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EDITOR’S PREFACE

We are happy to bring you yet another issue of the Mwenge Journal of Academic Studies, (MJAS). MJAS is published bi-annually by Mwenge Catholic University (MWECAU), in Tanzania. It is an upcoming journal that is dedicated and committed to promote and encourage excellent scholarship in Tanzania and beyond.

As a multidisciplinary academic forum, MJAS accepts articles on crosscutting issues and it is therefore a forum for those interested in sharing their academic knowledge and studies with the rest of the world.

This is the third issue of the Mwenge Journal. Since its inception, MJAS aspired to establish itself as a leading source of outstanding academic research in this region. MJAS will therefore, continuously encourage and engage responsible scholars to publish their research findings and thus contribute to the betterment of our society.

This issue carries numerous extensive and informative topics. The articles covered are on environmental pollution in the mining industry in Tanzania; implementation of learner centred pedagogy in secondary schools in Kilimanjaro, Tanzania; the use of e-reference services in facilitating effective teaching and learning processes in higher learning institutions. Other articles include the analysis of the characteristics of the informal sector in Morogoro, Tanzania; the future beyond fossil fuels in Tanzania; factors affecting performance of women entrepreneurship in Taita-Taveta County of Kenya; and finally the articles on the impact of education on child labour in Kenya.

We are grateful to all authors who have contributed articles to this issue. We hope that you will find our articles both insightful and educative, and we look forward to your comments and contribution to our future issues.

Keep reading!

Dr. Godfrey Telli,
Editor

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Notes for Contributors

The Editorial Board of the Mwenge Journal of Academic Studies (MJAS) welcomes submission of manuscripts to be considered for publication. Manuscripts should comply with the following format: A-4 double space; 1 inch margin: left, right, top and bottom; Font size: 12, Word type: Times New Roman; Program: MS Office 2003; Length: Analytical papers and research-based articles should be between 5,000 and 8,500 words. Reviews and short communications must not exceed 3,500 words. Scientific ethics: The authors should adhere to scientific ethics, namely the terms of authorship, do not do fabrication, falsification and plagiarism. References: References and reference citation should follow the style of the *American Psychological Association* (Publication Manual 5th or 6th Edition). Footnotes to the text should be avoided. Manuscripts will only be published subject to review by scholars of proven competence in their areas of specialization. Nevertheless, the final decision regarding publication shall reside with the Editorial Board. All Manuscripts, including all correspondences, notes, comments, articles and book reviews must be made in English and should be submitted both in hard-paper format and electronically as an attachment to the address below:

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Assessment of the Implementation of Learner Centred Pedagogy in Secondary Schools in Kilimanjaro Region - Tanzania

By Salema Victorini

ABSTRACT

This study assessed the implementation of Learner Centred Pedagogy (LCP) in Kilimanjaro region, Tanzania. The Ministry of Education and Vocational Training in Tanzania revised the curriculum in 2005 and adopted LCP. Learner centred pedagogy emphasizes the active role of learners in the process of learning to enhance creativity and critical thinking in acquiring knowledge, skills, and competences. This study explored the teaching and learning processes that reflect LCP in public and private secondary schools in Kilimanjaro region. The researcher adopted mixed research methods for data collection and analysis. Specifically the researcher used cross-sectional survey and ethnographic designs. The study sampled 580 students, 115 teachers, 6 heads of secondary schools, one education inspector and one official from National Examination Council of Tanzania (NECTA). Data collection instruments were questionnaires for students and teachers, in-depth interview guides for heads of schools, inspectors and official from NECTA, observation guide and document analysis guides. The study found that teaching and learning processes that reflect learner centred pedagogy in public and private secondary schools in Kilimanjaro were lagging behind the expectations. Many schools lack adequate resources, teachers lack adequate knowledge and skills on LCP, big work load and lack appropriate and adequate supervision. The researcher recommends that the teachers should be given adequate training on LCP organized by schools, inspectorate and other organizations. The government has to provide adequate resources for schools, training more teachers and change of mind set and attitude of teachers who maintain teacher centred pedagogy.

INTRODUCTION

The Tanzania Development Vision 2025 focused on five important areas of concern namely: high quality livelihood; peace, stability and unity; good governance; a well educated and learning society and finally a strong and competitive economy. The Vision accords high priority to the education sector, so as to impact positively on the economic development of the country. From the document it is stated:

Education should be treated as a strategic agent for mind-set transformation and for the creation of a well-educated nation, sufficiently equipped with the knowledge needed to competently and competitively solve the development challenges which face the Nation.

In this light, the education system should be restructured and transformed qualitatively with a focus on promoting creativity and problem solving (United Republic of Tanzania, 2008).

As a reaction to the implementation of Vision 2025, the Ministry of Education and Vocational Training (MoEVT) had to review the former curriculum to ensure that it addresses the broad national Vision. Moreover, the Ministry had to consider external changes in educational approaches and theories that were taking place all over the world. The influence of globalization has caused the world nations to harmonize their ways of doing things for the sake of opening up opportunities for better interactions between nations. This has meant, for education, addressing issues such as teaching approaches whereby the emphasis was directed to the learner rather than the teacher. As Ginsburg (2006) argued, active-learning, student-centred pedagogies are advocated by researchers and policy makers around the world. This approach emphasizes the role of learner in the process of learning and changes the role of teacher to a guide, to engage students with active learning and discovery learning or problem solving, and frequent student questions and discussion. It is advocated by constructivist psychologist like Bruner and Vygotsky on learning by discovery and problem solving, which requires pupils to hypothesize, ask questions and discuss lines of enquiry (Bruner, 1967). According to Cuseo (2000), in learner-centred pedagogy the student's role changes from being a passive receptacle and recipient of teacher-delivered information to being an engaged learner and active agent in the learning process, learning how to learn and developing lifelong learning skills such as critical thinking, problem solving, and communication skills.

Current studies on the implementation of learner- centred pedagogy indicate some serious challenges related to LCP. For instance studies on learner centred pedagogy conducted by Barret (2007), Kabendera (2008) and Salema (2009) reported shortages of qualified teachers, shortage of infrastructure and shortage of teaching resources and many administrative challenges. A similar study (HakiElimu, 2010) found that the implementation of new curriculum leaves a lot to be desired if skills and competences are to be realized, to facilitate quality learning and production of quality graduates in the public school system. An ethnographic study by Vavrus, Thomas and Bartlett, (2011) in Kilimanjaro region in selected private secondary schools on LCP found that teaching has largely been didactic even though the content of the curriculum in Tanzania has become more learner-centred.

Looking at the approaches of various researchers on LCP, there is a dichotomy approach, where, some studies contend that learner centred pedagogy is an imposed approach which cannot be realized in poor countries. For example, studies carried out in Namibia and Botswana the authors consider learner centred pedagogy as a western oriented approach which cannot fit African poor countries (Chisholm & Leyendecker, 2008, O' Sullivan, 2003, Tabulawa, 2003). These studies give an impression that constructivist theories are irrelevant in African context and at the same time they do not guide to what should be appropriate to African context.

Moreover, some of the studies were done too early when the approach had just begun (HakiElimu, 2010). This implies that these studies might have skipped some important issues which researcher deemed to be clearer after four years of the implementation of learner- centred pedagogy.

Furthermore, many research studies do not address some critical questions related to the use of LCP as an efficient way of teaching in secondary schools in Tanzania or as a better method than those it aims to replace. Is LCP the only approach that should be used, or is it just one amongst many? Have there been any attempts to match each aim and objective in the syllabi with the best method for each one whether consistent to LCP or not? For instance rote learning may be very effective and efficient for some objectives but not useful for teaching independent learning skills or critical thinking. This particular study has explored some of the issues emerged in relation to the application of LCP.

In particular, some of the studies were narrow not only as regards to the context, methodology and area of study (HakiElimu, 2010, Vavrus, Thomas and Bartlett, 2011).

This study particularly assessed the implementation of learner- centred pedagogy in both private and public secondary schools in Kilimanjaro.

Research questions

This study was guided by the following research questions:

1. How Learners actively participate in LCP in secondary schools in Kilimanjaro region?
2. To what extent teachers apply LCP Teaching methods in secondary schools in Kilimanjaro region?
3. What is the role of Supervision/ inspection of teachers to ensure implementation of LCP in secondary schools in Kilimanjaro region?
4. To what extent teachers were prepared to implement LCP in secondary schools in Kilimanjaro region?
5. What are challenges of the implementation of LCP in secondary schools in Kilimanjaro region?

Hypotheses:

H_{a1}: There is a significant difference between teachers in private and public secondary schools in Kilimanjaro secondary schools in application of participatory teaching methods.

Ha_2: There is significant difference between teacher's means scores on application of LCP methods as per their area of specialisation.

METHODOLOGY

This study applied mixed research method because of its flexibility to collect data from diverse situations (Creswell, 2007). More specifically, cross sectional survey and ethnographic designs were used. The respondents were sampled from three districts in Kilimanjaro region. The sample comprised six heads of secondary schools selected by purposive sampling technique, 115 teachers selected by stratified sampling, 580 students sampled by stratified sampling and one educational inspector and one NECTA official selected purposively. This study used questionnaires for teachers and students, interview guides for heads of schools, education inspector and NECTA official. Observation guides and document analysis guides were also used as instruments for data collection.

Validity of the instruments was determined by research experts and reliability of the questionnaire was tested by Chronbach Alpha technique. Chronbach Alpha of 0.8 and 0.9 were obtained from teachers and students' questionnaires respectively. The questionnaires were reliable because according to Kerlinger (2000) a value of Cronbach Alpha 0.7 is considered to be a cut off point for acceptable and unacceptable reliability.

Descriptive and inferential statistics were used for quantitative analysis of data, while qualitative data was analysed through transcription of data, developing themes, categories and interpretation.

FINDINGS

The major findings are summarized in the following themes: Students' active participation; Teaching methods, Supervision/ inspection of teachers; Teacher's preparedness; and challenges of implementing LCP.

(i) Students' Participation in LCP

How learners participate in the process of teaching and learning can be deduced through observation. A systematic observation of classroom and outside classroom activities indicated that majority of the teachers were still using the old approaches, with students as passive receivers of knowledge. Observations in classroom settings showed that there is a lot to be desired if participatory learning is to be achieved properly. In most of the observed schools, the level of passivity gave an impression that there could be other immediate problems that need to be addressed. For example, a language barrier was seen as an obstacle in the process of learning.

During one class observation the teacher wanted the students to discuss questions. The discussions in most of the groups were conducted in Kiswahili. This observation concurs with what Desforges (2012) argued that the problem arises when teachers at all levels of the system use Kiswahili for teaching, or allow students to conduct class discussions in Kiswahili, and make little effort in their subject teaching to develop the oral and written English skills of their students. At this point poor English skills have a devastating effect on performance. Desforges added that the development of the East African community makes this competence in English even more important as a regional labour market develops and Tanzanian citizens will be competing with Kenyans, Ugandans and others for employment in an increasingly globalised world where English is the major language of commerce, diplomacy and academic life.

In some other observation cases, the students were busy copying notes from the blackboard and they had little time to take active roles in the process of learning. The teachers would ask few questions and that was over. Good number of the teachers when asked about their approach; the response was that the completion of syllabus was important to them. One f teacher when asked as to why they prefer lecturing to active leaning methods, argued that, they still remember the poor form four exam results and they think covering the syllabus before national exams was a solution. The students were furnished with model answers for the exams where each student was supposed to make a copy ready to prepare for the examinations.

The researcher also observed on how teachers give equal opportunity to students in answering questions and in active participation roles. In some classes only boys answered the questions and the teacher did little to encourage the girls to answer the questions or take active roles in discussions. A good teacher needs to give equal chances to boys and girls in the process of learning. Thomas and Rugambwa (2011) suggested some of the good methods to assist girls to participate in LCP. According to them, calling on girls even when they have not raised their hands is sometimes necessary to overcome situations where girls feel “nervous” about speaking in class. Another strategy is the mixing of boys and girls in groups. They believed that mixing male and female students during small group discussions served as a means to socialize students and to provide girls an equal opportunity to express themselves and experience success in general learning. These skills were lacking in some teachers who were not able to ensure all students take active roles in the process of learning. The findings also concur with what Altinyelken (2010) in his study on pedagogical renewal and teacher development in Sub-Saharan Africa, a case of Uganda found that traditional teaching practices persist in classrooms. He added that most of teachers still hang on the old approaches of delivering content to students while students have little to contribute and memorize content for examinations.

Similar research carried out in Malawi by Mtika, Gates & Peter (2010) on the capability of trainee teachers to implement learner-centred practice at one of the teacher education institutions in Malawi indicated that there is no clear evidence on the extent to which trainee teachers or indeed qualified teachers develop and utilize learner-centred education during their classroom pedagogical practices. The findings also indicate that appropriation and application of learner-cantered education has not brought substantial change in classroom practice. Unless this challenge is addressed in secondary schools in Tanzania then implementation of LCP will not be achieved with ease and the national Vision 2025 may not be a reality.

ii) Teaching Methods to Enhance Learner Centred Pedagogy

A good balance of roles in the process of teaching and learning is crucial for the implementation of learner centred pedagogy. Learners have to take active role and the teacher is not the one to dictate the whole process of learning. Therefore, the teaching methods used in class and outside class are very important determinants to enhance active participation and critical thinking. The researcher wanted to know the way teachers use various methods classified by experts as methods to enhance learner centred pedagogy. These methods range from those used in classrooms to those used outside the classrooms. Some of the methods used outside classrooms include independent projects, discussions, debates, practical, field trips, peer mentoring and many others. In the classrooms setting, various methods can also be used such as discussion, giving turns to students to speak, quizzes, writing reflections, class presentations, role plays, poster presentations and many others. To determine the extent to which teachers use these methods in their process of teaching, teachers and students were required to rate “very often (5)”, “often (4)”, “sometimes (3)”, “rarely (2)” and “never (1)” to the questions. The findings are summarized in figure 1.

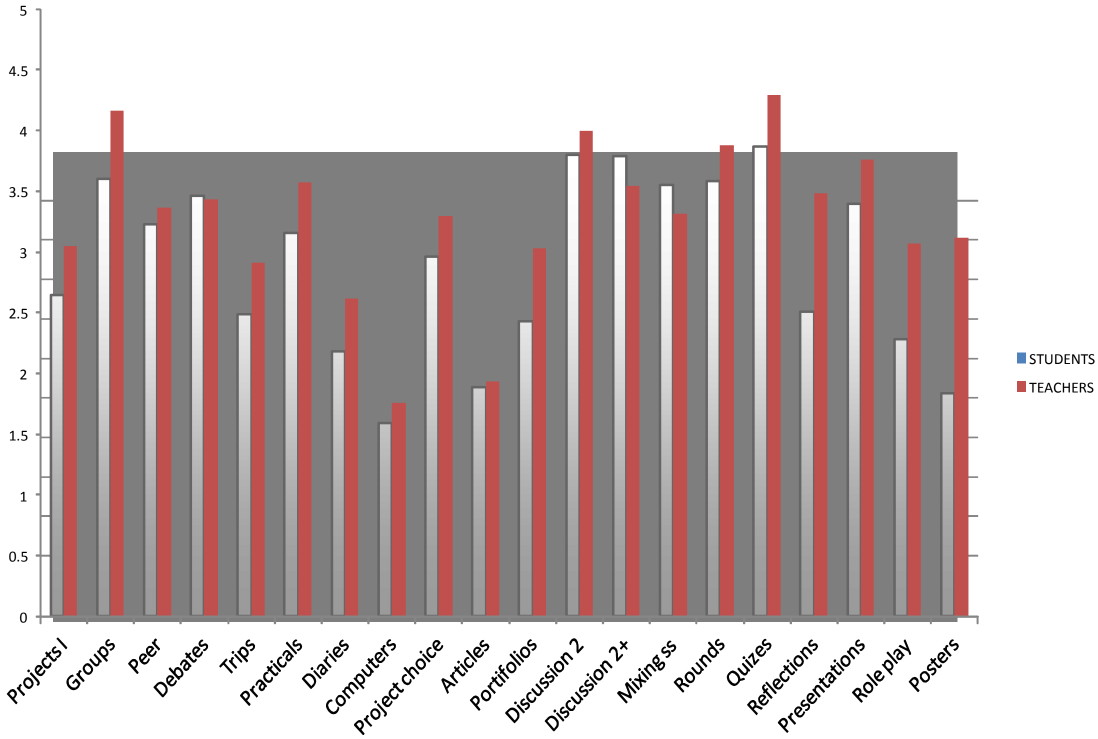

Figure 1: **Comparative Analysis on Rating of LCP Teaching Methods Used by Teachers and Students**

The findings in figure 1 indicated the students rated as moderate (mean scores between 3-4) the use LCP methods such as group discussion, peer mentoring of other students, debates, practical, short discussion in twos, groups into larger groups, mixing students into groups, giving turns to individual students to talk and quizzes.

Some of the methods which were rated below mean score 3 included: field-trips, students to have reflective diaries, computer assisted learning, students to choose subjects for study/projects, students writing newspaper or journal article, portfolios, writing reflections on learning (3 to 4 minutes), role play and poster presentations. The researcher wanted to compare the teachers and students on rating of the use of LCP methods. The findings indicated that most of the teachers rated the use of various methods higher than students with the exception of big group discussion and mixing of students into groups which were highly rated by students than teachers.

From the observation in classroom, there were some exaggerated cases and assumptions made by the teachers. The researcher was keen to observe the methods rated high being used by the teachers during their lessons. On the contrary, very few of the methods were used by teachers. One of biology teacher was asked as to why he does not use varieties of teaching methods in class and he said, "Application of any method depends on the nature of a topic and time available. Other methods consume too much time, so we avoid them". That implies that the pressure to cover the syllabus may hinder the teachers from using some of the participatory teaching methods.

Generally, the class observations by the researcher found out that there were many teachers who cling to the teachers-centred approaches. Other teachers could apply two or three of the methods throughout. It was also found that some of the teachers do not know how to apply some of the methodologies. In discussion with one teacher after the observation he confirmed not to know how to apply role play, reflective diaries, portfolios, writing journal articles and using computer assisted learning. This also gives an indication that some teachers may claim to use certain methods but in fact they do not know how to use them. That could be another indication of a problem in the training of teachers on how to teach and how to apply various methods in the process of teaching.

From the further observation and interview with teachers, what determines the use of learner-centred pedagogy methods was the background of the teachers' training and also the way the owner of the school wants his/her teachers to work. It was observed that in most of the private secondary schools where the owners are serious and want their teachers to adhere to the new approach, then the teachers adjust themselves to meet the standards. The zonal education official confirmed that when she said, "What makes a difference between public secondary school and private secondary school is that the administration in Private secondary school is always about to monitor the daily running of schools, to ensure classes are attended and they teach properly". On the other hand, in public secondary schools especially where the head of school is not very keen, teachers do not bother about new approaches. One head of public school argued:

The problem is that, the real implementation in classroom may be difficult to make a follow up. This is true because teachers may prepare very good lesson plans showing the competences, strategies and methods to be used in class, but it may not happen in class. If you go in class you do not see it being implemented (Interview: 21/10/2013).

In general it was observed that majority of the teachers who had a good foundation on LCP in their college education and in- service training, were better in participatory methods.

Hypotheses Testing

The researcher wanted also to know whether or not there was any significant difference on teachers' rating on the extent to which they apply some of the learner centred methods in relation to their school type and area of specialization. The researcher advanced the following hypotheses:

Null Hypothesis 1 (Ho1)

H_{o1}: There is no a significant difference between teachers' means score on application of participatory teaching methods in public and private secondary schools in Kilimanjaro region.

Independent Sample T- Test was summed as: t (102) = -1.987, *P=0.05)*. The findings indicate that *P*-value 0.05 is equal to 0.05 significance level. The Null hypothesis was rejected and it was concluded that there was no significant difference between teachers' mean scores on application of participatory teaching methods in public and private secondary schools in Kilimanjaro region. Teachers in public schools had low mean scores on rating the application of participatory methods used in teaching than teachers in private schools. This could be because, most of the private schools are well equipped with resources in the process of implementing learner-centred pedagogy and they were able to apply various teaching methods frequently.

