natural gas spot markets tests the Granger causality in volatile markets. Four markets were identified from which spot prices were obtained. Granger causality tests were done for different pairs of the markets. Of the four markets, one (Bunde) market indicated no association with the other three markets. All the hypotheses that the other three markets can be used in predicting volatility in Bunde were rejected at 1% significance level. This meant that Bunde could not be considered a price setter in the European gas spot market.

The study by Fung and Hsieh (2004) was further extrapolated by Zhongjian (2009) who analyzed the same hedge funds in view of further examining the validity of the method used in deriving the seven factors which had been suggested by Fung and Hsieh (2004) for the inclusion in an hedging portfolio. In his research, he highlights that Fung and Hsieh (2004) did not provide enough evidence to prove that the procedure used in choosing the factors is quite different from the Sharpe and Fama-French which only relies on one characteristics of the entire market. Contrary to Fung and Hsieh (2004), Zhongjian (2009) bases his parameter stability on the adjusted R^2 statistic. Zhongjian (2009) does not mention the reason for his selection of R^2 statistic instead of the cumulative recursive residual. He identifies nine hedge indices which can be included in the hedging strategy. A full rank co-integration in the industry was as well established, and an eight factor model to be used for hedging strategies as the most powerful model, is proposed.

Initially, Rashid (2005) had applied granger causality in agriculture in a study on spatial integration of maize markets undertaken in the post-liberalized Uganda. Different markets were identified. Causality tests were conducted on different pairs of markets, and the results indicated that all pairs which included Kampala and Jinja failed to reject the causality null. This was an indication of a unidirectional causality, implying that the regional maize prices Granger caused the prices in these two large cities. Also, a two directional causality effect was established between Mbale and Hoima indicating a

dependence behavior; that is, all deviances in one market affect the other.

Huang and Neftci (2004) investigated co-integration relationship that existed between the swap spreads and various rates such as the LIBOR rates, US corporate credit spreads and the treasury yield curve; which found evidence of co-integration existence. In their study, they showed that under the ECM framework, the daily swap spreads reacted to the corrective long-run forces except from the short-term fluctuations in the variables. They concluded that the swap spread had a negative effect only on one measure, the treasury yield curve, but positive in all the other rates.

Later on, Petrov (2011) applied ECM in evaluating a pairwise co-integration strategy between the South African equity market and other emerging and developed markets; using the price indices rather than MSCI index, as used by Biekpe and Adjasi. He gives two reasons; one, that price index is raw and two, it enabled comparisons across different markets. Petrov (2011) showed that all the markets were responding slowly to any long term disequilibrium. The integration proved to be high between most markets and hence portfolio selection was the most sensitive task to undertake. Petrov (2011) applies an ECM to analyze different portfolios of different sizes. He finds out that USA dominated in all the portfolios in which it was introduced. It was then recommended that such portfolios should be considered the most favorable for investors.

Credit risk is one of the most important types of risk which a bank will be keen to assess to ensure that it remains in business. On the other hand, most of the bank advances are made on a collateral basis. Karumba and Wafula (2012) studied this collateral lending characteristic of the lending institutions and their implication on the general financial equilibrium. They investigated its implication on the level of credit risk faced by the banks. Karumba and Wafula (2012) applied co-integration and error correction techniques to investigate long-run relationship. The study found over-reliance on collateral in institutional lending. A negative ECM adjustment coefficient was found indicating that advances in loans and collaterals had a short-term adjustment. With the introduction of credit referencing, the study concludes a general reduction in credit risk.

In Basel III accord, the main challenge is addressing rates volatility. Its evolution over time makes credit risk analysis more complex. In this research, we contribute to the bank of literature by investigating existence of short-term and long-term relation between lending and interest rates. This contributes to mitigation of credit risk analyzed by Karumba and Wafula (2012). A procedure for modelling interbank lending rates can be seen as a milestone to the mitigation strategy. It will make the work proposed in Basel III accord much easier.

2 Some Theoretical Review

In this section, we review some important definitions on the various tests which will be used in section (3) for analyses. We start by reviewing definitions on granger causality in sub-section (2.1); followed by a review on ECM in sub-section (2.2), and finally defining some tests in sub-section (2.3), which are fundamental in the study.

2.1 Granger Causality

In this section, we review basic concepts on granger causality. We define what granger causality in sub-section (2.1.1) is, and give its mathematical representation in sub-section (2.1.2).

2.1.1 Definition of Granger Causality

Granger (2004), proposed a procedure of investigating causality using lagged series and residuals. Suppose we have a series or vector y_t from which we want to obtain k ahead predictions, y_{t+k} , from an information matrix Λ . Let Λ be a vector of random variables/series $(a_t, b_t, a_{t-1}, b_{t-1}, \dots, a_1, b_1)$. Obtaining the y_{t+k} using least squares involves calculation of the conditional mean $E[y_t | \Lambda]$. In time series, it involves regressing y_t on Λ where Λ in this case has the variables $(y_t, y_{t-1}, y_{t-2}, \dots, y_1)$. This is rather complex. An easier procedure is to consider its causality.

2.1.2 Theoretical Representation of Granger Causality

Let X_t and Y_t be two series. X_t is said to Granger cause Y_t if the lagged values of X_t has statistically important information about the future values of Y_t . It is calculated for stationary series. An appropriate procedure is chosen to determine the lag to be used, to obtain optimum results. Regression is used for

estimation. T-tests are used to retain the significant variables in the regression and F-test determines jointly significant variables to be retained.

The procedure involves fitting a regression of lagged values of y_t

such that;

$$y_t = \lambda_0 + \lambda_1 y_{t-1} + \lambda_2 y_{t-2} + \dots + \lambda_k y_{t-k} + \varepsilon_t$$

where ε_t are the residuals. The k statistically significant lags of y_t is augmented with lagged values of x_t such that;

$$y_t = \lambda_0 + \lambda_1 y_{t-1} + \lambda_2 y_{t-2} + \dots + \lambda_k y_{t-k} + \mu_a x_{t-a} + \dots + \mu_b x_{t-b}$$

The lagged values of x_t in Equation (2) are retained if it adds an explanatory power to the regression equation. F-tests are used to determine the retained lagged values of x_t .

The shortest possible regression has a values where longest has b values.

The null hypothesis of no Granger causality is rejected if \exists at least one lagged value of x_t retained in Equation (2).

2.2 Error Correction

When estimating a granger causality relationship, the requirement is to ensure the series is $I(1)$. Making a series $I(1)$ implies differencing. According to time series theory, differencing means removal of trend; hence loss of important information about the time series behaviour in the short-run. Also, a cointegration relationship assumes a linear relationship; which might not be always the case due to random shocks. A displacement from the equilibrium relation implies a response from one of the variables to attain the equilibrium. The rate at which either

variable re-attains equilibrium is modelled by an ECM. Simply, an ECM is a model which gives an estimated response behavior of a variable upon dis-equilibrium. An ECM can be estimated as

$$\Delta A_t + \lambda \Delta B_t = \Omega + \beta(\Lambda) + \varepsilon_t$$

where λ and β are just coefficients, Ω an intercept which may or may not be included;

ε_t random noise; and Λ an 'error correction component'.

2.3 Empirical Unit Root tests

In this section we review definitions of some tests which are fundamental to the empirical analysis in section (3).

2.3.1 Review of Augmented Dickey Fuller test

This is a generalized form of the Dickey Fuller test, (Dickey and Fuller (1979)). It relies on the assumption that the residuals are independent

and identically distributed. For a series y_t , ADF uses the model

$$\Delta y_t = \alpha + \lambda t + \eta y_{t-1} + \delta_1 \Delta y_{t-1} + \dots + \delta_{p-1} \Delta y_{t-p+1} + \varepsilon_t \quad (4)$$

which reduces to a random walk when $\alpha = 0$ and $\lambda = 0$; and a random walk with a drift when $\lambda \neq 0$. The ADF¹⁰ test thus detrends the series before testing for unit root. It uses lagged difference terms to address serial correlation. The ADF test clearly depends on differenced series. This thus suggests a need for another validating test.