Null Hypothesis 2 (H_{o2})

Again the researcher wanted to know whether or not teachers differ in rating of the application of participatory teaching methods according to their area specialization. The researcher put the following hypothesis:

Ho_2: There is no significant difference between teacher's means scores on application of LCP methods as per their area of specialisation.

One Way ANOVA test was summarized as (F (3,102) = 2.42.1, *P*= 0.020). From the findings, *P*-value is less than 0.05 significance level. The Null hypothesis was rejected and it was concluded that there was statistically significant difference between teachers' means scores on LCP methods application based on their area of specialisation. That means that, teachers differ in the way they apply learner centred approaches depending on their area of specialization. This could be true because various methods used across departments may differ depending on the nature of the lessons.

From the researcher's observation, it seems that some of the teachers rated high the application of learner-centred methods but in fact teacher-centred approaches or methods such as lecture methods are still rampant in some secondary schools with the claim that teachers want to complete their syllabus, or shortage of resources. The findings concur with Bartlet and Mogusu (2011) in their research on teachers' understanding of LCP in Kilimanjaro which revealed that there was a persisting sense of knowledge as something predetermined to be given or transferred from teachers or books to students. Therefore unless teachers radically decide to adopt LCP it may remain unimplemented.

iii) Supervision/ Inspection for the Implementation of LCP

Supervision or inspection of teachers is important so as to guide them into right teaching practices. Inspection can be done by the head of school or by external inspectors. To determine whether or not the teachers were inspected by the heads of school in their process of teaching, teachers were to respond by yes or no to the question. The findings indicate that majority of the teachers 79% were inspected by the heads of secondary schools. Only 21% of the teachers confirmed that they were not inspected by the head of school. The teachers were also asked to show how often they were inspected per semester. The findings indicated that a good number of the teachers 42% were inspected twice a semester, 33% inspected once a semester while a few teachers 25% were inspected often. During the interview with one head of public secondary school the conversation went as follows:

I. As a head of school, do you supervise or inspect your teachers in classroom?

R. I do inspect teachers in classroom very often but the problem is that, most of the teachers do not follow their lesson plans, they are not well organized (Interview: 14/10/2013).

Another head of private secondary school was asked about supervision in class and had this to say:

I normally go to class to inspect teachers in their teaching and ensure that they involve students in the process of leaning. I also ensure that students are given assignments where they can make use of the library and broaden their knowledge. I do make a follow up of the lesson plans, schemes of work and teachers also. I discuss with teachers based on what they plan and insist the importance of using various teaching aids (Interview: 11/10/2013).

Most of the teachers who were inspected expressed the benefit they get through the supervision such as improved teaching and learning, confidence in teaching and in handling their classes, discipline in their profession, punctuality and in updating their profession by modern science and technology insights. These positive gains may play a role in the implementation of LCP, but the question is, is supervision done adequately?

The researcher also wanted to know about external inspection by the zonal inspectors of education. The findings indicated that 79% of the teachers were inspected by external inspectors. Only 21% of the teachers seem not to have been inspected by the inspectors. During the interview with a head of one public secondary school, the conversation went as follows:

I. Do you also have external supervisors or Inspectors coming to your school?

R. Yes, they do come, even few months ago they were here. They inspected

> classes, teachers and counseled teachers. They had time with us; they told us our weaknesses and strengths. Unfortunately, there were things they were not happy with, and they gave us a warning letter. We scored 40% of the evaluation for curriculum and general score was 51%. Warning letter means your school is not in standard (Interview: 21/9/2013).

From the inspector's desk the researcher found that when they visit schools, they have a detailed criteria or guidelines for inspection.

However, teachers who were inspected had different feelings as to the benefits of the inspections. Some of the teachers considered inspection as a mere frustration to their profession. The image of an inspector is taken as faulty finders and they do not see their use in schools rather than intimidation and frustrations. They also argued that some of the inspectors end in the office of the heads of schools and they do not do their job. There were other teachers who were very positive about the inspection. Inspectors are considered as people who help them, to correct them when they go wrong, help to update formats for schemes of work and lesson plans, log books and many others.

While some of the teachers were complaining about inspection, and some schools getting a warning letter, a good number of private secondary schools considered inspection as core if quality education and standards are to be achieved. One head of private school confirmed;

> *"Sometimes we call the Inspectors on a special note to come and inspect and advice on how we are faring". This was also confirmed by the inspector, "We do not segregate schools, we attend both publish and private schools. For those who pledge for special visits or inspection we normally give them priority" (Interview: 17/9/2013).*

There was a clear indication that teachers were inspected by both heads of schools and external supervisors. Despite the fact that some of the teachers are negative about supervision, there is more supporting evidence from teachers that they do benefit from it and it helps them in improving their teaching approaches to achieve LCP. The findings are in harmony with what was found by Matete (2009) on the impact of school inspection on teaching and learning. The findings indicated that school inspection plays a potential role towards improving teaching and learning. Teachers perceived the advice and feedback given through inspection reports and recommendations as useful for making improvements in their work performance.

With the drastic increased secondary schools under SEDP plans, there are more schools but the inspectorate is still constrained with fewer inspectors. The big challenge remains, do teachers adhere to what they are told by the inspector or rather do they change their approach? This will be discussed further on the section of the challenges of implementing LCP in secondary schools.

iv) Preparedness of the teachers to implement LCP

This study was also geared to explore whether or not the teachers were prepared for the implementation of LCP. This was important because to enhance proper teaching and learning processes, one needs to have the ability and capacity to do so. The findings indicated that 71% of the teachers received training while 29% of the teachers pointed out that they were not trained on how to use LCP. Furthermore, teachers were asked about the place they were trained.

The findings indicated that majority of the teachers 81% were trained in the colleges, while 14% received in-service training. The findings indicated that majority of teachers got training in colleges. From the interview with the heads of schools it was found that some schools do organize in- service training for their teachers. This was more profound in private secondary schools compared to their counterparts in the public secondary schools. The following conversation with one head of private school confirmed this:

I. How do you ensure that teachers are empowered to practice LCP?

R. I normally go to class for inspection and allow them to attend in-service training and workshops…I also organize school based workshops when we find facilitators to do so in our school. Sometimes we call the Inspectors on a special note to come for inspection and advice on how we are faring (Interview: 25/10/2013).

While some of private schools take initiatives in organizing their own in-service training workshops, most of the public schools depend on the offer of the government which does not reach most of the schools. One of the heads in public secondary schools said:

> *"Yes, they are few and in most cases our marginalized schools do not get those chances. Moreover, there are good resources recommended for LCP, which are circulated to few schools." (Interview: 21/9/2013).*

The inspector of education when asked if the government gives any support in organizing seminar and workshops had this to say:

> *Every time I recommend in our reports to the government on the importance of in-service training, but I have never seen the government providing money for training. Even our activities as inspectorate are run by the funds we mobilize from secondary schools. We have even a problem of means of transport, we have three cars, and as you can imagine some schools are extremely at the remote areas where we spend up to 4 days visiting a single school (Interview: 17/9/2013).*

The findings indicated that there were serious problems related to the real implementation of LCP in schools. Some teachers were trained and others were not trained. Those trained feel that they were not obliged to apply LCP, when they failed to acquire the required resources to do so. Those who were supposed to supervise education, find the task to be challenging and tedious. The inspector of education said:

> *We were trained and we also conduct training for teachers but the training we acquired as inspectors was not enough to assist teachers confidently. In school we do support teachers. When we go to school we inspect their lesson plans, lesson notes, schemes of work and see how they incorporate LCP. However, many teachers do not know how to incorporate competencies in the lesson. We try to help them to incorporate LCP in the lesson. But this is very tedious. We are only 20 Inspectors and there are more than 600 schools. So how many can we Inspect? It is not ease! (Interview: 17/9/2013).*

Therefore, both teachers and inspectors fall under the same limitation of not having adequate preparations for the implementation of LCP. Most of the inspectors are teachers especially those who were used to old system of teacher centred approach. With few workshops they attend, it might be difficult if they are to help the teachers while they are not competent themselves. These findings concur with what HakiElimu (2012) found on preparedness of teachers that the majority of teachers are not conversant with the concept and requirements of a competent based curriculum, which is being implemented in schools. Additionally, the majority of teachers reported that they have never attended any professional development training opportunity in the past five years.

(v) Challenges of Implementing LCP in Kilimanjaro

The findings indicated that there are schools which are still constrained with resources and facilities for implementation of leaner centred pedagogy. Public secondary schools seem to have more challenges compared to private schools though the government supports public secondary schools more through capitation grants.

The findings also indicated that there is a lack of clear government policy on major education decisions. This was vivid due to many government plans which are top down and they don't involve the key stakeholders. This poses a big challenge when it comes to implementation of the policies.

The findings also indicated that majority of teachers have poor background on LCP. Some of the teachers received training in the colleges but application of what they learnt remains a challenge especially when they find themselves in situation where they are not supported by the availability of adequate resources and continuous capacity building programs. Lack of motivation and negative feelings about the sharing of power in class also contribute to the low application of learner centred pedagogy. The findings also indicate that the government does little in supporting in service training for the teachers.

The findings also indicated that there were serious challenges related to language and subject content. Language problem is not only to teachers but also to students. This makes it even worse when it comes to the application of active participatory methods, which need a medium of communication among the students themselves and with their teachers.

The findings indicated that lack of professionalism in handling student's issues, poor learning environment and lack of awareness contribute to the poor implementation of learner centred pedagogy. Some of the teachers did not know how to handle students in the process of learning, and students felt threatened to take active role in the learning process. Corporal punishment and overloading students are among the things which intimidate students in the process of participatory learning.

The research found that the inspectorate was highly overwhelmed. There were only twenty inspectors who had to inspect more than 600 secondary schools in Tanga and Kilimanjaro regions. This makes the inspectorate to be ineffective in their duties because they cannot manage all the schools if proper inspection is to be done. Moreover, poor coordination among the different stakeholders poses yet another challenge. There was a disconnection between the schools which implement the curriculum and other stakeholders such NECTA and curriculum makers. The new approach was taken as a top down policy with little participation of other stakeholders at the bottom. Little was also done to build the capacity of teachers and schools through in service training and in support of resources to enhance learner centred pedagogy.

CONCLUSIONS AND RECOMMENDATIONS

The researcher concludes that teaching and learning processes that reflect learner centred pedagogy in public and private secondary schools in Kilimanjaro are still lagging behind the required standards. Some of the teachers were still using teacher centred approaches in teaching and learning processes with passive learners. Means to support teachers in the application of Learner centred pedagogy was still a challenge to many schools particularly private secondary schools. Teachers from private schools had higher mean scores on application of LCP methods than teachers from public schools. Teachers were inspected by both heads of schools and external inspectors but the shortage of enough inspectors made it difficult to give appropriate and adequate services.

The researcher recommends that the teachers should be given adequate training on LCP organized by schools, inspectorate and other organizations. The government has to provide adequate resources for schools, training more teachers and inspectors. Teachers should change mind set and attitude and adopt learner-centred pedagogy. To achieve the vision 2025 should be taken seriously by all stakeholders and not the issue of few top officials imposing policies without clear strategies for implementation.

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The USE of E-Reference Services in Facilitating Effective Teaching and Learning Processes at Mwenge Catholic University Library

By IVAN MMARI

ABSTRACT

This case study on the use of e- resources was conducted at Mwenge Catholic University, Moshi Tanzania. The study used cross-sectional survey design. Two hundred and fifty questionnaires were disseminated to the library users from a random sample selected by the researcher. The findings revealed that the majority of participants have information about the library services offered by Mwenge Catholic University. However, access to the electronic reference services was deemed unsatisfactory. This was mainly due to the inadequate number of computers with electronic reference services facilities, lack of skills on how to use electronic reference services by users and frequent power cuts.

Key words:

electronic resources, effective teaching, learning process, and use of e resources

INTRODUCTION

At Mwenge Catholic University, (MWECAU) almost all reference services and information are now available online. Many of these services are provided by non-library and commercial organizations free of charge or at a moderate fee. Information is an important input for success of any educational system. Lack of information restricts library users (for example students and researchers,) from realizing their full professional and academic potentials (Tanzania Department of Research and Training, 1991). Books, research reports, theses, conference proceedings and scientific journals are among the major sources of information for students and researchers. Traditionally students and researchers use them in hard copies format. Today, however, technological developments have enabled their use in electronic form, which has revolutionized information communication.

The term e-reference is widely used to refer to electronic resources such as books, journals, reports, theses and conference proceedings. These are the most dependable source of information for facilitating teaching and learning processes. It also refers to a host of other forms of information communication by electronic means such as online chatting, e-mailing, web forms, suggestions and Frequently Asked Questions (FAQs).

Electronic technology has greatly expanded the methods of creating, editing, maintaining, transmitting and retrieving information (Mnjama 2004). One of such services is e-reference service. This is an important component of any library in facilitating library users' access to information resources.

In order to meet library users emerging needs, universities have found it inevitable to embrace e- reference services in their libraries. With e-reference services it is possible to conduct online teaching and learning which involves the use of information technology to facilitate the exchange of ideas among the participants. For this purpose, library users need information in order to perform well, in their respective field of studies.

With the advancement of ICT, it has been possible for students in the remote areas to access library collections at any time due to availability of e reference services. There is a need to increase the accessibility of e-reference services in order to facilitate teaching and learning processes. This enhancement of accessibility would help in the optimization of the use of reference services at Mwenge Catholic University (MWECAU) library. E-reference services development is indeed important for academic libraries.

Statement of the problem

This study seeks to examine the use of e-reference service in facilitating teaching and learning processes in Tanzania. The purpose of this study is to examine the use of electronic reference services in facilitating effective teaching and learning processes among MWECAU Library users. Library users need access to information to facilitate the teaching and learning processes. This is so when there are reliable and effective library and information services in the university. However this has not always been the case (Mcharazo, 2004; Maro, 2008). Despite the availability of resources at the University libraries, the extent to which learners optimally use the same has always been questionable. Traditionally, it has been difficult for users to acquire timely reference services from wherever they are located without physically going to the library. Due to difficulties in accessing library and information services in their information centers, library users spend a longer time accessing most materials and services, which ultimately affect their studies. In some cases, some information services such as library inquiries take a long time on make effective impact to the intended users due to challenges explained above.

Research Questions

1. What are the Library users' perceptions about using e-reference service?
2. To what extent is e-reference services at MWECAU library used in facilitating teaching and learning process?

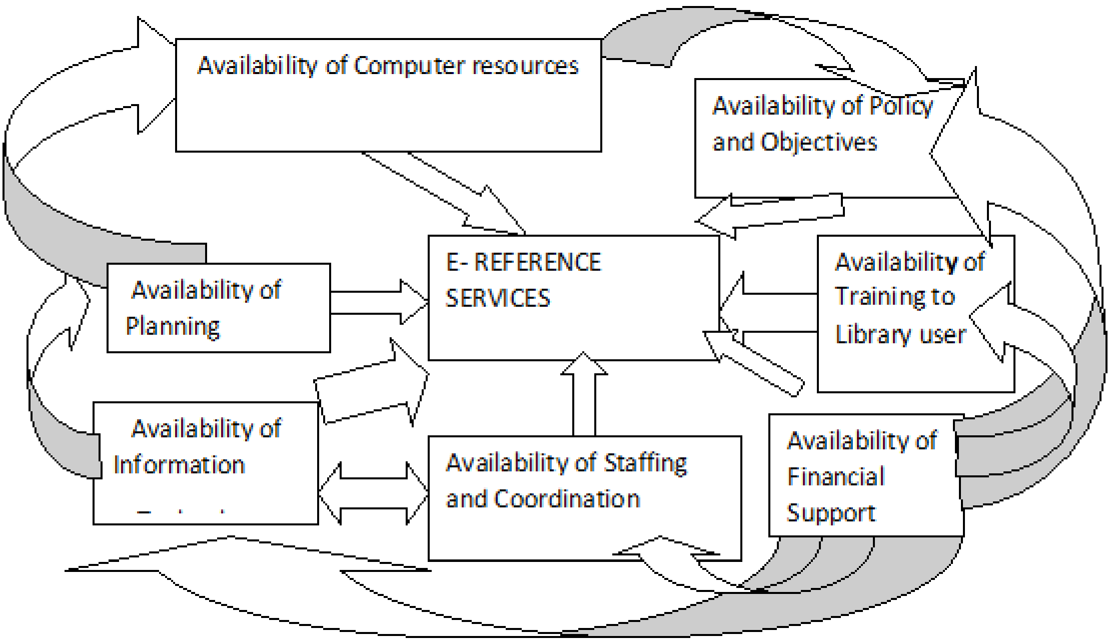
3. What are the challenges experienced by library users at MWECAU in the utilization of e-reference services?

4. What should be done to improve e-reference services in facilitating teaching and learning process at MWECAU Library?

Conceptual framework

In the constructed conceptual framework, e-reference service was regarded as a independent variable which was influenced by the dependent variables which are teaching and learning processes and also influenced by intervening variables such as availability of Information Technology, staff and coordination, training, financial support, planning, policy and objectives, and computer resources among other factors. This conceptual framework was used to guide the study in data collection, analyzing the data and discussion of the findings.

Figure 1.1 Source Mmari (2010)



Availability Planning of the Library - Thorough planning is needed to ensure that all activities intended to be carried out are geared towards meeting the institutional goals. In this study the researcher regards planning as an essential part of the conceptual framework which examines the use of e-reference services in facilitating the teaching and learning processes at the university

Availability Policy and objectives of Library – These are used to guide planning and implementation of institution's goals. In this research these were used in gauging the achievement and the success of the set objectives which is to examine the use of e-reference services in facilitating the teaching and learning processes at the University

Availability Information Technology- Information and Technology has some effects on the application of reference services since both library users require some computer knowledge. Also it is an important component in examining the use of e-reference services in facilitating the teaching and learning processes at MWEACU.

Availability Financial Support - Financial support from various sources is crucial in the provision of e-reference services in facilitating the teaching and learning processes at the University as it is used to acquire both human and material resources.

Availability Training – Training is an important element in this study due to the fact that new knowledge and resources, such as e-reference services, are continentally evolve and are being utilized in teaching and learning processes.

Availability Computer resources - Computer resources are important tools in availing e- reference services in facilitating teaching and learning processes at MWECAU.

Availability Library users – This is the key in the whole process of examining the use of e-reference services in facilitating the teaching and learning process within the Library.

LITERATURE REVIEW

Introduction

E- Reference services

Although most librarians have an idea about what E-reference is, they are less sure what to call it. There are various terms in use such as: online reference; digital reference; electronic reference; virtual reference; or live reference. Generally speaking, virtual or live reference refers to transactions in real-time, using chat and video-conferencing, for examples and demonstration. Online, digital, or electronic reference includes email and web form transactions. Digital reference refers to a network of expertise, intermediation and resources placed at the disposal of someone seeking answers in an online environment. Digital reference can provide support for users who find online tools and resources unfamiliar, difficult to learn, or insufficient to answer their information needs. It can also provide valuable user feedback to collection builders so that they may better tailor their resources. Social Inclusion:

email-based and especially chat-based reference extends library services to those users with physical challenges. Not only can those users access information, but can receive real-time guidance from librarians, thus facilitating the 'human interaction' so important in reference transactions.

Michael (1999) argues that information is a very important resource in the world due to its immense contribution to the satisfaction of needs and desires of individuals. He further reiterates that it is impossible to think of human life in the modern society without talking about information as a very useful tool in solving problems and for decision making. It is therefore important to consider information with the attention it deserves as a means to facilitate better understanding among people.