An inspection of the p-value also determines whether the null hypothesis of non-stationarity will be accepted. A small p-value leads to the acceptance of the null hypothesis. An inspection of the Dickey-Fuller value is as well important as this indicates the mean-reverting property. It is normally a negative value. The larger its absolute value, the lower the chance of occurrence of mean-reverting property.

Contrary to ADF test, the KPSS tests (Kwiatkowski D. *et al* (1992)) for the null hypothesis of level or trend stationarity. It gives a way to specify whether to test with a

2.3.2 Review of Kwiatkowski Philips Schmidt Shin test

trend or without, in its test statistic. A regression model with linear combination of a deterministic trend, a random walk and a stationary residual series

$$Y_t = \alpha + \beta t + \lambda \sum_{i=1}^t \varepsilon_i + \delta_t \quad (5)$$

is used where δ_t is stationary, βt is the trend component while $\sum_{i=1}^t \varepsilon_i$ is the random walk. $\beta = 0$ if we assume a without-trend regression. The series in Equation (5) will be stationary if $\lambda = 0$.

Regression is used to obtain the estimate of δ_t , that is $\hat{\delta}_t$, from which we compute

$$\Omega_{resid} = \sum_{i=1}^t \hat{\delta}_i \quad (6)$$

The test statistic for KPSS test is then calculated as

$$R = \frac{\sum_{i=1}^n \Omega_i^2}{n^2 \hat{\theta}_T^2} \quad (7)$$

Where the spectral density function estimator

$$\hat{\theta}_T^2 = \hat{\sigma}_\delta^2 + 2 \sum_{k=1}^T \left(1 - \frac{k}{T-1}\right) \hat{\omega}_k \quad (8)$$

is a linear combination of the variance estimator $\widehat{\sigma}_{\delta}^2$ and covariance estimator $\widehat{\delta}$

$$\widehat{\omega}_t = \frac{\sum_{t=k+1}^n \delta_t \delta_{t-k}}{n} \quad (9)$$

The test turns to a prudential choice of T in Equation (8) above.

2.3.3 Review of Phillip Perron test

The Phillips Perron approach (Phillips and Perron (1988)) applies a nonparametric correction to the standard ADF test statistic, allowing for more general dependence in the errors, including conditional heteroskedasticity. If there were

strong concerns over heteroskedasticity in the ADF residuals this might influence an analyst to go for PP14. If the addition of lagged differences in ADF did not remove serial correlation then this again might suggest PP as an alternative.

3 Empirical Results

A GARCH (1,1) is used to simulate data to be used in the analysis. The choice of the simulation procedure is aimed at capturing the heteroskedasticity which has been noted to exist in a series of returns (Particularly in price returns), where

volatility clustering exists. The classical inferential property of a high-low series is violated and a series of high levels tend to cluster together. In which case, variances tend to be related across different periods and hence leading to the result

$$\text{var}(X_t) = E(X_t^2) \quad (10)$$

that is the variance of the series at a given time, say t , is the same as the expectation of the square of the series. This is the basis for heteroskedasticity and hence an indication that auto-correlation still exists in the squares of the returns. The

main aim is to establish if there exists any causality between the two rates. Granger causality is investigated in sub-section (3.1) while an ECM is built in sub-section (3.2) as follows:

3.1 Granger Causality

The first step in granger causality analysis is to establish stationarity of the time series. A basic investigation of this property is by visual inspection of time plot. Figure 1 below

shows the plot of the simulated series. The values of α_0 , α_1 and β_1 are chosen arbitrarily to satisfy the conditions (i.e α_0 , α_1 , $\beta_1 \geq 0$ and $\alpha_1 + \beta_1 < 1$.) for a GARCH (1,1) model.

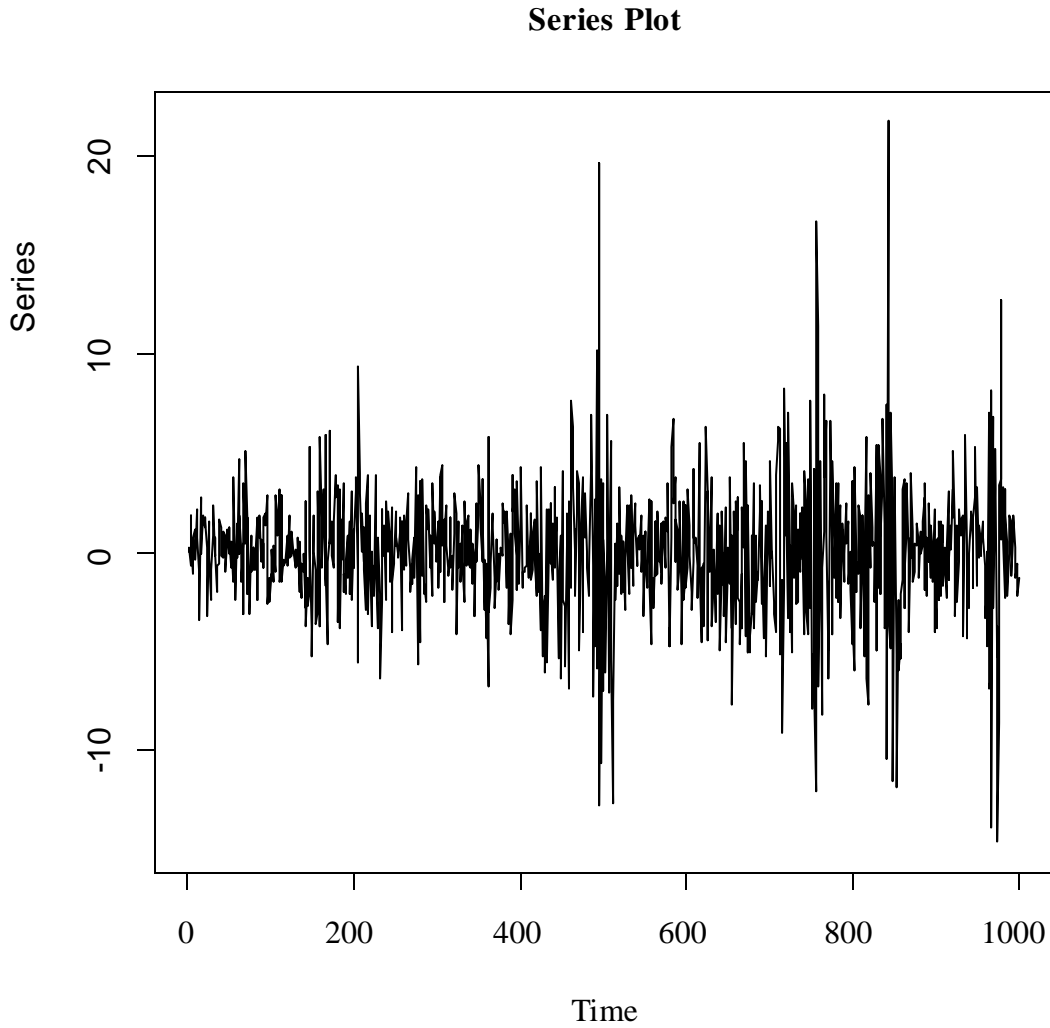


Fig. 1: A Plot of the Simulated Series Using GARCH(1,1).

Another GARCH(1,1) series is simulated and its plot superimposed (Figure 2) on the first series. An inspection of the superimposed plot suggests an existence of causality as in Figure (2) below.