Role of E-reference services in facilitating teaching and learning process

From a library perspective, Dervin (1998) dwells on the two questions emanating from that need for E-reference, first on how to ensure that clients who use a reference service get up-to-date assistance that integrates paper and electronic resources, and second, how to reach the user who has a question but no obvious place to ask it. Technology may have simultaneously ameliorated and exacerbated these questions.

There are numerous local, national, and international initiatives for the provision of e-reference. These include efforts within centralized library environments, between libraries under different management structures within the same institution, libraries within the same region, as well as larger initiatives such as the IPL (Internet Public Library) Reference Center, ANIC's (Agricultural Network Information Center) distributed service, VRD (Virtual Reference Desk), or the Library of Congress" CDRS (Collaborative Digital Reference Service), which attempt to serve any user, anywhere. Reference means many things to many people such as asynchronous or, conversely, synchronous communication, software tools such as email or an off-the-shelf CRM (Customer Relations Management) package or even an in-house tool built in Perl, to policy and management goals, to cooperative and non-cooperative ventures.

An Online Public Access Catalog (often abbreviated as OPAC or simply Library Catalog) is an online database of materials held by a library or group of libraries. Users typically search a library catalog to locate books, periodicals, audio/visual materials or other items under control of a library.

Availability of E- reference services such as e-mails, CD-ROMs, Databases, Internet, Computers enhance the teaching and learning processes. It helps dissemination of up to date relevant information. The absence of e-reference services may result into sub standard, slow and out dated information services. The availability of E-reference services facilitates the provision of information services within the institution.

Tweve (2000) points out that the use of e-reference services includes other things like online access to Library collections, the use of bibliographic databases, online literature searching and the use of personal computers for office use. The Internet has become an indispensable resource to enhance collection and improve services and operations at OUT Libraries and worldwide. Within the reference department library users will be able to retrieve the most up to date information thereby increasing effectiveness of the academic institutions and their information services.

Fortunately, information resources such as library catalogues, periodical indexes, full text articles and extensive databases are available electronically that meet the research and information needs of distance learners of the Open University of Tanzania. Further, students can access library catalogs in a remote area and gain access to the e-books and e-journals to which the university has subscribed. Also information can be obtained from other online free abstracts and full texts for their studies and research. Mcharazo (1999) points out that the OUT library tries to meet some of the students' requirements and demands. This demand should lead students and lecturers to perform better during the process of teaching and learning. Lecturers at MWECAU as well as students will have access to acquire information from the MWECAU Library also full text materials through internet.

Literature gap

Despite the fact that this literature review found many studies, which dealt with ICTs, none of the studies focused on the use of e-reference services in facilitating effective teaching and learning process within the context of local universities in Tanzania such as MWECAU. Maro (2008) in his study, examined information literacy skills of distance learners in accessing electronic resources and the extent to which the Open University of Tanzania (OUT) library facilitates the acquisition of the skills.

Mcharazo (1999) states that there are few audiotapes available but they have not been supplied to students yet. Videocassettes and CDROMs are available but there are no machines to play them. Also he identified that the traditional methods of teaching still practiced by some lectures as reasons why students think the library is of limited use.

Tweve (2008) states that computer literacy in higher learning institutions in Tanzania is not a serious problem. The issue of information literacy is not addressed in his findings, it is important therefore to examine the roles of e-reference services in facilitating teaching and learning process at MWECAU Library as important factors which are likely to influence needs of students and staff.

METHODOLOGY

Research Design

This quantitative study used the survey study design. Specifically cross-sectional design was chosen as it enabled the gathering of comprehensive information about the unit of analysis.

Sample Size and Sampling Procedures

An effort was made to ensure that the sample was appropriate, consisting of participants who best represent or have knowledge of the research topic. Different stakeholders dealing with the use of e-reference services for the effective teaching and learning were consulted. In this study the sample included users of MWECAU Library, which was obtained through random sampling techniques, whereby 200 undergraduate students, 10 postgraduate students, 30 lecturers and 10 library staff were involved. Thus, the total sample was 250 participants. Random sampling techniques were applied by taking a list of students according to their field of study for example in Physics and Mathematics, Sociology, History and Kiswahili and Computer Science whereby ten participants from each department or segment were selected.

Description of Data Collection Instruments

Secondary data was collected through document analysis. Therefore the published and non-published materials, research reports, electronic resources, journals articles were reviewed and major points analyzed. Primary data for this study was collected through the use of Questionnaires.

Data collection Procedures

Prior to data collection, a research permit was obtained from MWECAU administration where written authority to conduct a study was given. The researcher requested the student's leaders at university to distribute questionnaires amongst students respondents at different study program levels, namely, certificate, diploma, undergraduate and postgraduate level, the researcher distributed questionnaires to lecturers and library staff.

The researcher collected the filled questionnaires from university students with the assistance of student's government leaders. Information from published and non-published materials, research reports, electronic resources, journals articles was reviewed and major points analyzed.

FINDINGS

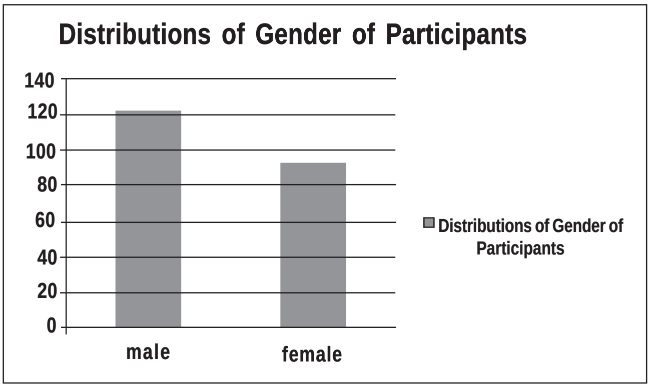
Background Information of the Participants

This part describes the demographic information of Participants. The questionnaire for library users had aspects such as; age, sex, user status and level of education. The results of the four aspects were presented and discussed as follows:

Gender of the Participants

This research involved participants with different gender and age groups. Out of 215 participants 93 (43%) of Library users were males and 122 (57%) were females. This is shown on figure 3.1.

Figure 3.1: Distributions of Gender of Participants

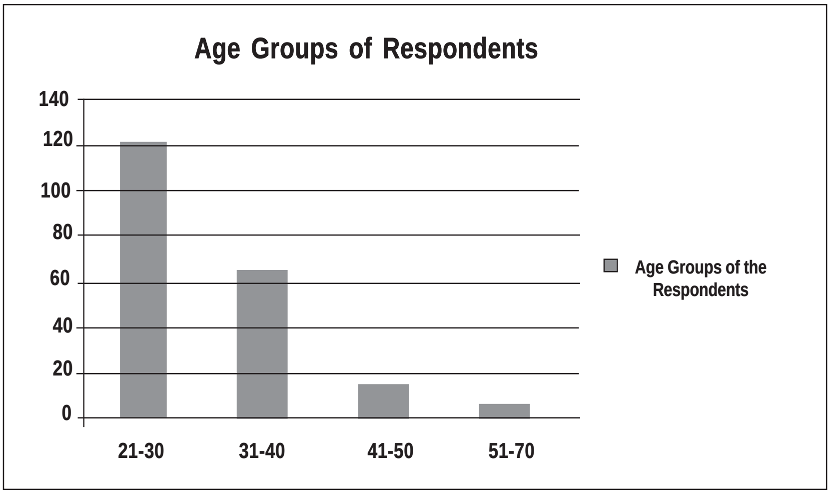


The study revealed that male participants accessed and used the e-resources more than the female participants. This concurs with Chachage (2001) findings, which indicate that males use new technologies more than females. When asked whether they accessed the e-resources that are available in their institutions, 68.89% of the males indicated 'yes' while only 15.56% of the females admitted that they accessed the e-resources in their institutions (Chachage, 2001). Thus, the findings concluded that larger percentage of male have higher awareness of e-resources compared to female at MWECAU library.

Age of the Participants

Participants were in the age groups that ranged between 21- 30 (59%) years, 31- 40 (32%) years, 41-50 (07%) years and 50 above (02%) years. These results are indicated in figure 3.2 below.

Figure 3.2: Distributions of Age of Participants



The participants of the age ranged between 21-40 years were found to use more the electronic reference services that the older participants. The findings of this study revealed that the adoption and the use of new technology were highly determined by the age of an individual whereby young people were the main users of new technology (see also Chachage; 2001).

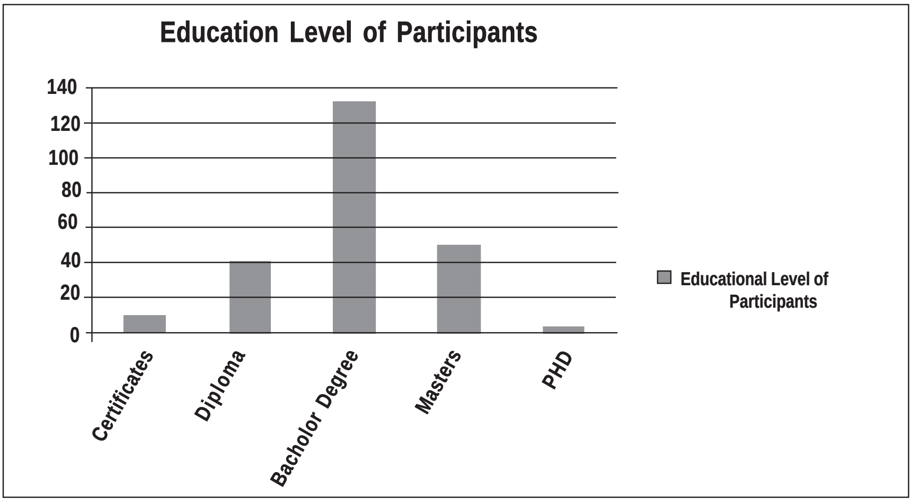
Unlike the participants in other age groups, all the participants below 30 years of age used the electronic reference services more than the older respondents. This is an indication that the younger participants are mainly students and are more comfortable in using the electronic reference services. These e-reference services participants are MWECAU Library users (certificates, diploma, undergraduate, postgraduate, lecturer and administrative staff of Mwenge University college of Education).

Level of Education of the Participants

Participants from five academic qualification levels were involved. These levels were; Certificate, Diploma, Bachelor Degree, Masters Degree and PhD. Ten (4%) had Certificates, 40 (17%) had Diploma, 133 (56%) had Bachelor's Degree, 50 (21%) had Masters Degree, and three had PhDs.

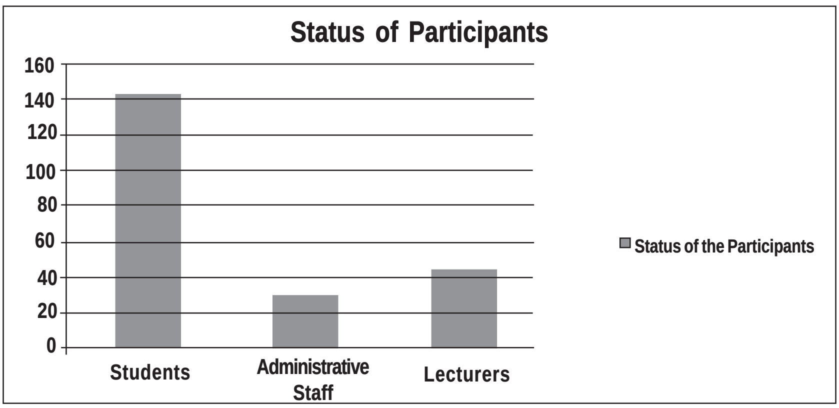
The participants with bachelor's degrees were found to access and use electronic reference services more than other participants. According to figure 3.2, a large number of undergraduate students used electronic reference services to acquire learning materials compared to postgraduate students at MWECAU library. According to the observations by the researcher, one possible reasons could be most postgraduate students had their own laptops to acquire electronic reference services such as e-mail, online chatting and internet search while undergraduate depend on desktop in the library

Figure 3.3: Educational Level of Participants



Education level of the participants revealed that the majority of student's mostly first degree students utilized electronic reference services at MWECAU library and PhD participants utilized e-reference services provided at MWECAU library the least.

Figure 3.4: Status of the Participants

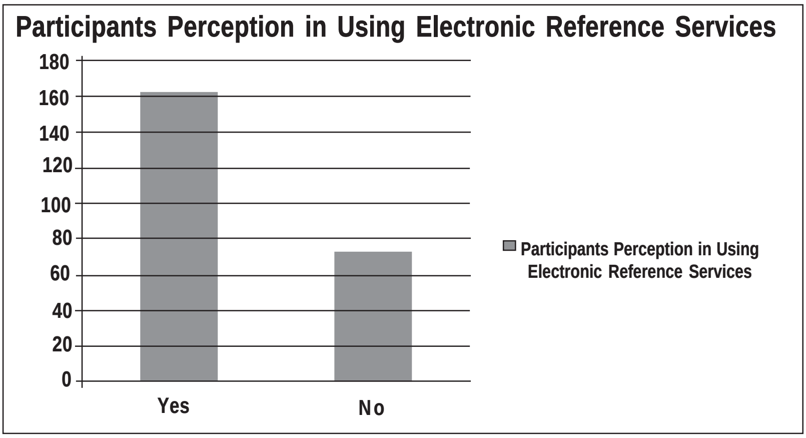


The results revealed that 142 (66%) of the participants were students, 29 (13%) administrative staff, and 44 (20%) lecturers. Results imply that students, lecturers and administrative staff utilized electronic reference services available at MWECAU library. The researcher observed further that most of undergraduate students were the major users of Computers at MWECAU library.

User's awareness of Electronic Reference Services at MWECAU Library

Participants were asked to indicate whether they were aware of and used electronic reference services in facilitating teaching and learning processes at MWECAU. The figure 3.5 indicates that, out of 215 participants, 161 Library users (75%) pointed out that they were aware of the Electronic reference services and 54 library users (25%) indicated that they were not aware of electronic reference services.

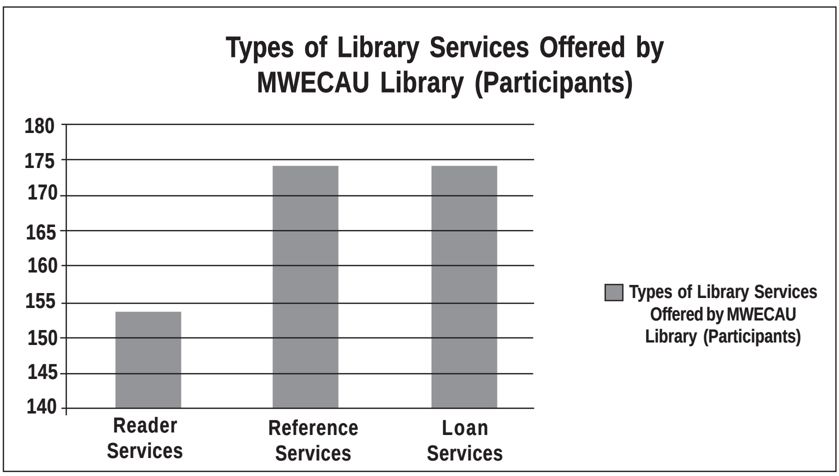
Figure 3.5: Participants Perception in Using Electronic Reference Services



Library Services Offered by MWECAU Library

Figure 3.6 gives the summary of the responses from the participants. The results here indicated that 154 (38%) of participants were aware of the readers services, 174 (43%) of participants mentioned reference services and 174 (43%) of participants pointed out the loan services available.

Figure 3.6: Types of Library Services Offered by MWECAU Library (Participants).



The studies revealed that majority of participants have information about the library services offered at MWECAU library. The type of information and services available at MWECAU library such a lending services, electronic communication, e-mail, literature search, exhibition and display, current awareness services and internet connectivity, were all available although as observed by participants it was not sufficient in terms of speed and reliability.

It was also observed that most of library users were familiar with the types of teaching and learning resources available through the computers internet connection. In interviews conducted with some academic staff, it was noted that majority of them sometimes refer their students to Internet sources, and that their students sometimes cited electronic sources in their assignments. However, it was noted that very few academic members of staff made professional contacts with the students via the electronic reference services.

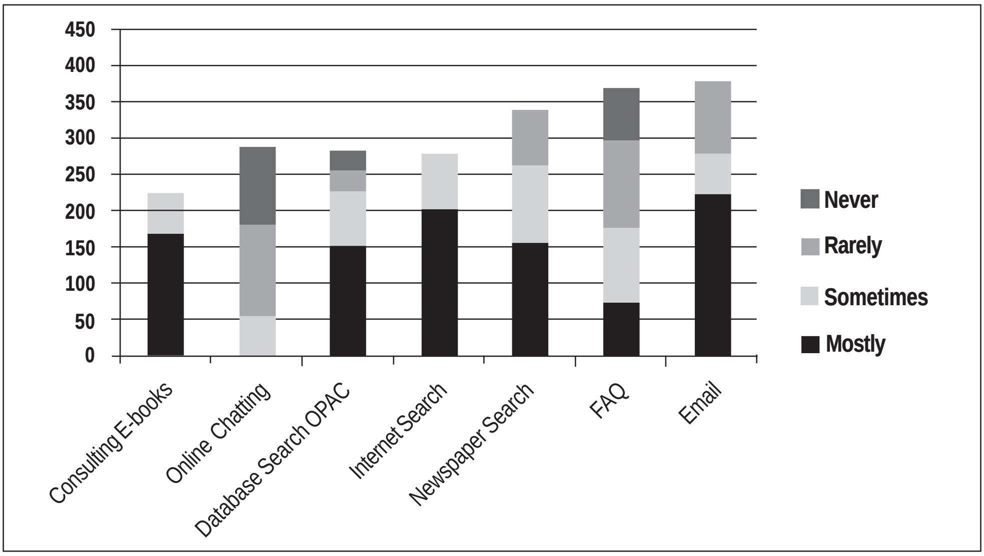
The main reason given was that the number of students significantly surpass the number of computers available at MWECAU library thus there was an insufficient number of computers. Lecturers' use of e-mail to make scholarly contacts with students would have fostered students' use of the electronic reference services.

The Extent to which Participants Used Electronic Reference Services at MWECAU Library

Library users were asked to what extent they used electronic reference services in fulfilling their information needs. The information in figure 3.7 revealed that mostly they used e-mail and internet search as electronics reference services to fulfill their needs, which facilitate the process of teaching and learning process.

On the other hand few participants used online chatting and Frequently Asked Question (FAQ) as type of electronic reference services to acquire information that helped to facilitate the teaching and learning process. In consulting e-books, newspaper search, internet search, database search and e- mails, participant's answers showed average users. Those answered "rarely" and "never" were few in consulting e-books, newspaper search, internet search, database search and e- mail. The findings proved that the majority of the participants used e-mail and Internets search mostly in comparison to others e-reference services.

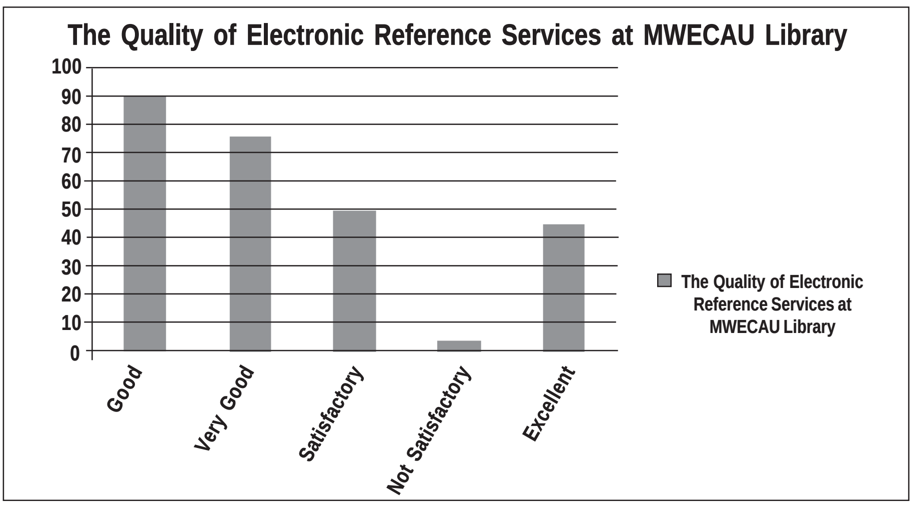
Figure 3.7: The Extent to which Participants Used Electronic Reference Services at MWECAU Library



Participants rating of E-reference Services.