Series Plot

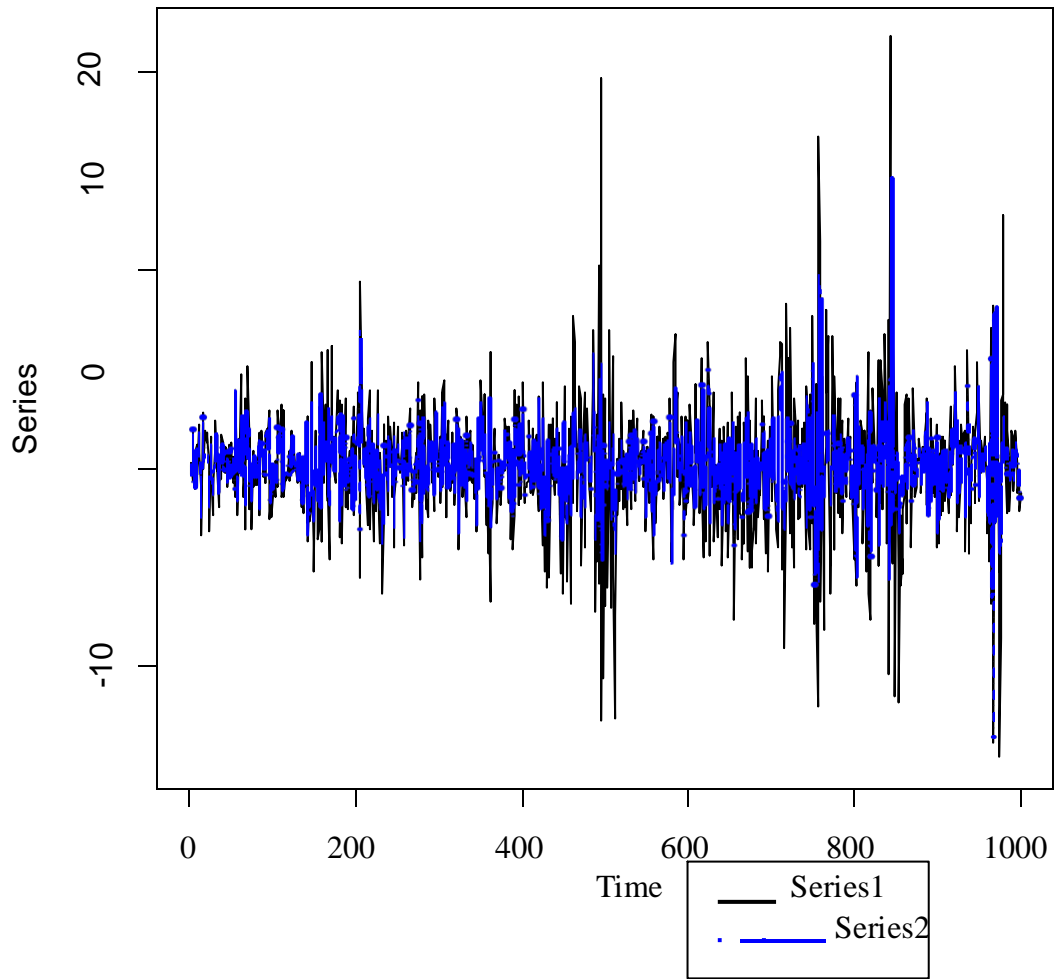
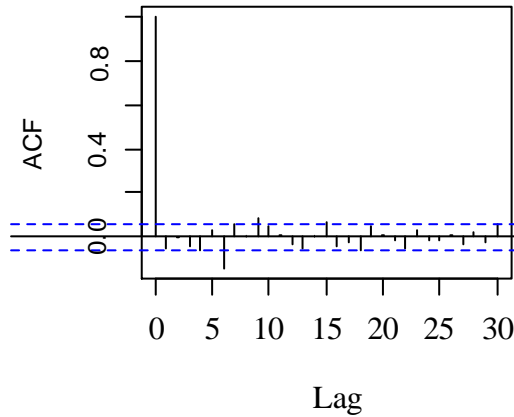


Fig. 2: The Second Simulated GARCH(1,1) Series 1 is Superimposed onto the Series 2 Plot in Figure 1.

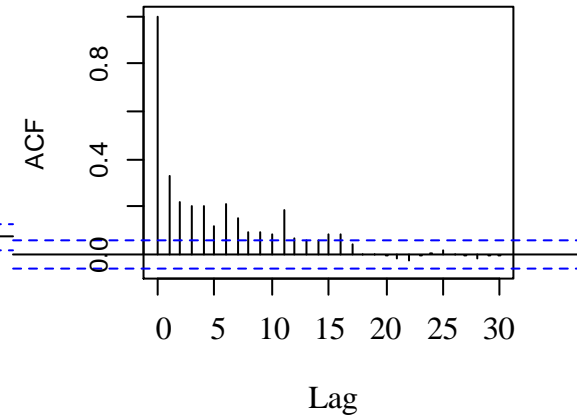
Before analysing the simulated series, an investigation of the GARCH properties should be done. All the properties must be met before the data can be used for any analysis. Being a GARCH model, it is expected to exhibit a high auto-correlation at lag one and insignificant correlation in higher orders. This translates to a spike at lag one in the Auto Correlation Function (ACF) plot