The Findings indicated that 17% of respondents the quality of e-reference services were at MWECAU excellent, 90 (34%), were good whereas 75 (29%) of the electronics services at MWECAU library were very good, a further 50, (19%) of the participants pointed out that the quality of the available e-reference services at the library were satisfactory. Only 1% (3) indicated that the e- reference services at MWECAU were not satisfactory

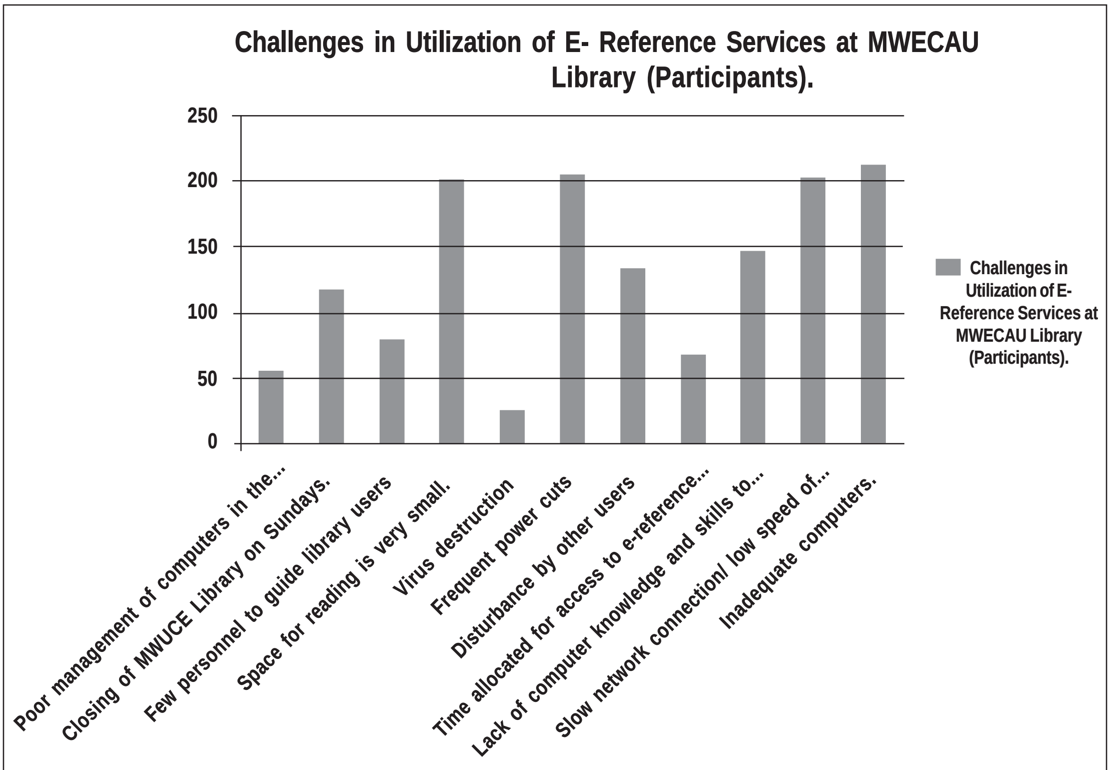
Figure 3.8: The Quality of Electronic Reference Services at MWECAU Library



Challenges in the Utilization of E- Reference Services

Library users were asked to specify the challenges that hindered their utilization of e-reference services at MWECAU Library. The information in figure 3.8 shows that majority of participants mentioned inadequate computers.

Figure 3.9: Challenges in Utilization of E- Reference Services at MWECAU Library (Participants).



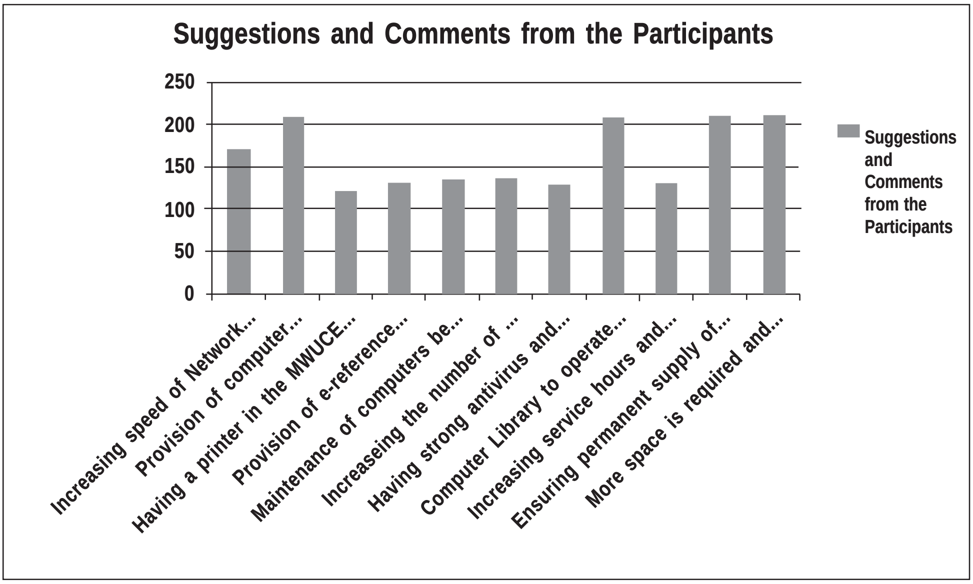
The major problems listed by the Participants were the inadequate provision of computers at MWECAU Library. This was pointed out by 15% of the participants. The other major problem mentioned by the participants was slow network connection (14%). This was major problem that hampered effective utilization of the electronic reference services.

The researcher, through observation noticed that some of the Library users had to stop attempting online access of e-reference because of the slow internet connection. This problem was attributed to low bandwidth, a major contributing factor to the low level of electronic reference services access in Africa. Slow network connection causes wastage of time as well as money. For network connection to be faster, a faster bandwidth needs to be purchased (Manda 2005).

Suggestions and Comments from Participants

Library users were asked to make suggestions on how to improve electronic reference services in facilitating teaching and learning processes at MWECAU Library.

Figure 3.10: Suggestion from the Respondents



From the findings, it is clear that the 8% of Participants mentioned increasing the number of computers with Internet connectivity as the major issues of their concern. They also recommended that internet connections speed should be improved. The numbers of computers need to be increased so as to cope with the increasing number of library users.

Suggestions also included having standby generators to assist in case of power cuts, employing competent systems managers, purchasing up-to-date electronic anti-virus programs as well as training library users on the effective use of e-reference services.

Another strategy of how to improve the quality of the electronic reference services at the MWECAU library as recommended by participants was to introduce software, which will limit the user up to 30 minutes access to a computer.

Other suggestions included having a lab supervisor (IT expert) who should guide the library users on how to access electronic reference services. Participants also suggest that there should be an improvement in computers facilities throughout the entire campus library, with more space improving the capacity of faster bandwidth to increase the speed of the electronic reference services as well as Information and Technology training on the use of the Internet.

To combat viruses, anti-virus programs should be installed and updated automatically on computers. Furthermore, printing facilities should be provided in order to save students' time. Participants also suggested that the staff should be trained in order to increase their efficiency.

CONCLUSIONS

Electronic reference services provided at MWECAU library are beneficial to library users including undergraduate and postgraduate students as well as university academic staff. The benefits associated with e-reference services are as follows: to enable library users to access electronic reference services such as e-mail, e-books, e-journals, reading international and national newspapers on the internet. The other benefits include learning how to access and retrieve information from the available resources and evaluate it ethically and professionally

As far as the researcher's conceptual framework model is concerned, the effectiveness of e-reference services at MWECAU library is still questionable. This is supported by the indicated challenges that affect the effectiveness of the e-reference services. These include, few computers, poor ICT infrastructures and inadequate numbers of professional staff.

Other challenges that hinder effectiveness of e-reference services in the teaching and learning process were lack of enthusiasm, commitment and awareness of the importance of e-reference services among library users. Also a large number of library users per session in relation to the available number of computers; inadequate facilities like computers connected to internet; lack of adequate space to accommodate a large number of students and shortage of qualified staff to implement and help library users.

RECOMMENDATIONS

Level of Education of the Participants

The level of adoption and use of technology depends very much on the level of education of the user and their needs. Due to the diversity of the e-resources, the library users need to be made aware of the relevant resources and how to access them. Information Literacy (IL) is the ability to realize the need for information, ability to identify sources of information, locate, search, access, analyze, evaluate and use information. This is geared towards attaining competence in the use of library and computer technologies (Aina, 2004). It does not mean that the more educated the user is, the more easily he/she can adopt and use new technology.

Marketing Services

It is recommended that MWECAU Library staff should advertise e-reference services and its facilities. Efforts should be directed in raising awareness of Library users on the availability of e-resources and facilities. Resources such as electronic databases should be advertised to students.

Management

Besides improving awareness accessibility and eventually usage of electronic resources, ensuring quality management is vitally important in satisfying the growing information demand for electronic resources users and other society needs. MWECAU should provide mechanisms to ensure reasonable library budget allocation for electronic resources. This will ensure availability and sustainability of the access to electronic resources. With regard to lack of enough and qualified library staff, MWECAU administration should consider allocating a sufficient budget for library personnel training.

Adequate Facilities

It is recommended that MWECAU Library, through the Electronic reference services should provide adequate facilities for students to meet their objectives. There is a need for the University library to provide students with up to date reading materials on those aspects not directly related to their academic demands. The University should increase the number of computers to facilitate easy access to the Internet by students. The number of computers at the MWECAU Library should be increased to cope with the increased enrolment of students. The same should apply to other sources of information such as newspapers and magazines copies.

Integration of Information Literacy into the Curriculum

The University should incorporate information literacy into the university curriculum. Undergraduate and Postgraduates students should participate in information literacy classes in partial fulfillment of their degree programs. This will empower students to pursue advanced searching of information on their own

Recommendations for Further Research

Further research is recommended to assess the impact of e-reference services on students' learning and academic performance that could be based on summative assessment/ evaluation.

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How Informal is the Informal Sector?

An analysis of the Setting and Characteristics of the Informal Sector in Morogoro, Tanzania

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ABSTRACT

This study was conducted in Morogoro Municipality to analyze the setting and characteristics of the Informal Sector (IS). Collection of primary data from 80 respondents was done using a questionnaire. The study results show that those most involved in the IS had low levels of education and no business skills, and generally use family labour, willing to operate businesses at times and locations convenient to customers. The study further shows that 55 % of the IS activities obtained capital from owners' own sources, and it was further revealed that 82.5 % of the businesses or activities operating in the IS in the selected wards were not licensed and rarely used any machinery. The results further show that 50% of the activities /businesses surveyed were owned by families.The study recommends that: a need for, addressing training needs for the IS andLGAs**' to intervene the IS's operations for better performance and contribution to the livelihood but also to allow the LGAs earn income in form of taxes.**

Keywords: 'Second Economy', 'Subterranean Economy', 'Hidden Economy', 'Underground Economy', Local Government Policy responses

INTRODUCTION

1.1 Background Information

Different terms are used to identify the IS including the 'Second Economy', 'Subterranean Economy', 'Hidden Economy', 'Underground Economy', 'Parallel Economy', 'Irregular economy', 'Shadow Economy', Black Economy (ILO, 1977; Gutmann, 1977; Maliyamkono and Bagachwa, 1990, Muhanga and Nombo, 2010). Regardless of the term used, at the core of the IS is the notion of "a non-structured sector that has emerged in the urban centers as a result of the incapacity of the modern sector to absorb new entrants" (Munbodh, 2003:4).

There is an apparent renewed interest in the informal economy worldwide, for a number of reasons, the most clear include the fact that a large share of the global workforce and economy is informal and because the informal economy is growing in many contexts and appearing in new places and guises (Muhanga and Nombo, 2010; Chen, 2012; Horn 2009; Vanek *et al.* 2012).The IS has a long and well charted history in developing countries. It should not however be misconceived that IS exists only in the developing part of the world. Literature (Tanzi,1982) shows that it also exists in the developed world. The concept of the IS was introduced into international usage in 1972 by the International Labour Organization (ILO) in its Kenya Mission Report, which defined informality as a "way of doing things characterized by: (a) ease of entry; (b) reliance on indigenous resources; (c) family ownership; (d) small scale operations; (e) labour intensive and adaptive technology; (e) skills acquired outside of the formal sector; (g) unregulated and competitive markets." According to Martinusse (2006) the IS was born when growth in the organized economy contributed very little to absorbing the rapidly growing workforce in many developing countries. The International Labour Organization (ILO) in the early 1970s defined IS as simply all activities that largely operate outside the system of government benefit and regulation (Kent and Mushi, 1995). The *IS* was interpreted as individuals or groups of people engaged in legitimate enterprises (either subsistence or small scale), some of which may be regulated by the state, (i.e. cooperatives) but the vast majority are considered to be operating outside the legal framework of the state.

Generally the IS is regarded as a group of production units which form part of the household sector. Household enterprises are units engaged in the production of goods and services, which are not constituted as separate legal entities independently of the household or household members that own them. They do not have a complete set of accounts which would permit a clear distinction between the production activities of the enterprises and the other activities of their owners, or the identification of any flows of income and capital between the enterprises and owners. Household employees that are exclusively engaged in non-market production are excluded from the scope of the IS. Agricultural activities, e.g. fishing, bee-keeping, are included in the IS when the purpose of production is the market, on the condition that the other requirements mentioned above are fulfilled

(Muhanga and Nombo, 2010).

Tanzania's official National Accounts according to **Bagachwa and Naho (**1995) suffer from two serious weaknesses with respect to IS; these are incomplete coverage as well as inaccurate estimates of the activities covered. This arises because many of the activities, especially those in the IS, are either misreported or under-recorded. It is however reported by 0'Riordan (1996) that the IS is a rapidly expanding sector which by 1991 was believed to account for 22% of total employment in Tanzania, eighteen years later (2009) the sector was reported to stand at 48.1 percent in terms of its share of employment in Tanzania (Osoro, 2009). It is in the record that there is a notable increase in Labour Force in Tanzania Mainland (for Persons Aged 15 Years and Above) and a mismatch with available formal employment opportunities hence most of the entrants to the labour market rely on the IS (NBS, 2014).

It is obvious that for the IS to realize its potentialities effective policy responses towards the sector has to be in place, so that the sector could contribute towards employment and hence income generation. It is against this background that this study was conducted in Morogoro Municipality to analyze the setting and characteristics of the IS.

1.2 Problem Statement and Objectives

Incognizant of the vast potential of the IS and the recognition or acknowledgement of its economic value by the government in terms of being a mechanism of employment and income generation. There are currently a number of efforts by various development partners, Local Government Authorities (LGAs) inclusive to formulate policy responses to accommodate the IS. For these attempts to succeed it is very crucial to analyze the setting and the characteristics of the IS. The understanding of the setting and the characteristics of the IS is an ingredient in formulating effective policy responses by the LGAs which will contribute to the creation of conducive environment for the IS to operate.

The study intended to determine how informal the IS was and what could be done to enable those involved benefit more. Through case study the researcher analyzed the setting and the characteristics of the IS in selected wards in Morogoro Municipality. This paper, therefore, analyses the setting and characteristics of the IS in Morogoro, Tanzania.

1.3 A Review of the IS in Tanzania

The informal sector is regarded as an oxymoron – in one hand it is an unorganized 'nuisance' sector whose members , for example , do not pay any form of tax , on the other, it provides jobs and increases incomes of the most vulnerable groups in a city –the very low income group.

The IS has often been described as economically stagnant and unproductive, as encompassing the unskilled and the uneducated and politically inactive. For local governments who are responsible for the development and management of cities in developing countries, the informal sector has been looked upon as representing a dilemma. It presents both advantages and disadvantages that need to be taken into account when designing policies targeted at the sector (Srinivas, 2009).Recently, nevertheless, research agendas have changed from focusing merely on the size of the IS to the dynamics at play within it (see TRA, 2011, ESRF, 2010).

It has strongly been noted that the IS has a significant job, income generation potential and stimulation of social economic growth in both urban and rural areas. According to the Integrated Labour Force Survey of 2006 (URT, 2007) the IS was the second main employing sector after agriculture by employing 10.1 percent of the employed persons, followed by other private sectors with 8.6 percent, where agriculture employed 75.1 percent (TRA, 2011). However, the social, economic and political realities of the IS translate to a complicated operational reality for business formalization and the tax administration (TRA, 2011).

It is evident that the IS is growing as indicated by the 2006 Integrated Labour Force Survey (ILFS) that in 2006, 40 percent of all households in Tanzania Mainland were in IS activities as compared to 35 percent in 2001. In 2006, the urban IS employed about 66 percent of the people for whom the IS work is the main activity and only 16 percent of those for whom it is the secondary activity. In contrast, 34 percent of the people for whom IS work is a main activity are in rural areas and 84 percent for whom this work is a secondary activity. This suggests that the IS is a source of employment for majority poor Tanzanians (URT, 2007).

Since 2000/2001 Tanzania Mainland has experienced a notable increase in Labour Force for Persons Aged 15 Years and Above from 15,490,730 to 20,654,795 in 2010/11. According to NBS (2014) the total number of employees in the formal sector (FS) in Tanzania Mainland was 1,858,969 in 2013; this is an increase of 308,951 employees from 1,550,018 recorded in 2012. It is therefore clear that the IS has a large share of the workforce and contributes significantly to economic growth in Tanzania. TRA, (2011) and ESRF (2010) point out that the IS could be an important contribution to the Gross Domestic Product of Tanzania when taxed substantially.

Generally scholars have changed their outlook and regard IS as more dynamic, productive, and as a political challenger to the state, as well as an alleviator of the state. States in developing countries have also started to view the IS as more than just an underground, clandestine, surreptitious part of society, and regulations and policies have changed towards it (see TRA, 2011, ESRF, 2010; Chen, 2012; Horn 2009; Vanek *et al.* 2012).It is therefore obvious that the IS in Tanzania is not a passive sector due to its socio-economical and political significance to the society.

THEORETICAL DEBATES ON INFORMAL SECTOR

The Dualist school

The Dualist school sees the informal sector of the economy as comprising marginal activities—distinct from and not related to the formal sector—that provide income for the poor and a safety net in times of crisis (Hart 1973; ILO 1972; Sethuraman 1976; Tokman 1978).

The Dualists subscribe to the notion that informal units and activities have few (if any) linkages to the formal economy but, rather, operate as a distinct separate sector of the economy and that the informal workforce—assumed to be largely self-employed—comprise the less advantaged sector of a dualistic or segmented labour market. They pay relatively little attention to the links between informal enterprises and government regulations. But they recommend that governments should create more jobs and provide credit and business development services to informal operators, as well as basic infrastructure and social services to their families

The Structuralist school

The Structuralist school sees the informal economy as subordinated economic units (micro-enterprises) and workers that serve to reduce input and labour costs and, thereby, increase the competitiveness of large capitalist firms (Moser 1978; Castells and Portes 1989).

The Structuralists see the informal and formal economies as intrinsically linked. They see both informal enterprises and informal wage workers as subordinated to the interests of capitalist development, providing cheap goods and services. They argue that governments should address the unequal relationship between "big business" and subordinated producers and workers by regulating both commercial and employment relationships.

The Legalist school

The Legalist school sees the informal sector as comprised of "plucky" micro-entrepreneurs who choose to operate informally in order to avoid the costs, time and effort of formal registration and who need property rights to convert their assets into legally recognized assets (de Soto 1989, 2000).

The Legalists focus on informal enterprises and the formal regulatory environment to the relative neglect of informal wage workers and the formal economy per se. But they acknowledge that formal firms what de Soto calls "mercantilist" interests—collude with government to set the bureaucratic "rules of the game" (de Soto 1989). They argue that governments should introduce simplified bureaucratic procedures to encourage informal enterprises to register and extend legal property rights for the assets held by informal operators in order to unleash their productive potential and convert their assets into real capital.

The Voluntarist school

The Voluntarist school also focuses on informal entrepreneurs who deliberately seek to avoid regulations and taxation but, unlike the legalist school, does not blame the cumbersome registration procedures.

The Voluntarists pay relatively little attention to the economic linkages between informal enterprises and formal firms but subscribe to the notion that informal enterprises create unfair competition for formal enterprises because they avoid formal regulations, taxes, and other costs of production. They argue that informal enterprises should be brought under the formal regulatory environment in order to increase the tax base and reduce the unfair competition to formal businesses.

METHODOLOGY

The study was conducted in selected wards in Morogoro Municipality. Kingo, MjiMkuu, Saba Saba and Kiwanja cha Ndege wards were randomly selected for this study. Morogoro municipality is among the fast growing urban areas in Tanzania, the wards selected are the ones forming the central part of Morogoro municipality hence justifying the choice of the study area.

Data on which this paper is based was collected through a case study design whereby the researcher used Morogoro Municipality as a case study to determine how informal the IS was and what could be done to enable those involved benefit more. Through case study the researcher analyzed the setting and the characteristics of the IS in selected wards in Morogoro Municipality

The data used in this study were from primary sources. Primary data were collected from individual household heads in the selected wards in Morogoro Municipality, namely Kingo, KiwanjaNdege, Saba Saba and MjiMkuu. Generally information was collected on various aspects related to IS and the general state of the affairs in the respective wards in Morogoro Municipality. The process of primary data collection involved the use of questionnaire and personal interviews.

Pre-testing of the questionnaire was carried out before the main investigation. Pre-testing of the research instrument covered some few individuals at Mbuyuni area. The objectives of the Pre-testing of the research instrument were: (i) to pre-test both the checklist and the questionnaire, (ii) to determine the approximate time that will be needed to complete the data collection work, (iii) to ascertain the availability of data for the objectives of the research and (iv) to determine the most efficient way of carrying out the main research. Some of the experiences gained during the pre-testing of the research instruments are worth noting. First, it was discovered that WEOs Offices just like other organizations have problems related to record keeping hence some of the information needed could not be found hence some modifications in both the checklist and the questionnaire. Second, time allocated previously for data collection had to be adjusted due to the fact that data collection involved some Ward Executive Officers who often had a tight schedule.

The study population consisted of all households that are involved in the IS found in the selected wards. Information of the status of the informal activities, households that are involving themselves in IS were obtained from Ten Cell leaders and the WEOs. Sampling frame consisted of the four wards and the sample consisted of 80 households involved in the informal activities. A multiple stage sampling technique was used in selecting households in each of the four wards. In the first stage strategic/purposive sampling was used to obtain households involved in IS. Sampling unit was a household and respondents were the household heads or representatives. Selected households were considered to be representatives of the households involved in IS in the selected wards.

Data analysis was done using SPSS which involved calculation of descriptive statistics and cross tabs. Descriptive statistics such as frequencies and percentages were used to present some aspects assessed with respect to IS in selected wards in Morogoro Municipality. The study used quantitative data to analyse the setting and the characteristics of the IS and in selected wardsinMorogoro Municipality. Quantitative data was used to calculate percentages and frequencies in various aspects of the IS along the study objectives. Statistical Package for Social Science (SPSS) software was used in data analysis.

RESULTS AND DISCUSSION

Socio and demographic characteristics of the respondents

Three aspects of socio-demographic characteristics namely sex, marital status and education level of the respondents are presented in Table 1. These aspects provide the background for other findings.

Table 1: Socio-demographic characteristics of the respondents (n=80)

Variable		Frequency	Percentages
Sex	Female	25	31.2
	Male	55	68.8
	Total	**80**	**100.0**

Marital Status	Married	48	60.0
	Single	19	23.8
	Divorced/separated	8	10.0
	Widowed	5	6.2
	Total	**80**	**100.0**
Education Level	No formal education	25	31.2
	Primary education	36	45.0
	P.E +Any Other training	11	13.8
	Secondary education	8	10.0

Sex of the respondents

The sample of the respondents surveyed comprised of 68.8% men and 31.2% women as presented in Table 1. The findings conform in a way with those by URT (1995) which reported an increase of women operators in the IS, but still declaring the dominance of men in the sector.

Marital status

The results in Table 1 further show that 60% of the respondents were married while 23.8% were single, 10 % separated or divorced and 6.2 % were widowed. These results are typical characteristics of many areas in Tanzania whereby 60% women and 50 % men are married (NBS, 2005). This indicates that involvement in the IS has been in a way influenced by the responsibilities individuals are shouldering in their community. Married people have more responsibilities for their families compared to those who are single. In this regard the IS is serving as a source of income. Studies are indicating that to most of the urban poor the IS has for a long time in the absence of formal employment opportunities been a way to rescue them (ILO, 1972; The World Bank, 2009).

Education level of respondents

Education is regarded as a major determinant factor towards formal employment in Tanzania. This study focused on this variable to assess whether those in the IS have the same level of education as those in the formal sector. The results in Table 1 indicates that 45.0% of the respondents had completed primary school, followed by 31.3% with no formal education, 13.8% with primary education plus other training and only 10% having secondary school education. The small percentage having secondary school education may be due to the fact that after attending primary education, which is compulsory for all, could not either afford or pass for higher education. Furthermore, one has to pass the primary school leavers exam to be eligible to join government run school. Whereas those failing could join private schools which are expensive and out of reach for the majority of poor households. Munbodh

(2003) documented the relation between education level and involvement in IS. Formal employment to a larger extent at least requires secondary education in Tanzania (Mushi and Kent, 1995).

Age of the respondents

The findings from the study as presented in Table 2 revealed that females of the age group between 19-26 years are the one dominating the IS among the females, accounting for 11.25% of those operators in the IS (male and female), this age group (19-26 years) is forming 36.05% of the females involving themselves in the IS in the selected wards. This group is mainly made up of girls who have just completed schools and could not find way to formal employment. NBS (2014) reports a notable increase in Labour Force in Tanzania Mainland covering persons aged 15 years and above and a mismatch with available formal employment opportunities hence mostly relying on the IS.

Table 2: Age of the respondents' distribution in percentage (n=80)

Sex	**Age of the respondents**				
	19-26	**27-34**	**35-42**	**43-49**	**50 and above**
Male	12.5	13.75	20	15	7.5
Female	11.25	6.25	7.5	2.5	3.75

Setting and Characteristics of the Informal Sector

Types of businesses found in the selected wards

Table 3: Types of businesses found in the selected wards (n=80)

Type of activity	**Frequency**	**Percent**
Carpentry	12	13.8
Laundry i.e washing clothes (*dhobi*)	8	9.2
Food vending	23	26.4
Selling of second hand clothing *(mitumba)*	4	4.6
Seat cover making	4	4.6
Shoe making	6	6.9
Shoe shining	8	9.2
Tailoring	11	12.6
Welding	11	12.6
Total	**80**	**100.0**

Table 3 presents the findings with respect to the types of business found in the selected wards which are related to the IS. The study found that food vending accounted for 26.4 %, followed by carpentry (13.8%), Tailoring (12.6%), Welding (12.6 %), Laundry work (dhobi) (9.2%), shoe shining (9.2%), shoe making (6.9%), selling of second hand clothing *(mitumba)* (4.6 %) and seat cover making accounting for 4.6 %.

The types of businesses found in the selected wards have been significantly influenced by the location of the study area. The selected wards of Kingo, Kiwanja cha Ndege, Saba Saba and MjiMkuu form the core urban part of the Morogoro Municipality. It has been a common phenomenon to find the businesses reported in Table 3 under the IS conducted in locations convenient to the customers, this is evident from the studies by Munbodh (2003) and McLaughlin (1990). The types of business found reflect the needs of the urban population in a way. It is obvious that many youths particularly single or generally people living alone normally would not prefer to cook hence buying form vendors. In addition same people and especially youths don not have time to wash their clothes or find it convenient to have them washed at a fee hence the expansion of the informal laundry services and others.

Business location for the IS

Business location is an important aspect that distinguishes formal sector from an informal one (McLaughlin, 1990). Respondents in this study were asked how they decided on premises for their businesses/activities. The study revealed that 68.8% of the respondents were willing to operate businesses at times and locations convenient to customers; and only 31.2 % regarded it important to have their business in locations convenient to their businesses. It has been a common phenomenon to find the businesses under the IS conducted in locations convenient to the customers. The results supportwhat has been reported by Munbodh (2003) and McLaughlin (1990).

Business skills

Effective production in any activity depends on, among other factors, skillfulness of those who are involved in that particular activity. This study found it worthwhile to elicit information on the kind of formal business skills possessed by those involved in the IS in the selected wards in Morogoro Municipality. The study revealed that 75% of the respondents did not possess any business skills, while 25% had business skills. However the sector is boosted by experience, adoption and innovation of those involved in it.

Source of labour

Human resource is one of the most critical resources in any activity, as offices, machines and any other non human resources cannot become productive except for the human efforts (labour). The findings from the study revealed that 57.5% of labour source was from the family members; whereas 23.7% accounted for own labour source (this signifies the fact that the owner of the enterprise handling all the activities on his/her own) and 18.8% of the activities had hired labourers. Other studies (McLaughlin, 1990; O'Riordan, 1991) have identified similar trends with respect to the source of labour in the IS, whereas it has been a common phenomenon to have family labour (labour force from family members) contributing significantly for the labour used in the IS. The details are presented in Table 4.

Table 4: Source of labour used in the IS (n=80)

Labour Source	Frequency	Percent
Employees	15	18.8
Family labour	46	57.5
Own	19	23.7
Total	**80**	**100.0**

Source of capital for the business

Table 5: Source of capital for business/activity in the IS (n=80)

Source of capital	Frequency	Percent
A loan from MFI	2	2.5
A loan from a friend	5	6.3
Assistance from a friend or relative	27	33.8
Own sources	46	57.5
Total	**80**	**100.0**

Opening up any business activity requires capital, this study took interest to investigate into the sources of capital for the IS activities. The study revealed that 55% of the IS activities were financed from own sources, whereas 33.8 % obtained capital through assistance from a friend or a relative, 6.3 % through loan(s) from friend(s), and 2.5% through loan(s) from Micro-Finance Institutions. The results of this study conform to the findings made by O'Riordan (1996) which reports that the operators in the IS mainly obtain capital from their own sources to start their businesses. Table 5 presents the details

Legal status of business

Among the cardinal legal requirements for opening up any business, is to have a business license. In the course of analyzing the characteristics of the IS activities in selected wards in Morogoro Municipality, the study investigated the legal status of such businesses, that is, aspects of licensing of the respective businesses. It was found that 82.5% of the businesses operating in the IS in the selected wards were not licensed and only 17.5% had licenses. These findings qualify the activities surveyed as being in the IS basing on the definitions provided by various scholars. These findings concur with those by ILO (1998), where ILO reports that most informal traders do not (or are unable to) comply with regulations concerning registration, licensing, tax payments, occupational safety, health, and working conditions. This inability is ascribed to a number of factors, including cumbersome bureaucracies, high costs, unreasonable demands, ambiguous regulations and negative state attitudes to workers in the informal economy. The World Bank (2009) also points out to the fact that the IS is unofficial business which is evading tax, avoiding labour regulations and other government or institutional regulations, with no registration of the business.

Business ownership

Business ownership was another aspect considered important by this study. The IS is considered as a subset of household enterprises or unincorporated enterprises owned by households. Table 5 presents the findings with respect to business ownership.

Table 6: Distribution of respondents according to activity/ business ownership (n=80)

Business ownership	Frequency	Percent
Owned by my family	40	50.0
A different entrepreneur	1	1.3
Jointly owned	1	1.3
Individually owned	38	47.5
Total	**80**	**100.0**

The findings presented in Table 6 revealed that 50% of the activities /businesses surveyed were owned by families (this involved inherited properties and run by members of the family in a extended sense), 47.5% being owned by individuals (initiated by the current owners and being managed by them), joint ownership (by different individuals who do not have family ties) accounting for only 1.3% and 1.3% accounted for the activities owned by a different entrepreneur. Similarly, issues of ownership of businesses in the IS are reported by McLaughlin (1990) and Mushi and Kent (1995). Generally IS enterprises itself is dominated by sole proprietorship and the business management is embodied in one person.

CONCLUSION

It is obvious that the IS is having a large share of the workforce in Tanzania, furthermore the sector has a significant job, income generation potential and stimulation of social economic growth in both urban and rural areas, despite having that share but yet contributes marginally to tax revenue generation. In terms of setting and characteristics, most of the business activities surveyed under this study relied on indigenous resources; owned by the family members; most businesses operated in a small scale; labour intensive ; most of the operators acquired skills outside of the formal sector and the business activities were not registered. These observations qualify what is mostly described in literature related to IS. It is recommended that the LGAs and micro finance institutions work hand in hand to improve the conditions out of which the IS operates in Morogoro, for LGAs it is imperative to create policy responses to the sector which is becoming dominant in the urban areas in terms of being a mechanism of employment and income generation. Microfinance institutions also have a role to play towards creation of conducive and supportive environment to the IS by providing soft loans those involved.

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The Future Beyond Fossil Fuels

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ABSTRACT

This research was carried out to determine the viability of using the milk bush, Euphorbia tirucalli L., *as a potential alternative source of diesel-grade oil for present and future sustainable uses. Thus, the variations in the liquid biofuel quantity of bark and phylloclade extracts of* E. tirucalli *were evaluated on the basis of the stem diameters of the trees and the ecological zones from which the samples had been collected (i.e. Dar es Salaam, Dodoma and Mbeya). Data analyses were conducted using SPSS (version 15) and Minitab (version 16) software. The results show that* E. tirucalli *oil yields increase with increases in stem diameter and for stems with the largest girth they ranged between 15% and 16% of the sample dry weight for stem bark samples and 14% to 15% of the sample dry weight for phylloclade samples. Thus high amounts of oil can be obtained by extraction from any above-ground part of* E. tirucalli *(stem bark or phylloclade) harvested from trees with different stem diameters. However, more quantities of oil were obtained from older trees with the largest diameters growing under wild conditions. With respect to zones, the oil yields decreased in the order of Dodoma > Mbeya > Dar es Salaam. The study recommends further studies on the enhancement of the yields of liquid biofuel from* E. tirucalli *stem bark and phylloclades.*

Key word: *Euphorbia tirucalli*, biofuel, phylloclades, bark, energy

1.0 INTRODUCTION

World is faced with the problem of fossil fuel depletion, high fuel prices with the global warming and climate change issues associated with the atmospheric accumulation of carbon dioxide originating from the burning of fossil fuels. These problems which affect all aspects of human civilization have prompted governmental and nongovernmental organizations (NGOs) to search for alternative sources of energy, which are renewable, safe and non-polluting (IPCC, 2007). Also, Tanzania is faced by the problem of little access of fossil fuels in rural areas than in the towns and cities. Thus, there is a need for nonconventional sources of energy to be sought and optimized in terms of yields and qualities in order to provide viable alternative energy sources for the rural areas.

Latex producing green plants, offer the best possible alternatives to fossil fuels as sustainable energy sources for domestic and industrial uses. This is because their latex contains more than 5% of their biomass as oils that are chemically similar to fossil fuels and distributed throughout their tissues (Buchanan *et al*., 1978). For example, studies by Buchanan *et al.,* (1978), Calvin (1978) Erdman and Erdman (1981), The National Science and Technology Authority of the Philippines (NSTA, 1982), Photi (2005), and Shuma (2008) have shown the possibility of using plant latex from various plant families such as Euphorbiaceae, Asclepiadaceae, Sapotaceae, Moraceae etc., to produce both hydrocarbon and oil extracts as substitutes for petroleum with a low molecular weight of 20,000 and carbon chains of C_{15}, C_{20} and C_{30}. These extracts can be converted into liquid biofuels by the transesterification process or other chemical mechanisms such as catalytic hydro-processing, because all their characteristics are suitable for such conversion (Nielson *et al*., 1977; Calvin, 1978; Weisz *et al*., 1979; Stumborg *et al,*. 1993; Wong and Feng, 1995).

In Sub-Saharan African countries, plant-based liquid fuels can also be obtained from the latex producing plant species such as milkweed (*Calotropis procera*) and the African Milk bush (*Euphorbia tirucalli* L) (URT, 2003; FARA, 2008; Kumar, 2009).

Euphorbia tirucalli, the focus of the present study *Euphorbia tirucalli* L. belongs to the genus *Euphorbia*, Family: Euphorbiaceae, Order: Malpighiales, Class: Magnoliopsida, Division: Magnoliophyta and Kingdom: Plantae. The family Euphorbiaceae is composed of five subfamilies, 49 tribes, 317 genera and about 8,000 species (Webster, 1994; Priya and Rao, 2011). The plant is a succulent cactus-like shrub or small tree of 4 - 12m tall and maximum size of 75 - 80cm in trunk diameter (Van Damme, 2001). It has erect branches, rough and cracked greenish brown bark with smooth, polished, whorled cylindrical, slender pencil-like branchlets (see plate 1) that are modified to form phylloclades (Priya and Rao, 2011).

Plate 1: ***E. tirucalli*** **plants** *(Picture by H. Y. Nchimbi)*

E. tirucalli is a native plant in the African Countries including Tanzania (Taylor, 2005; Loke *et al.,* 2011). When wounded, it can produce an eye and skin irritating white to yellowish latex that contains, among other things, oil and hydrocarbon fractions (Priya and Rao, 2011; Calvin, 1980; Duke, 1983; Depeyre *et al*., 1994). It is generally evergreen since its stems and branches remain green all year round and are rarely fed on by herbivores. The tree is known as mtupamwitu, mwasi or mnyaa in the Kiswahili language (Webster, 1994; Priya and Rao, 2011).

In Tanzania, *E. tirucalli* grows in the wild in almost all Regions but in most cases it has been used for live fencing purposes to deter livestock from wandering into crop fields. However, there is little information on its use for producing liquid fuels in Tanzania. Yet, a study by Calvin (1978) and other studies done in countries such as Brazil, India and United States of America have shown that *E. tirucalli* has the capacity to produce between 10 and 50 barrels of oil per acre per year (equivalent to between 636 and 3180 liters of oil per hectare per year) without any agronomic improvement (Anon, 2012). This is different from the cotton plant (*Malvaceae gossypium*) and the African oil palm (*Elaeis guineensis*), which have been cultivated intensively using improved agronomic conditions for the production of oils for domestic use and also as sources of liquid biofuel as alternative energy sources (Nielsen *et al*., 1977; Buchannan *et al*., 1978; Calvin, 1980; FARA, 2008). Therefore, the focus of the study reported here was to find out whether *Euphorbia tirucalli* L. growing wildly under the conditions prevailing in Tanzania had the potential to produce liquid biofuel for Tanzania.

2.0 RESEARCH PROBLEM

In the course of bio-prospecting for alternatives to fossil fuels *Euphorbia tirucalli* has shown promising potential for biofuel production in different parts of the world. However, little attention has been paid in Tanzania to study the variation in the quantity of liquid biofuel (oil) under different climatic and ecological conditions prevailing in Tanzania. Such knowledge is important in establishing the potentiality of the plant for yielding economically viable liquid biofuel as an alternative source of energy to run domestic and industrial activities as well as improve the economy in terms of reducing expenditure on imported fossil fuels. Hence, it was found worthwhile to carry out a study on the variations in oil productivity of bark and phylloclade extracts produced by *Euphorbia tirucalli* that are pre-cursors for liquid biofuel production so as to obtain data that would be specific to the climatic and ecological conditions prevailing in various parts of Tanzania.