Series One

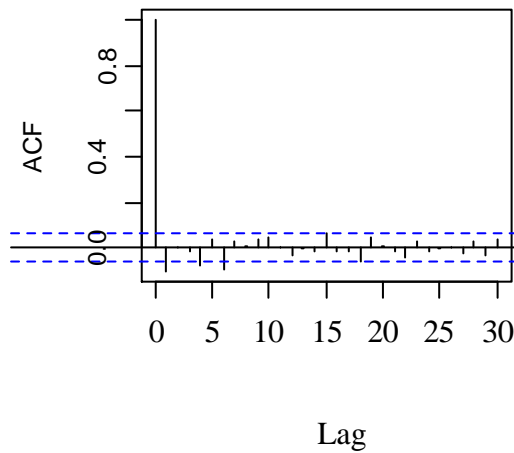


which is evident in Figure (3). An investigation on the heteroskedastic property of the series can as well be investigated from Figure (3). An inspection of the ACF's of the squares of the two series indicates existence of serial correlation, an indication of heteroskedasticity property. The mean and variance properties of a GARCH model are all satisfied.

Square of Series One



Series Two



Square of Series Two

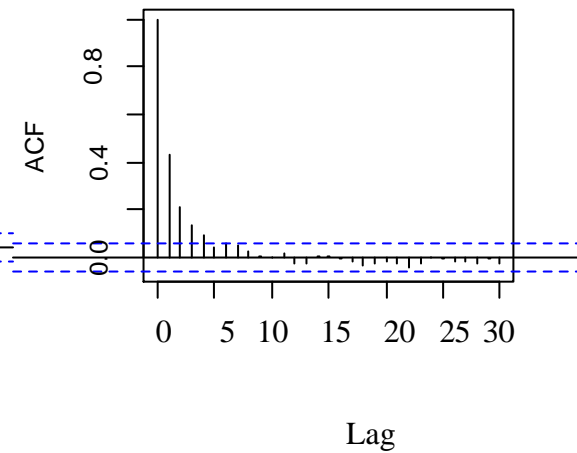


Fig. 3: Auto Correlation Functions for the Series and Their Respective Squares, in that Order.

The model used for simulation should yield a stationary series, by definition. This is evident as the series plot resemble a mean zero white noise process. Nevertheless, unit root tests such as ADF, KPSS and PP tests discussed previously in section (2.3) are used to investigate stationarity in the series.

The ADF test tests the null hypothesis of non stationarity. The p-value indicates the amount of evidence against the null hypothesis. For the two simulated series, the ADF test output is as shown in table 1 below;

Table 1: Augmented Dickey Fuller test output for the two simulated series. Omega represents the First Series Whereas Omega1 is the Second Series.

Data	Dickey-Fuller	Lag	P-value
Omega	-9.726	9	0.01
Omega1	-10.0075	9	0.01

From table 1, the p-value is 0.01. At 5% level of significance, the classical probability rule dictates rejection of the null hypothesis. The decision rule is that there exists sufficient evidence that the series might be stationary. Also the absolute values of the Dickey-Fuller values are relatively low thus we may conclude both series may be mean-reverting. But ADF test has two downsides which have to be addressed.

1. The model for an ADF test uses the differenced series.
2. It assumes that the residuals are independent and identically distributed.

KPSS test addresses the differenced model in ADF test. It tests the null of stationarity with respect to an existing trend. It is similar to the ADF test but does not detrend the series. That is, the long term general movement of the series is preserved. Table 2 presents the output of this test.