3.0 RESEARCH QUESTIONS

The research was guided by the following questions

(i) Do the differences in the climatic regimes prevailing in different parts of Tanzania have any influence on the levels of oil extracted from *E. tirucalli*?

(ii) Does *E. tirucalli* yield sufficient quantities of oil to merit consideration as a viable alternative source of energy?

4.0 RESEARCH HYPOTHESES

(a) The prevailing climatic regime has a significant effect on the levels of oil yield of *E. tirucalli*.

(b) The oil yields of *E. tirucalli* are of sufficient quantity to make the species merit consideration as a viable alternative source of energy.

5.0 RESEARCH OBJECTIVES

5.1 General Objective

To determine the variation in the quantities and qualities of oil extracts from the stem bark of *Euphorbia tirucalli* L. in selected ecological zones of Tanzania, *viz*., Dar es Salaam, Dodoma and Mbeya

5.2 Specific Objectives

The specific objectives of this study were to:

(a) Determine the climatic regime in Tanzania under which *E. tirucalli* has the highest oil yield.

(b) Determine the viability of using *E. tirucalli* as an alternative source of energy.

6.0 MATERIALS AND METHODS

6.1 The study areas

The study was carried out at three sites in different ecological zones of Tanzania, *viz.,* (i) Kinzudi village in Goba, Mbezi, (Dar es Salaam Region), (ii) Ibihwa village in Bahi District (Dodoma Region), and (iii) Iyela Ward, Mbeya City (Mbeya Region) (Figure 1). These regions have different climatic conditions that at the outset of the study were considered to be likely causes of the differences in the rates of physiological activities of *E. tirucalli* plants that, in turn, would result in differences in the oil yields of the trees of the species growing in the three regions (ecological zones).

6.1.1. Geographical locations and climate characteristics of the study areas

Dar es Salaam Region, the first study area, is one of the 27 Regions of the United Republic of Tanzania (URT) which is located on the east coast of the country between latitudes 6.45°S and 7.25°S, and longitudes 39°E and 39.55°E (Figure 1).

Figure 1: Map of Tanzania showing the locations of the study areas

The climatic condition of Dar es Salaam is generally warm and humid throughout the year with a mean annual temperature of about 26°C which may rise to 35°C during the hottest season (from October to March) (Mahongo, 1999, URT, 2004). The Region is relatively cool between May and September, with mean temperatures of around 25°C. There are two main rainy seasons in Dar es Salaam Region: the short rains season is between October and December and the long rains season between March and May. The average annual rainfall is 1000mm the lowest being 800mm and highest 1300mm. The average humidity is 96% in the morning and 67% in the afternoon (URT, 2007).

Dodoma region is one of the centrally positioned Regions of Tanzania that lies between latitudes 4°S and 7°S and longitudes 35°E – 37°E (URT, 2011). Its climate is characterized by a long dry season (average annual temperature, between 31°C maximum and 18°C minimum) lasting between late April and early December, and a short single wet season (average annual rainfall, 570mm) occurring during the remaining months. Rainfall figures are higher in the more agriculturally productive parts of Mpwapwa and Kondoa Districts (WHF, 2011). Apart from the rainfall being relatively low, it is rather unpredictable in frequency and amount. In June – August, temperatures are at times very high with hot afternoons up to 35°C and chilly nights on hilly areas down to 10°C (URT, 2011; WHF, 2011).

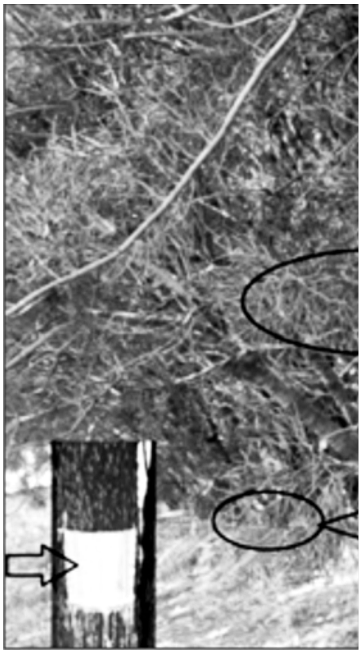
However, due to differences in climatic conditions, the Region is sub-divided into three agro-ecological zones. Zone I covers the Maasai steppe stretching from the northeastern part of Kondoa District to the southern part of Dodoma Rural District and the southwestern part of Mpwapwa District. Zone II which was the centre of this study covers the central and southern part of Kondoa District, the northeastern part of Bahi area, central Dodoma Rural District, the whole of Dodoma Urban and Kongwa Districts and parts of Mpwapwa. The zone has a rainfall regime ranging between 500 and 700mm annually. Soil in this zone is dark-brown and dark-reddish loamy sands (URT, 2003). Zone III falls within central parts of Mpwapwa District and mainly hilly areas and Bereko highlands in Kondoa District (URT, 2003).

Mbeya Region lies between Latitudes 7°S and 9°S and between Longitudes 32°E and 35°E (URT, 1997). The region generally experiences a tropical climate with marked seasonal and altitudinal temperatures and high rainfall variations causing dry and rainy seasons. It has a mean annual rainfall of 1675mm while the mean annual temperature is 21°C, ranging from a mean minimum of 12°C and a mean maximum of 30°C (URT, 1997; Janssen *et al.,* 2005). The region is generally considered to be located on a highland characterized by moderate climate and sufficient rainfall influenced by its altitude.

6.2 Sample collection

Four bark strip samples each measuring 20cm wide by 20cm long (Plate 2) were collected from wildly growing *E. tirucalli* trees having diameters at breast height (DBH) of 20cm, 30cm, 40cm, 50cm, 60cm, 70cm and 80cm at three study sites, i.e., Ibihwa (Dodoma), Iyela (Mbeya) and Goba (Dar es Salaam).

Plate 2: *Euphorbia tirucalli* trees showing locations of the 20cm x 20cm stem bark strip cut from the tree at breast height *(Photo by H.Y. Nchimbi)*



The samples were placed in plastic bags to prevent moisture loss and then transferred to the University of Dar es Salaam laboratory, weighed to determine their fresh weight and oven-dried to a constant weight at a temperature of 70°C. The oven-dried samples were ground (with an electric milling machine) into small-sized particles that could pass through a 2 mm-diameter mesh sieve and again weighed to determine their dry weight prior to extraction of the oil. Safety precautions (*viz*., proper cleaning of samples) were observed during sample collection and preparations to avoid contamination with foreign materials likely to reduce the efficiency of the extraction process.

6.2.1 Extraction and separation of the oil fraction from stem bark samples of *E. tirucalli*

Quadruplicate 20-g sub-samples from each of the finely ground bark samples of *E. tirucalli* collected from the three different study sites were extracted using 150mls of analytical grade acetone for eight hours in a Soxhlet apparatus according to the method described by Kalita and Saekia (2004) (Plate 3A). Then, for each extract, acetone was evaporated out using a rotary evaporator at a temperature of 38°C to obtain a mixture of acetone-soluble extracts which were collected in a round bottomed flask. The acetone-soluble extracts collected in the flasks were each separately partitioned in a separating funnel (Plate 4) using a mixture of analytical grade hexane and distilled water. In that partitioning the oil fractions dissolved in hexane while the polar components (mainly polyphenols) dissolved in the distilled water. The oil fractions were then freed from hexane by evaporation in a rotary evaporator (see Plate 3E) at a temperature of 68°C and the oil extracts that remained in the rotary evaporator were collected in previously weighed flasks (Plate 3D) and left to cool down for about 5 minutes before re-weighing the flasks. Then, the weight of the oil extracts was determined by subtracting the weight of the empty flask from the weight of the flask with oil and the obtained oil yield was stored in a refrigerator at 4°C for use in further investigations. The mean quantities and the percentage content of the oil fractions obtained were recorded. The percentage contents of the oil fractions were calculated using the formula:

$$\% \text{ Oil Content} = {}^{(\text{Weight of the Oil Extract})}/_{(\text{Dry weight of extracted sample})} \text{ X } 100\%$$

Plate 3 Soxhlet extractor (A) in which each *E. tirucalli* sample was extracted using acetone. Thimbles used to keep plant sample used during extraction (B). Heating mantle (C), Round bottomed flask, for collection of sample extractives (D). Rotary evaporator for solvent evaporation (E)

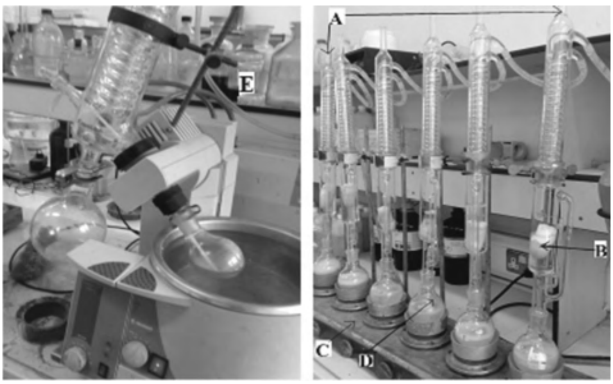
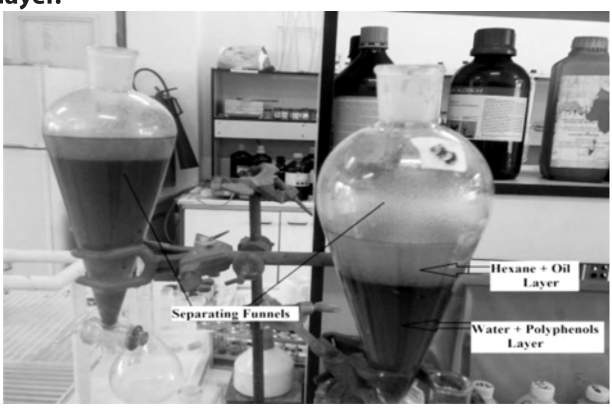


Plate 4: The method for partitioning acetone-soluble extracts whereby Oil dissolved in Hexane to form a Hexane-oil layer and the polar components (Polyphenols) dissolved in water to form a water-polyphenols layer.



6.4 Statistical analyses

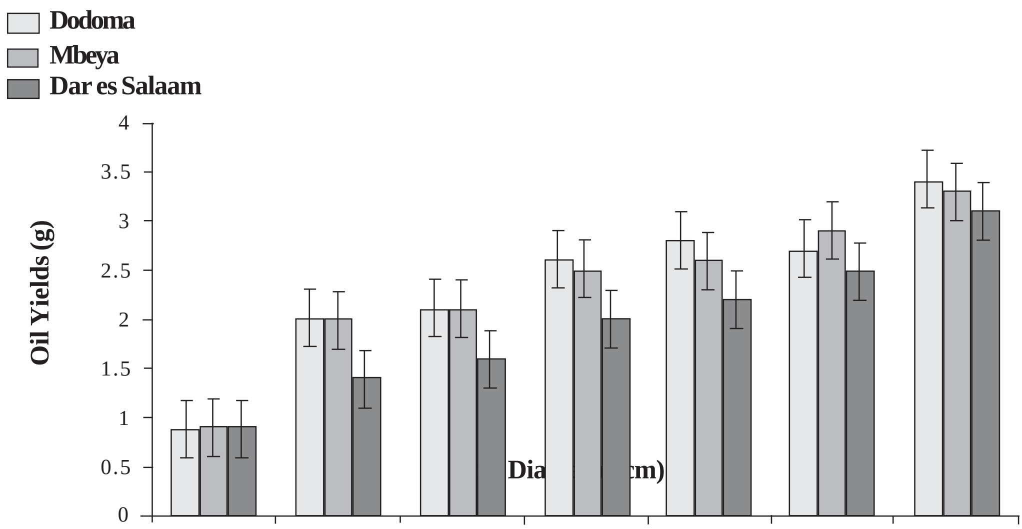
The data obtained in this study were subjected to statistical analysis whereby the analysis of variance (Two-way ANOVA) at Pd” 0.05 using Statistical Package and Software Systems (SPSS v.15) was applied to test for the statistical significance of the differences in the mean oil contents of the bark samples of *E. tirucalli* trees with different stem diameters and collected from the three ecological zones of Tanzania. Post-hoc tests (Turkey Honestly Significant Difference Tests (HSD) were computed to determine whether individual means differed significantly).

7.0 RESULTS AND DISCUSSION

7.1 Oil yields from *E. tirucalli* samples collected from different ecological zones

The oil yields [in terms of weight (g) and percentage of sample dry weight] extracted from dried bark samples of *E. tirucalli* collected from the three different ecological zones, i.e. Dar es Salaam, Dodoma and Mbeya, are presented in Figure 2.

Figure 2: Variations in the quantities of oil extracted from *E. tirucalli* trees with different stem diameters collected from different ecological zones.



7.1.1. Variations in the quantity of oil extracted from the stem bark of *E. tirucalli* with stem diameters and ecological zones

The quantity of oil extracted from the stem bark of *E. tirucalli* stripped from different stem diameters and ecological zones showed a pattern of increase from the smallest (20 cm) to the largest stem diameters (80cm) (Figure 2). The increasing trend in the quantity of oil from *E. tirucalli* stem bark shows that, trees having larger stem DBH (i.e. older trees) produced higher amounts of oil than trees with small stem DBH (i.e. younger trees).

A closer look at the results in Figure 2 reveals that, there were differences between ecological zones in the quantities of oil extracted from the stem bark of *E. tirucalli* whereby in the Dodoma ecological zone the oil yields varied from 0.87g $\pm$ 0.01 (4.17 $\pm$ 0.01% of sample dry weight) for the bark samples collected from trees with a mean DBH of 20cm to 3.4g $\pm$ 0.09 (16.47 $\pm$ 0.34% of sample dry weight) for the bark samples collected from trees with a mean DBH of 80cm. In the Dar es Salaam ecological zone the comparable results ranged between 0.9g $\pm$ 0.01 (4.20 $\pm$ 0.01% of sample dry weight) and 3.10g $\pm$ 0.09 (15.28 $\pm$ 0.34% of sample dry weight) for trees with diameters of 20cm and 80cm respectively while in the Mbeya ecological zone the oil yields from the stem bark ranged from 0.9g $\pm$ 0.01 (4.20 $\pm$ 0.01% of sample dry weight) to 3.3g $\pm$ 0.09 (15.8 $\pm$ 0.34% of sample dry weight) for trees with diameter of 20cm and 80cm respectively.

These results show that *E. tirucalli* trees growing in the Dodoma ecological zone produced significantly higher quantities of oil from the bark than those growing in the Mbeya, and Dar es Salaam ecological zones at $P = 0.003$, and the magnitude of the difference was large (Partial Eta Squared (0.168 > 0.14) Cohen (1988). There were also statistically significant differences in the quantities of oil extracted from the stem bark samples of *E. tirucalli* between stem diameters (DBH) at the $P = 0.000$. In this case, the magnitude of the difference was very large as indicated by the Partial Eta Squared (0.77 > 0.14) Cohen (1988) (Table 1).

Table 1: ANOVA summary results for the differences in the quantities of oil from the stem bark of *E. tirucalli* with variations in stem diameter and ecological zones.

Tests of Between-Subjects Effects

Dependent Variable: Quality of Oil from the Stem Bark (gm)

Source	Type III Sum of Squares	df	Mean Square	f	sig	Partial Eta Squared
Corrected Model	46.667[2]	20	2.333	11.819	0.000	0.790
Intercept	409.646	1	409.646	2074.99	0.000	0.971
Ecology	2.506	2	1.253	6.347	0.003	0.168
Girth	43.125	6	7.188	36.407	0.000	0.776
Ecology *Girth	1.036	12	0.086	0.437	0.942	0.77
Error	12.437	63	0.197			
Total	468.75	84				
Corrected Total	59.104	83				

a. R Squared = 0.790 (Adjusted R Squared = 0.723)

In general, the results of this study revealed that, regardless of the ecological zone from which the samples were collected, there were statistically significant differences (p <0.005) in the quantities of oil extracted from the stem bark samples of *E. tirucalli* trees with different stem diameters if the differences between the stem diameters were higher than 10cm, but the differences were not statistically significant where the differences between the stem diameters were 10cm or less. It can also be affirmed from the data obtained in this study that the larger the girth of *E. tirucalli* trees the higher the oil yield.

The results obtained in this study were in agreement with the results of Mirzaie-Nodousham *et al* (2001) which showed that stem diameter was among the factors that had a positive direct effect on leaf essential oil yield in *Mentha spp*. Similar results were reported by Talle e*t al.* (2012) for lemon balm (*Mellisa officinalis* L.) where the essential oil content of the plant was positively and significantly correlated with stem dry weight among other factors. The fact that, *E. tirucalli* trees grow vigorously once established (Maugh, 1976; Calvin, 1980) implies that the plants can increase their biomass and rapidly accumulate oil-containing latex. Thus, the increase in the plants' biomass as they grow older is related with the increase in oil production. The results of this study show that the oil yields of *E. tirucalli* reached up to 16.47 $\pm$ 0.34% of the largest stem bark sample dry weight samples collected from the largest trees (80 cm in diameter). These percentages clearly show that *E. tirucalli* yields sufficient oil to merit consideration as a possible alternative source of energy.

The results of the present study also show that the bark samples of *E. tirucalli* trees collected from the Dodoma ecological zone had higher yields of oil than those collected from the trees growing in the Mbeya and Dar es Salaam ecological zones. This was probably because the climatic conditions in the Dodoma ecological zone were more conducive for the growth and productivity of *E. tirucalli* trees than the conditions prevailing in the Mbeya and Dar es Salaam ecological zones. The Dodoma ecological zone generally has a mild and semi-arid climate i.e. Temperature range: 17^{o}C – 31^{o}C; Rainfall: 500mm – 800mm. Mild temperatures do not favour the rapid microbial break down of organic matter. Furthermore, the semi-arid rainfall regime does not lead to rapid leaching of the nutrients from top soil and, therefore, the fertility of the soil is not lost due to leaching. Thus the soil in the Dodoma ecological zone probably had the best nutrient levels than the soils in either the Mbeya or Dar es Salaam ecological zones where the mean annual rainfall levels were higher. Better nutrient conditions in soil in the Dodoma ecological zone coupled with conducive climatic conditions meant better growth and accumulation of oil-containing latex by *E. tirucalli* in that zone. The results of the present study agree with those of Maugh (1976), Duke (1983), von Willert *et al*. (1990), van Damme (1989; 2001), and Voigt (2007) who clarified the ability of *E. tirucalli* to grow well in semi-arid areas.

The ability of *E. tirucalli* to survive in the semi-arid conditions is due to its succulent nature which enables it to reserve water in its tissues for use during drought periods. As such it exists more or less independent of water supply from the soil and its physiological activities proceed as normal during the peak of the dry season. Furthermore, the use of phylloclades instead of leaves for photosynthesis gives an extra advantage to *E. tirucalli* to be able to combine both CO_2-fixation in its tiny leaves (when present) with Crassulacean Acid Metabolism (CAM) in the stem and phylloclades. The phylloclades and stem open their stomata and absorb carbon dioxide at night when it is cool thereby minimizing water loss through the stomata and increasing water use efficiency. According to Van Damme (1989; 2001) this mechanism offers an additional ability of *E. tirucalli* plants to increase their metabolic rates and thereby maximize their yields. The small leaves of *E. tirucalli* are preferentially used for photosynthesis in normal situations during the rainy season whereas the green stem takes over when the leaves fall off during arid conditions and a combination of both pathways increases the plant's water use efficiency since the small leaves have a high affinity for carbon dioxide but tend to use water less efficiently (Van Damme, 2001).

Despite the fact that, *E. tirucalli* utilizes both C3 and CAM metabolic pathways in fixing carbon, it is the CAM pathway which is an adaptation for the species to manage carbon and water for survival as well as the realization of some yields and upgrading of yields under adverse conditions (Van Damme, 2001). The extent of succulence has been positively correlated with both the colonization of increasingly arid habitats and an increased contribution of CAM activity to total carbon gain (Herrera, 2009; Kluge *et al*., 2001; Van Damme, 1989; 2001). Von Willert *et al*. (1990) argued that succulence is a survival strategy for plants inhabiting arid and semi-arid areas.