Table 2: KPSS test output for the two simulated series

Data	KPSS Level	Lag	P-value
Omega	0.1328	7	0.1
Omega1	0.2012	7	0.1

The test yields a p-value of 0.1. Following the same decision rule, we fail to reject the null hypothesis at 5% significance level and conclude that the series might be stationary. All the above tests are parametric. They all assume independence and identical distribution of residuals. A non-parametric test need to be done, which can be used in

presence of heteroskedasticity. Philip Perron test is the best alternative. To ascertain these decisions, a Philip Perron test is done whose results are presented in table 3. This test, just like ADF, tests the null of non stationarity. Having the same p-value of 0.01 as that in the ADF test, the same decision rule is followed.

Table 3: Phillip Perron test output for the two simulated series

Data	Dickey-Fuller	Lag	P-value
Omega	-955.7931	7	0.01
Omega1	-1025.337	7	0.01

It can finally be concluded that the two series are stationary and therefore satisfying all the underlying model assumptions. The requirement of the two

series being integrated of order 1, $I(1)$, is fully satisfied since the two series were simulated from a GARCH (1,1) series, and all the tests above indicate stationarity

satisfaction.. It then remains to estimate the parameters and laf values of Equation (11) to estimate the granger causality. Estimation of lag value to be used in the estimation of causal relation between the

two series follows. AIC is the commonly used procedure in the estimation. The output of the estimation is presented in the following Table.

Table 4: Results for the AIC lag Estimation

	Degrees of Freedom	Sum of Squares	RSS	AIC
Null			5983	1792.1
Differenced Exchange Rate	1	4819	10802	2380.3

NB : $rank = 2$

From the output, the second lag is the most appropriate for estimation. The model effects are therefore investigated

and from Figure (4), it is clear that the model has a level effect except for tail values.

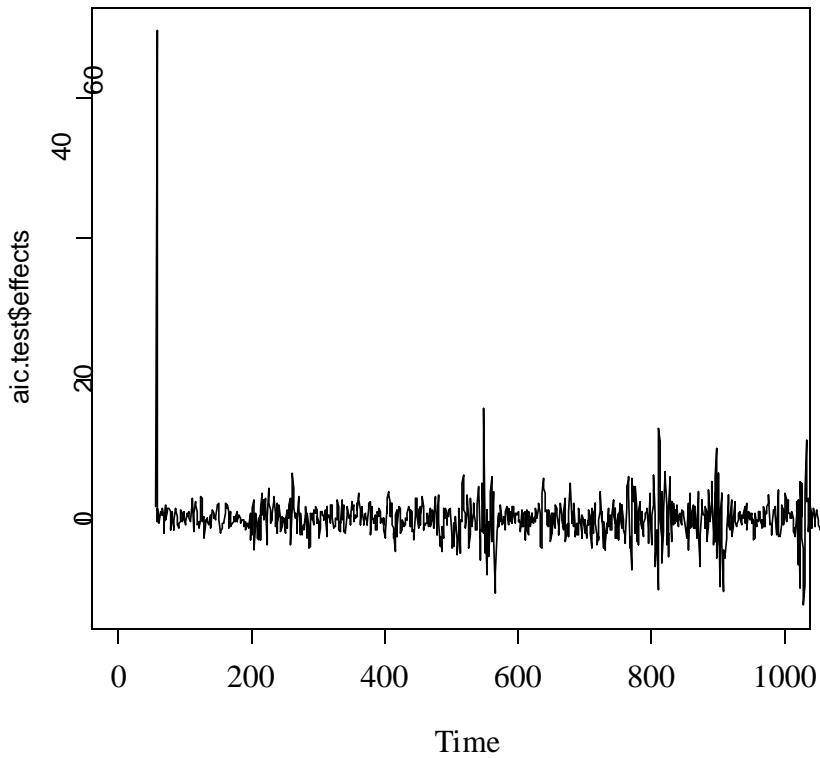


Fig. 4: Model Effects for the Two Simulated Series

Since the model effects are level within the mean, the necessity of lag inclusion in the model is investigated. The results of this test are as shown in Table (5) below.