Despite the fact that the Dar es Salaam ecological zone showed favourable climatic conditions for the growth and biofuel productivity of *E. tirucalli* plants such as warm temperatures (22°C – 32°C) and high rainfall (750mm – 1200mm), it is probably the poor nutrient status of its soils possibly associated with high nutrient loss through leaching under the warm and humid conditions that made it difficult for the species to absorb sufficient nutrients to enable it to yield comparatively high oil levels in that ecological zone. Thus the quantity of oil produced by *E. tirucalli* in the Dar es Salaam ecological zone was less compared to those recorded for the Mbeya and Dodoma ecological zones. It has been suggested that warm and humid climatic conditions hasten the rate of microbial break down of organic matter to release mineral nutrients which are swiftly leached away by the water originating from the heavy rains characteristic of the Dar es Salaam ecological zone which leads to quick loss of natural fertility (Beets, 1989). Apart from the probable reason of having low nutrient levels, the soil in the Dar es Salaam ecological zone is generally characterized by having low levels of organic matter content usually associated with the rapid rate of microbial break down of organic matter under the warm humid conditions prevailing in that zone.

The results of the present study showed that, the quantities of oil extracted from the stem bark samples of *E. tirucalli* collected from the Dodoma ecological zone were statistically significantly higher than those extracted from the bark samples of the same species collected from the Mbeya and Dar es Salaam ecological zones. This makes Dodoma a potential area for growing *E. tirucalli* as an alternative source of energy in the future. The fact that the oil quantities extracted from the bark and phylloclade samples of *E. tirucalli* collected from different ecological zones decreased in the order of Dodoma Ã Mbeya Ã Dar es Salaam confirms the hypothesis that the prevailing climatic regime under which the plants of *E. tirucalli* are growing has a significant effect on the levels of oil yields of the species.

The results of the present study further showed that the quantities of oil extracted from the bark and phylloclade samples of *E. tirucalli* collected from trees with large stem diameters were significantly higher than those extracted from samples collected from trees with small stem diameters confirms the hypothesis that the larger the stem girth of *E. tirucalli* trees the higher their levels of oil yield.

8.0 CONCLUSIONS

The research work whose results are reported here was carried out in order to evaluate the variation in oil productivity of the bark samples of *E. tirucalli* as a potential source of liquid biofuel in three different ecological zones, i.e. Dodoma, Dar es Salaam and Mbeya. The method used was solvent extraction, and the solvent extractable fraction referred to the oil fraction which was extracted from the stem bark samples of *E. tirucalli* trees of different stem diameters (i.e., 20cm, 30cm, 40cm, 50cm, 60cm, 70cm and 80cm) using acetone as a solvent.

The quantities of oil extracted from the stem bark samples collected from the wildly growing *E. tirucalli* trees from the Dodoma ecological zone were significantly higher than those extracted from the bark samples of the same species collected from the Mbeya and Dar es Salaam ecological zones. These results confirm the hypothesis of the current study which states that "the prevailing climatic regime has a significant effect on the levels of oil yield of *E. tirucalli*." The differences in the quantities of oil yielded by the stem bark samples collected from trees with different stem diameters collected from the different ecological zones i.e., Dodoma, Dar es Salaam and Mbeya were statistically significant at the 95% confidence limits as verified by the results of the Analysis of variance (One-way ANOVA).

These results confirm the hypothesis that "the larger the stem girth of *E. tirucalli* trees the higher their levels of oil yield." Thus the results of the present study showed that oil can be obtained by harvesting the stem bark of *E. tirucalli* from trees with different stem diameters but more oil would be obtained from older trees. Bark oil yields from old trees (with diameters of 80 cm) ranged between 15.18% and 16.47% of sample dry weight. These yields were sufficient to make the old trees of *E. tirucalli* worthy of consideration as possible alternative sources of energy for domestic and industrial uses in Tanzania.

9.0 RECOMMENDATIONS

- On the basis of this study, it is recommended that, for mass production of biofuel from *E.tirucalli*, Dodoma offers better opportunities in terms of the quantities of oil to be extracted when compared with the Mbeya and Dar es Salaam ecological zones, because the oil productivity of the study plant was higher in Dodoma than in the other two ecological zones studied.
- Methods should be developed for tapping fresh latex from *E. tirucalli* trees and directly investigating it for the quantity and quality of oil rather than using the destructive method of obtaining the oil from the stem bark.
- In order to obtain biofuels from *E. tirucalli* in economic quantities, it is recommended to use older trees with thick girths.

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Factors Affecting Performance of Women Entrepreneurship in Taita-Taveta County, Kenya

ABSTRACT

This article is based on a thesis that examined factors affecting performance of women entrepreneurship in Taita-Taveta County in Kenya. The study adapted a descriptive survey and census research design to collect data which was analyzed statistically using both qualitative and quantitative methodology. Data collection instruments were questionnaires and question guides containing both open and closed end questions which were administered to fourty six (46) women entrepreneurs, randomly selected, who formed the total number of respondents. General findings to this study indicate that women entrepreneurship performance in Taita Taveta County was below average; majorly due to poor infrastructure, exploitation, low level of education, poor business network and unhealthy business cultural practices in the community under study.

INTRODUCTION

Entrepreneurship is an activity that involves identification and exploitation of opportunities to create an economical value that may benefit the society. This requires a lot of efforts from individuals who may require to sacrifices time, money, intellect, physical energy, job security, and or comfort for purpose of growing an economy which has a positive effect towards poverty eradication and creation (Mair &Martin 2006). History of the concept (entrepreneurship) dates back in 1700 during the industrial revolution (Hoselitz (1955: p. 289 - 336). Though at this time according to Praag (1999) philosophers of science did not hold entrepreneurs in high esteem, instead they regarded entrepreneurs as robbers due to their behaviour of profit making and the economic definition of return on gain. However, since then there has a great evolution to the concept due the discoveries of different types of entrepreneurs. Dobbins et al. (2005) noted that entrepreneurship has been the most important worldwide aspect of economic development in business history. It creates jobs, improves living standards, and increases capital investment, among other benefits (Wennekers et al. 2006). This is true in Taita-Taveta County where women are the backbone of their families and play a significant role to enhance their families' upkeep through entrepreneurship. Report from Ministry of Devolution & Planning (Government of the Republic Kenya)(2013), indicate that women entrepreneurship programmes in Taita-Taveta County form a total population of 1328 registered self help projects though the poverty level rates as high as 66.8%. This study will therefore establish the main stumbling block towards the growth of economy in the Taita-Taveta County.

Theoretical Framework

The theoretical framework of this study follows the Cantillon's theory of wealth creation (Brown & Thornton 2011). According to Cantillon, consumption and demand are the main drivers of entrepreneurship or economic development, which results to a "circular-flow" model which brings about profit through risk averseness. The choice of a place for a market is regarded very important considering the population and the transport availability. According to Cantillon, entrepreneurs need to be near the market places to avoid unnecessary costs on transportation. He (Cantillon) advocates for unfixed economy in entrepreneurship, according to his theory anybody who engages in a productive activity and creates goods for consumption is an entrepreneur. This theory assumes that where there are investments, we likely to find chances of employment and growth of an economy. The theory considers risk takers as very important in such a scenario due their aggressive behaviour self scarifies in order to make a change. In relation to this study, the women entrepreneurs in Taita-Taveta County choose to trade in their small towns where there is demand of goods and services, easy access to transport and availability of consumers. This process (value creation) results to a positive relationship between entrepreneurial activity, economic growth, poverty eradication and wealth creation (Mair &Martin 2006).

Statement of the Problem

Taita Taveta County is one of the forty seven counties of Kenya, located in the south eastern part of the country. It lies approximately 200 km northwest of Mombasa and 360 km southeast of Nairobi city. Taita Taveta County which boarders Tanzania and is situated on the high way to Nairobi the Kenyan Central Business town. It covers an area of 16,975 km2 of which 62% or 11,100 km2 is within Tsavo East and Tsavo West National Parks. The remaining 5,876 km2 is occupied by ranches, sisal estates, water bodies such as Lakes Chala and Jipe in Taveta and Mzima Springs, and the hilltop forests which occupy less than 100 km2 or approximately 10 km out of 587.5 km (http://www.zarumasafaris.com). The above mentioned natural resources; water bodies, national reserves and forests among others, are a great opportunity for wealth creation. However, small scale businesses that were as a result of the rich mineral resource discovered during research were; sisal farming, horticultural products, livestock faming, small scale tourism, 'bodaboda' taxis, small scale fishing, small scale mining, sand selling, bricks making, charcoal burning, firewood selling, sugarcane selling, ballast and miraa, business among others earned income to the community. In the year 2013 the Ministry of Devolution and Planning registered 1328 women entrepreneurial activities from a population of less than 300,000 people, in Taita-Taveta County (Census Kenya, 2009/2010). Despite availability of the above mentioned businesses, as noted earlier, the county ranks among the poorest country wide. "Could the women entrepreneurship performance in this county be below average"? This study therefore will investigate some the reasons that contribute to high level of poverty despite the availability of natural resources and some wealth creating activities in the place.

Research Objectives

The general objective is to establish challenges facing women entrepreneurs in Taita Taveta County. The specific objectives are to;

i. To establish the effect of taxation on performance of women entrepreneurs in Taita- Taveta County.

ii. To find out the impact of credit facilities to women entrepreneurs in Taita-Taveta County.

iii. To establish cultural barriers that affect women entrepreneurs in Taita-Taveta County.

iv. To establish the effect of personal characteristics on the performance of women Taita- Taveta County.

LITERATURE REVIEW

A study carried out by Brush in 1992 indicated that both men and women have similar entrepreneurial characteristics (Morris, 2006). As noted earlier in this article, women have continued to embrace entrepreneurship to cater for their family needs. A study carried out by Brush (1992) indicates that the trend of women entrepreneurship changed from 1.9 to 3.3 million between 1977 and 1985 and the number of self-employed women increased dramatically - from 1.7 million in 1977 to 2.3 million in 1982 (Hisrich & Brush, 1984). Report of OECD (2004) at Istanbul Turkey indicates that between 1981 and 2001, the number of women entrepreneurs increased by 208%, compared to a 38% increase for men. This increase was more significant in urban areas most probably due to increased technology especially in urban areas (OECD Weeks, 2001). Studies carried out in US indicated that between one-quarter and one-third of the formal sector businesses were owned and operated by women (NFWBO, 2002). The UN report of (1996) indicated that 40 percent of the GDP in Africa was a contribution of women labour force A study carried out in India by Rao et al. (2012) indicated that women entrepreneurs comprised about 10% of the total number of entrepreneurs in India, with the percentage growing every year. **Report from ILO (2013), indicated that** more women than men entrepreneurs were starting businesses and that they accounted for a quarter to a third of all businesses in the formal economy worldwide. Barwa (1995) in his study in Ghana noted that women owned 60 percent of small business which offered 40 percent employment in the country. The empirical studies above are an indication that women play a significant role in economic development in world wide.

Factors Affecting Women Entrepreneurship

Studies on entrepreneurship have established that a person's intention to become an entrepreneur offers the best predictor of her/his actually engaging in entrepreneurship in future (Rao et al., 2013). According to Rao there are varied approaches and theories which deal with the facts why some individuals decide to venture into entrepreneurship. Herzberg's calls them motivation-hygiene theory or Herzberg's two factor theory (Rao et al., 2013). According to Tüzin et al. (2003) the major theories that explain gender differences in entrepreneurship focuses basically on psychological and sociological characteristics in males and females. Differences in achievements on both sexes are based on opportunities either in education or experience or in social cultural factors. These theories explain the low status of women in a society from the perspective of *liberal feminists* and *social feminist*. According to Tüzin et al. (2003) the new theory that combines the two is *integrated perspective*. Some of the theories that can explain the above phenomenon include:

The *power distance* refers to the degree of a culture tolerance and/or to accepts societal inequalities and it may have an effect on entrepreneurial character, where there is high power distance there is no equality. This theory assumes that lack of powered distance would result to high rate of innovation and resultantly higher level of entrepreneurial intentions in the citizen of the country (Ali et al., 2002).

Individualism is another theory which refers to the degree of a culture to encourage individual to achieve and ability or group achievements and relationships. A study carried out by Hofstede noted that in individualistic culture one focuses on the individual issues and his or her independence, achievements and goals (Gorodnichenko & Roland, 2010). This is typical the theory of a successful entrepreneur who prefers to work independently in order to grab opportunities without a second party interference.

Another theory is the *Masculinity* theory/behaviour which refers to the degree of a culture to encourage competitiveness, assertiveness, ambition, accumulation of wealth, and distinction of gender roles. Lewis (2006) notes that most women entrepreneurs tend to identify themselves with masculine characteristics that include scalability, openness, and low levels of adjustment.

The personality of the *Uncertainty avoidance* is another theory which refers to the degree of a culture to tolerate or deal with uncertainty and ambiguity. A study carried out by Wennekers (2004) indicates that attitudes, such as risk aversion, pertain to individuals may show a wide variety within groups. At the 'ecological level' of nations, cultural traits related to these individual attitudes may be distinguished easily even in a big population. Another study carried out by Wilson et al. (2007) found that women were more risk averse compared to men, but also emotionally more stable and lower self-efficacy. Also psychologically women have been found to put more emphasis on autonomy, self-actualization and adaptability, but they are less profit-driven. Could Wilson's findings be the reason for stagnation of women entrepreneurship?

The theories above tend to be a justification on either failure or success to women entrepreneurship though an individual can be held responsible for the same. However, different scholars have identified gender discrimination, cultural barriers, and access to finance, legal barriers, taxation and powerless networks among others as some of the hindrances towards entrepreneurship. Could the same factors be causes of stagnation of women entrepreneurship in Taita-Taveta County or there are other reasons causing high rate of poverty in the county despite the evidence of women entrepreneurial activities?

RESEARCH METHODOLOGY

Data collection for this study was carried out through questionnaires, focus group discussion and observation from four (4) constituencies of Taita-Taveta County. Questionnaires were distributed to forty six (46) members in the county. The study adapted a descriptive survey and census research design together with random sampling techniques to select the respondents from a total numbers of 1328 self help registered groups.

STUDY FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

The variable under investigation comprised taxation, credit facilities, cultural barriers, and women personal characteristics. Both qualitative and quantitative analysis was done and results presented on a narrative format.

All study participants were women entrepreneurs owning businesses, and who belonged to registered women groups for income generating activities. Businesses operated comprised grocery, second hand items, hawking, electronic money transfer (M-pesa) businesses, dress making, retail shops, dairy, goats rearing, salons, small hotels and outside catering, and horticulture farming.

Number of employees in the businesses were averagely 3 workers while majority worked sole or with family members. The number of employees in a business defined the size of a business and the entrepreneurial performance thereof. This information concludes that the businesses were small in size which means the return in capital investment is limited.

Purposeful selected participants comprised 18.5% chairpersons, 16.7%, secretaries, 13% treasurers and 51.9% ordinary members of the groups from the four constituencies of Taita-Taveta County. Majority of the participants came from Voi constituency (28.4%), while 22.8% represented Mwatate constituency, 25.9% came from Wundanyi constituency and 22.8% came from Taveta constituency. Research findings also indicated that a total of 96% participants were affiliated to Christian religious background. These results concur with those of Audretsch et al. (2007) that Christianity and Islam encourages entrepreneurship while others, particularly Hinduism does not. However, as noted before, the businesses owned by the women in this county were too small in size to register any significance sign in the county's development.

Respondents' ages ranged from 20 - 70 years with the majority (87%) of women entrepreneurs being between 20 and 49 years. From the studies reviewed, there was no specific age for entrepreneurship. However, according to the results the age bracket of most women entrepreneurs in Taita-Taveta County was between 26 and 61 years. This may be due to the fact that women in this age bracket in the county already had family responsibilities and were the main bread winners of their families. Widows and single mother phenomenon was also attributed to more women in this age bracket being involved in income generating activities to cater for their family needs.

The education background of the respondents varied between primary education level, ordinary/secondary level, tertiary, bachelor degree and postgraduate degrees. Responses indicate that majority (40.7%) attained secondary level of education though 78% of the participants had not attained a post secondary school education level.

Factors Affecting Performance of Women Entrepreneurship in Taita-Taveta County

During the study it was clear that there were number of factors that affected the performance of women Entrepreneurship in Taita-Taveta County. Some of these factors were:

(i) Taxation

According to the findings there were a number of taxes that businesses had to pay. These include personal income tax, business income tax; value added tax, trade taxes, property taxes, county taxes, and market taxes. The research findings indicated that value added tax (VAT) in Taita-Taveta County rated highest (40.7%) thus 'retarding' the businesses most compared to other taxes. More information indicated that the average propensity to consume in a give period was determined by the prices, whereby, when prices rose due VAT, the consumption of goods and services went down drastically hence the multiplier theory.

(ii) Credit facilities

Research findings indicated that 37% of the women under this study failed to grow their businesses due inflexible financing arrangements by banks, lack of knowledge on available products at the banks and financial institutions, lack of financial management skills and lack of capital. Though access to capital is an advantage towards creation and wealth multiplication, women entrepreneurs were found to own small businesses in order to operate with lower levels of overall capitalization. Lack of collateral or banks unwillingness to accept household assets as collateral and negative perceptions of female entrepreneurs by loan officers contributed highly to women challenges to access loans from the banks.

Reports indicated that financial literacy to women in Taita-Taveta discouraged banks and other financial institutions from lending money to women entrepreneurs. The banks and other financial institution failed to trust whether or not, the entrepreneurs would payback within the given period of time.

(iii) Cultural Barriers

Cultural buriers which were under investigation include; relegation of women to domestic work, inequalities between men and women, lack of aggressiveness in business undertakings, beliefs of the role of a woman to be in the domestic arena, lack of personal motivation in the community, marital status, networking, lack of internal solidarity, disloyal among members, and unequal opportunities with regard to work.

The study indicated that majority (62%) of women entrepreneurs in Taita-Taveta County were married, while out of these married women 24.1% who had little children regarded children up-bring as a constrain towards business success and 31.5% regarded family responsibilities as the major challenge in entrepreneurship performance. Thus whether a woman had little children or without, marriage responsibilities contributed to slow growth of the business.

Informal networking ranked 20.4%, which was quite high compared to other cultural barriers under study. This was an indication that women in Taita-Taveta County preferred individualism to socialization in business. However, studies indicate that for successful entrepreneurial activities social networking is necessary because it connects an individual with the like minded associates.

(iv) Personal Characteristics

Personal characteristics under investigation include; age, family back ground and education level

As noted before majority of women entrepreneurs (87%) were between 20 and 49 years. This age bracket conformed to studies carried out by Gosseline &Grise (1990) that early adulthood was the best in entrepreneurship due to the required energy in entrepreneurial activities. Women in the age bracket mentioned above were found to be with family responsibilities such as providing for their family needs, paying school fees for their children and paying for social welfares in the society. This required women entrepreneurs to save some amounts of money they collected from their small businesses. However, this was not the case due to the minimal returns they received from their small businesses.

During the research individual respondents expressed their concerns on lack of business administration skills, lack of financial management skills, lack of information on credit facilities and services provided by the banks, lack of information on human rights pertaining business ownership and poor informal and formal network and links with other entrepreneurs world wide, which was attributed to low level of education. These findings conformed to the study carried out by Richarson (2004), that lack of formal education may be a limiting factor towards development of women entrepreneurship and it contributes to lack of access to resources, management skills and self-confidence in business undertaking.

Other finding indicated that a total of 57.4% respondents had one or more persons in their families who owned a business. This was an indication that entrepreneurial characteristics were greater to individuals who came from a background where family member (s) were entrepreneurs than those who did not. These results conform to the empirical study carried out by Hisrich & Brush (1984) that role model and mentorship contribute greatly in successful entrepreneurship.