Table 5: Statistical Test Output on Lag Inclusion in the Model

Model	Inclusion	Residual Df	F-value	$pr(> F)$
One	$Lags(Y, 1 : 1) + Lags(X, 1 : 1)$	995		
Two	$Lags(Y, 1 : 1)$	996	0	0.9956

Y and X represents the two simulated series. The null hypothesis of the saturated model is rejected. Therefore, there is sufficient evidence that the inclusion of the lagged values in causality estimation leads to the overall improvement in the model predictive ability. The coefficients for the granger causality model are presented in the table below.

Table 6: Granger Causality Model Coefficients

Intercept	X11	X12	X13
-0.05010	1.65084	-0.05791	0.01796

The first and fourth variables are found to be insignificant in the model, at 5% level of significance. The variables are therefore dropped. A linear model is thus fit with the series itself and its second lagged value. All the model parameters were found to be statistically significant at 5% level. From the output above, the granger causality model therefore becomes:

$$Y_t = 1.65084X_t - 0.05791X_{t-1}$$

Where, Y_t represents the first simulated series while X_t is the second simulated series.

It therefore remains to check on the direction of the causality. The output is presented below.

Table 7: Direction of the Causality

	F-statistic	p-value
Omega -> Omega1	8.54254	1.0×10^{-7}
Omega1 -> Omega	7.6985	1.0×10^{-8}

It is clear that the two rates granger caused each other. Therefore, movements in one simulated series are more likely to be caused by the movements in the other series.

3.2 Error Correction Model

Once the granger causality model in sub-section (2.1) above has been built (Equation (11)), an ECM is easily built by considering the residuals of the model in Equation (11) above. ECM involves fitting a regression equation of the differenced series and the residuals of the fitted granger causality model. Due to the inclusion of the residuals, dynamic

linear modeling is used. The fitted model will involve two main parts; the residual part which might be considered more stable than the differenced series part, hence the use of a dynamic linear model. The output of an estimated ECM is as shown in Table (8) below.

Table 8: An Estimation of an ECM for Exchange and Interbank Lending Rates

	Estimate	Std. Error	t value	pr (> t)
Intercept	-0.05787	0.06478	-0.893	0.372
Omega1	0.80422	0.02291	35.104	2.0×10^{-16}
Residual	1.11172	0.05338	20.826	2.0×10^{-16}
Residual Standard Error : 2.046 on 995 df				
Multiple R^2 : 0.6143				
Adjusted R^2 : 0.6135				
P-value = 2.2×10^{-16}				

NB : The fitted model is $A_t = \alpha + \beta B_t + \lambda \varepsilon_t$ where $A_t = \text{Omega}$ (Series One),

$$B_t = \text{Omega1 (Series Two)} \text{ and } \varepsilon_t = \text{residual}$$

All the parameters, except the intercept, from the model are significant at 5% level. R^2 value of 0.6143 shows that the overall model fits well to the data. The fitted ECM therefore becomes;

$$Y_t = 0.804226X_t + 1.11172\Lambda \quad (12)$$

where Y_t represents the first series, X_t the second series while Λ denotes the error correction component.

4 Conclusion and Discussion

Results of the granger causality indicate that the two rates granger causes each other. This is expected since the two series were simulated, and hence represent a very ideal scenario. Movements in series one can be used as an indication of the most probable movement in series two. The residual sum of squares from the granger causality model is quite low, an indication that the model optimally explains the variations in the data. Finally, an ECM model is built and results presented in Table (8) in sub-section (3.2). The model is presented in Equation (12). From the output, the R^2 value is 0.6135, an indication that the model is a good fit for the data. Further, the adjusted R^2 value is 0.6135, which is very close to the R^2 value, meaning the model can as well perfectly fit to any other data with similar characteristics. Therefore, the model can be used for predictive purposes. This argument is ascertained by the very small

sum of squared residuals. The model can therefore be used to analyse data with similar characteristics as those used in the study. It can as well be adopted by institutions for their internal hedging and as a liquidity guard, as the ideal scenario.

Recommendations

It is recommended that the same study be conducted with with real time series data, following the same procedures. Further, a study on the tail values should be done to examine the cause of the tail clustering and its impact on the overall model. Given the granger causality model, it is recommended that a cointegration model be built to examine whether the two models differ from each other; and if so, examine the reasons for the difference.

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