Discussions with women entrepreneurs indicated that the community was not highly motivated and that those who were in businesses lacked internal and external network. This explains the reasons why the businesses were small with little potential growth. As noted earlier, low education levels, exposure in business, experience, lack of role model and mentors among other challenges, contributed to stagnation of businesses in the county.

Other Factors

Problems such as fear of risk taking, poor roads conditions especially in remote areas of Mwatate and Taveta constituencies, lack of property ownership, water scarcity, and intense competition were reported as some of the reasons that contributed to poor performance in entrepreneurship.

In Taveta consistency, respondents reported that the neighboring Tanzanian entrepreneurs acted as middle men/women by buying goods from them and selling the same commodities at a higher price back in their country. Reports indicated that roads network from Kenyan boarder to Tanzania were better compared to those from Taveta to other potential markets within the country (Kenya). Reports indicated therefore that Tanzanian entrepreneurs were a great competitor hence a threat to Taveta business growth.

Given the fact that the County has two distinct climatic characteristics, with the hills (Wundanyi) experiencing lower temperatures as stated before, differences in form of population and infrastructure distribution affected entrepreneurial activities in the county. Results indicated that entrepreneurs in Wundanyi and Voi benefited from improved infructure compared to Mwatate and Taveta constituencies. This was an indication that the two constituencies (Wundanyi and Voi) had better entrepreneurial performance compared to rest. However, general findings indicated county operated small business for subsistence benefit and not for wealth maximization.

CONCLUSION

The findings in this study indicate poor performance of women entrepreneurship in Taita-Taveta County. The study also indicates marital status and family responsibility with low level of education as the main contributors to small business startup in the county. Low levels of education also contributed to lack of information and links to the wider business network. Poor infrastructure on the other hand contributed greatly to exploitation in business by the middle men/women, which in turn affected the entrepreneurial performance in the region.

Lack of training, experience, management, exposure to business networks or and linkages with local and international network, lack of motivation, lack of strong role model, and family status were reported as major challenges that hampered entrepreneurship in the county. Residents from Mwatate and Taveta constituencies reported that county tax payments, lack of property ownership, water scarcity, and competition from neighboring were the major factors that hampered entrepreneurship in the area.

RECOMMENDATIONS

This study focused only on women entrepreneurship; however, records indicate that in 2013 the government, through the Ministry of Devolution and Planning registered more than 7000 self help projects from the Taita-Taveta County. Apart from the above number of the self help projects, the researcher discovered a number of big businesses such as supermarkets, transport businesses, hotels and corteges among others, that were either partnership organizations or sole businesses. Nevertheless, the county languished in poverty. The researcher recommends that further studies should be conducted to find out the main course of high poverty level in this county.

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Does Education Eliminate Child Labour? An Investigation into the Interventions by the International Labour Organization's Programme on the Elimination of Child Labour In Kenyan Primary Schools And Its Effects On Learning Achievements (2000- 2006)

By Dr. Paschal WAMBIYA

ABSTRACT

This study was conducted to determine the effects of child labour programme on the learning achievement of pupils in Kenyan Primary schools. The study used mixed method, which combined both qualitative and quantitative paradigm. There was also a combined use of quasi-experimental designs and case study design. Both probability and non-probability sampling procedures were used to sample 480 pupils (240 from project and a similar number from non project schools), 48 teachers and 12 primary schools sampled from a sample frame of 52 project schools. The main finding was that though education and school based interventions by ILO/IPEC played a significant role in getting children to school and doing well, there still was a need to supplement what the project was doing to get more children in school. This includes provision of health facilities, income-generating activities for parents and family life education for parents among others.

1.1 BACKGROUND TO THE PROBLEM

According to ILO (2013) child labour is defined as work that deprives children of their childhood, their potential and their dignity and work that is harmful to the physical and mental development of children. It refers to work that is mentally, physically, socially and morally dangerous and harmful to children. For work to qualify as child labour, it must be hazardous to the life and safety of the child, it has to be exploitative and it must be keeping children out of school.

The new ILO (2013) report on child labour situation globally indicates that there are 168 million children worldwide in child labour. The same report indicate that the largest number of child labourers in the 15-17 year age group are in Asia and the Pacific region (77.7 million) followed by Sub-Saharan Africa (59 million) then the Caribbean (12.5 million) and finally Middle East and North Africa (9.2 million). The biggest concern is with Africa where one in five (21%) children in the same age group is in child labour as compared to Asia, Pacific and Latin America at 9% and Middle East and North Africa at 8%. The problem of child labour is still persistent in Kenya. The results of the 2005/6 Kenya Integrated Household and Budget Survey shows that in Kenya, the total number of working children was recorded at just over 1 million (52% boys and 47.1% girls) down from 1.9 million in 1999 (Gok, 2007).

Child labour has serious physical and psychological consequences for the child. Children are more prone to injury through accidents and more sensitive to noise, heat and toxicity (Bequele and Myers, 1995; Forastieri, 1997; Fassa et al, 2000). The physical strain of work on growing bones and joints can lead to stunting and spinal injury (ILO, 2002, p.12). All these risks are increased for poorly fed children, whose physiology has already been weakened through malnourishment (ibid). Physical work depletes a child's stock of energy. Over exertive work exhausts the energy stock below the minimum required to sustain physical growth and combat infection (Dasgupta, 1993, pp. 401-36).

Education is recognized as one of the most critical solutions to the elimination of child labour. If children do not to school, they are available for child labour and people trample on their rights. Uneducated and poor children cannot articulate for their rights and consequently they are manipulated and exploited. To reverse this, child labour must be eliminated and it has been confirmed that provision of quality, compulsory education is an important strategy to eliminate child labour.

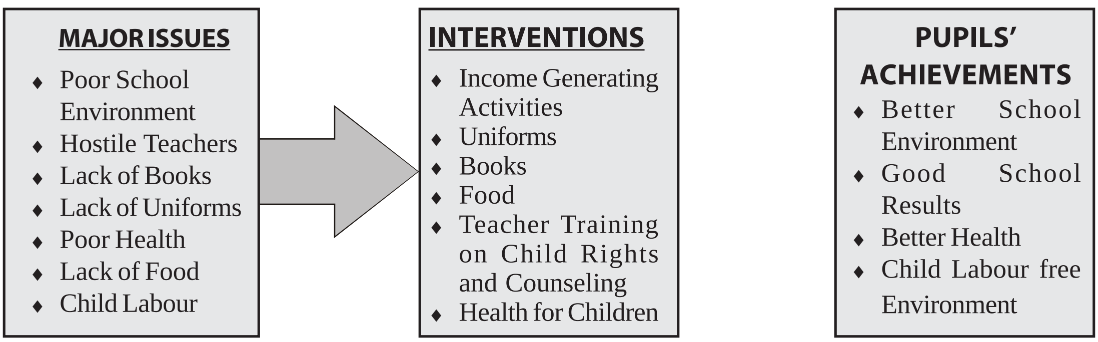
It is in this regard that ILO established the International Programme on the Elimination of Child Labour (IPEC). IPEC is the world's largest technical co-operation programme on child labour. It was launched in 1992 with funding from Germany and currently leads an alliance of nearly 90 countries in the war against child labour.

Kenya was one of the first generation IPEC countries in the world. In 1992, the Government of Kenya signed a Memorandum of Understanding (MoU) with ILO. The MoU requires the Government of Kenya to spearhead the war against child labour by ratifying relevant International Conventions aimed at protecting children from abuse, including child labour and to domesticate them in conformity with national legislation; instituting relevant policies and programmes aimed at eliminating child labour as well as removing children from child labour and taking them to school or training institutions. On its part, ILO/IPEC is supposed to provide technical and financial support to enable the government achieve the stated goals. ILO/IPEC has been giving this support for over thirty years to eliminate child labour in Kenya. Some of the achievements realized so far from the initiative include development of policy and legislation, capacity building, direct support to parents and children removed from child labour and those at risk, awareness of the dangers of child labour and the importance of taking children to school and various researches to further highlight the dynamics of child labour. The activities of ILO/IPEC in Kenya are steered by a twelve-member National Steering Committee composed of ILO traditional tripartite partners i.e. the Government, Employers and Workers as well as Non-Governmental Organizations dealing with children's issues. The Permanent Secretary in the Ministry of Labour chairs the committee.

This study focuses in the education component of the ILO/IPEC programme in Kenya, which is referred to as the Education Project. The ILO/IPEC programme on education started in 1996 with funding from the Government of Norway. It was meant motivate the Government to work towards the realization of free and compulsory education. It further aims at motivating wide spectrums of actors to eliminate child labour and campaign for quality and accessible education for all children, particularly the hard to reach in child labour. The programme has also implemented concrete direct support projects for children and their parents. Several children removed from child labour have been bought books, uniforms and other educational materials. Teachers have also been trained on child rights and how to rehabilitate and handle traumatized children removed from child labour. Policy discussions on the improvement of teacher status and learning environment, including school facilities, have been done with the Government. The activities are meant to retain children in school as well as improve teaching and learning at school.

This study seeks to establish the effect of the interventions on learning achievement. The introduction of Universal Primary Education (UPE) by the government is one such initiative to curb the upsurge of child labour. It is in this regard that ILO/IPEC's projects came up with integrated projects targeting children removed from labour and those at risk of deviating into child labour. The projects are premised on the belief that schools in the child labour-prone-areas are characterized by poor school environment; unmotivated teachers who have no patience for children who where removed from child labour, endemic lack of books and other scholastic materials, children who lack adequate food and suffer from ill health. Figure 1.1 shows the major issues identified by ILO/IPEC, the intervention components and the expected results.

Figure 1.1 Framework of the ILO/IPEC school based Projects in Kenya



The education projects of ILO/IPEC have the following interventions at school and community levels: firstly, a broad spectrum of actors, which includes parents, local administrators, religious leaders, agricultural officers, medical personnel, teachers and education officials, who have been helped to form school-based Child Labour Committees. The main purpose of the committees is to mobilize action to keep children in school through the use of home-grown solutions such as establishment of viable Income Generating Activities (IGAs) both at school and in the communities to support children at risk of falling into child labour and their parents as well as those rehabilitated from the practice. Secondly, ILO/IPEC has been offering direct support to vulnerable children through provision of uniforms, books and services such as psychosocial counseling, medical care as well as food. Thirdly, the programme has trained teachers in child rights and counseling to make them receptive to the problems of children who are removed from child labour. The interventions are meant to attract children from child labour by improving the school environment, an effort that would lead to improved learning achievement.

1.2 PROBLEM STATEMENT

Child labour does not only prevent children from acquiring education but also harms their physical, psychological and socio-economic well-being and interferes with their schooling. Gondi and Omotto (2004) studying Child Work, School Attendance and Performance in Kenya, found that pupils who involved themselves in many activities outside academic responsibilities were more likely to perform poorly than those who are focused and do not engage in child labour. Ranjan and Lancaster (2003), studying whether child labour affects school attendance and school performance using the Child Labour Survey Data from seven countries, found out that there was a strong negative impact of child labour hours on the educational variables and concluded that the effect of child labour at individual, family, community and national levels necessitated innovative response initiatives from all stakeholders.

Although end of phase one evaluation report for the ILO/IPEC projects revealed that project schools had recorded higher enrolments; improved on KCPE results and created conducive school atmospheres (Ogula, 2003), the study did not pay adequate attention to effects of the project interventions on the learning achievement of the beneficiaries. Since then, no study has focused on the same issue.

Based on this realization, the present study sought to examine the effects of the project interventions on the learning achievements of pupils supported by the projects to yield more comprehensive information for effective decision-making, policy dialogue and more informed project intervention strategies.

1.3 RESEARCH QUESTIONS

The study was guided by the following research questions:

1. To what extent have the ILO/IPEC project contributed to learning achievements of pupils?
2. What are the challenges to effective learning achievement in the project and non-project schools?
3. How does the learning achievement resulting from the projects vary by type of project activity in school?
4. How does the learning achievement resulting from these projects vary by duration of the project?

1.4 HYPOTHESES OF THE STUDY

H_o1: There is no significant difference in the mean achievement scores between project and non-project pupils.

Ho2*:* There is no significant difference in the mean achievement scores of pupils in the project schools with respect to the type of project.

2.0 DESIGN AND METHODOLOGY OF THE STUDY

This study used the mixed method which combined both qualitative and quantitative paradigm. There was a combined use of quasi experimental designs and case study design. Quasi experimental design was used because it was not possible to assign participants to project and non-project groups. The specific design under quasi experimental design was non-equivalent control group design. Case study was used to get an in-depth analysis of what was going on in some project schools.

The Target population for the study included: 21 districts, namely, Siaya, Koibatek, Busia, Nyambene, Taita-Taveta, Kisumu, Kakamega, Mwingi, Kiambu, Nairobi, Mombasa, Nakuru, Kwale, Laikipia, Homa Bay, Kericho, Uasin Gishu, Makueni, Nyeri, Malindi and Kajiado. Within the target districts, the projects were initiated in 200 primary schools. The study targeted standard seven and eight pupils from the project and non-project schools. The study also targeted teachers, Child Labour Committee members and non-project schools.

Both probability and non probability sampling procedures were used to sample the above target groups. Primary schools, districts and pupils were sampled through probability sampling procedures. Teachers, Child Labour Committee Members and non project schools were sampled through non probability sampling procedures and particularly purposive sampling. The project was implemented in 21 Districts and consequently the districts were not sampled as they were all considered in the study. The study ended up with 480 pupils (240 from project and a similar number from non project schools), 48 teachers and 12 primary schools sampled from a sample frame of 52 project schools. These 52 project schools were considered homogenous as were all day and mixed primary schools. Consequently, Simple Random Sampling was used to select 12 primary schools. A stratified random sampling technique was applied to obtain 20 pupils from each of the 12 project schools. The stratification was based on class and sex. Accordingly, the study drew *five* male and *five* female pupils from standard seven and a similar number from standard eight respectively.

The study had a Questionnaire for pupils, which was used to get information from pupils on the status of family and economic status, parental attitudes towards school, socio-cultural issues like domestic violence. The other instruments were Three tests, founded on the basic learning skills of numeracy, literacy and life skills, were administered to pupils in both project and non-project schools. The tests were prepared in line with the national education syllabus and borrowed from the principles of basic learning competencies developed by UNESCO (UNESCO, 2001). The tests for each class were derived from the previous classes, based on the assumption that the issues had been covered successfully in the previous year of schooling. The instruments were the Interview Guide for teachers, Focus Group Discussion for Child Labour Committee members and an observation schedule to examine the facilities and other resources used in the project.

3.0 FINDINGS

3.1 Demographic characteristics of the respondents

Pupils

Even though the study intended to obtain requisite data from 480 pupils, only 348 (about 73 percent) participated in the exercise. This was prompted by the fact that it was not possible to find the required number of eligible pupils in the project schools. In view of this, the study utilized the actual numbers that were available in the selected schools

Teachers

In addition, the study captured the views and essential characteristics of 58 teachers out of a possible 96. This implies coverage of about 60 percent. The low coverage was attributed to acute understaffing of most schools

Child Labour Committees

The study captured the views of members of the school-based Child Labour Committees in all the 12 project schools including an action group in Kajiado District. The number of participants in each of the Focused Group Discussions with the committee members ranged between 5 and 9

3.2 Findings according to the research questions

The study had the following Research Questions:

1. To what extent have the ILO/IPEC project contributed to learning achievements of pupils?
2. What are the challenges to effective learning achievement in the project and non-project schools?
3. How does the learning achievement resulting from the projects vary by type of project activity in school?
4. How does the learning achievement resulting from these projects vary by duration of the project?

The extent to which ILO/IPEC project has contributed to learning achievement of pupils

During the study, three tests, founded on the basic learning skills of numeracy, literacy and life skills, were administered to pupils in both project and non-project schools. The tests had been prepared in line with the national education syllabus and borrowed from the principles of basic learning competencies developed by UNESCO (UNESCO, 2001). Since the study intended to measure learning achievement, the tests for each class were derived from the previous classes, based on the assumption that the issues had been covered successfully in the previous year of schooling. Accordingly, the test for standard eight was set from the standard seven syllabus and for seven from the standard six syllabus. Pupils were given equal time to write the tests. The non-project schools performed best in literacy test (59%), followed by life skills (56%) and Numeracy (45%) tests. However, it is evident that the project schools performed better in all the subjects. Aggregate means for all the subjects were done for project and non project schools. Further analysis to establish if there was any difference between the means of the two distributions culminated into testing of the first null hypothesis **(Ho1)** stating that *there is no significant difference in the overall mean achievement scores between project and non-project pupils* using the t-test. Table 1 presents the outcome of the differences between the mean scores of the project and non-project pupils.

Table 1: The differences in overall mean scores between project and non-project pupils

Paired Differences		t	Significance
Mean	Std. Deviation		
-4.24	15.84	-2.857	.005*

* *Significant at a = 0.05*

The table indicates that the variation of the mean learning achievement scores between the project and non-project pupils yielded a t statistic of –2.857, which was found to be statistically significant at 95% confidence level and led to rejection of the null hypothesis. This implied that the mean learning achievement scores of the pupils in project and non-project schools varied significantly, as one lot performed better than the other.

Challenges affecting learning achievements in project schools

Though project schools did fairly better that their counterparts in the achievement tests administered, several challenges were encountered by the projects. Many project schools were understaffed. Some teachers were also not trained and were unmotivated as they were poorly paid. But one of the most serious challenges was the fact that most schools lacked teaching and learning resources. Books were inadequate as were desks. Many children sat on the floor. There were serous problems with project management. Many projects were not well managed and proper records were not available. Some of the projects did not bring enough income as was expected. In some areas, pupils walked long distances to school and were tired when they reached the schools. On a more serious note, some pupils were attacked by wild animals and pricked by thorns. These problems led to irregular attendance and hence poor performance. Some children suffered from diseases and hospitals were far from schools. In some schools there was no water and food, making many children thirsty and hungry.

How learning achievement vary by type of project

The ILO/IPEC's educational and training projects were initiated through local partners with interest in the fight against proliferation and subsequent elimination of child labour in Kenya. Some of the agencies included KUDHEIHA, a trade union for domestic and hotels workers; Dupoto-e-Maa and CEPED, local NGOs based in Kajiado and Siaya Districts respectively. Table 3 below shows the mean achievement of schools per project.

Table 2: Learning achievement and the type of project

Serial No.	Project Schools	Type of Project	Mean Score
1.	Bondeni, Kinungi, Makina SH,	KUDHEIHA	54
2.	Masavi &Tiekunu Il Bissil, Il Motio and Lorngosua	Dupoto-e-Maa	61
3.	Lunyofu, Malomba, St Cecilia & Uhembo	CEPED	65

Table 3: ANOVA summary Toble on Pupils Achievement by type of project

	Sum of Squares	Mean Square	F	Sig.
Between Groups	2532.342	1266.171	10.748	$.000^{*}$
Within Groups	13076.973	117.811		

Further analysis to establish if there was any difference between the means by type of project culminated into testing of the second null hypothesis **(Ho2)** of the study stating that *there is no significant difference in the pupil's mean achievement scores by type of project*. The procedure produced an F statistic of 10.748, which was found to be significant. Based on the results, the null hypothesis was rejected, implying that the mean learning achievement scores varied by the type of project. The finding was attributed to the different styles of management, level of commitment of the project managers and prudent expenditure of the project funds to reach the target beneficiaries. Table 3 presents the results from one-way ANOVA procedures.

Variation of the learning achievement by duration of the project

The study assessed the age of the projects with a view to establishing whether there was any significant variation in the mean learning achievement by the duration of existence. Table 4 shows that most of the projects had existed for about 5 years by the time of the study, one project had done two years, while three were initiated only a year preceding the study.

Table 4: Distribution of the mean scores and duration of the projects in years

Serial No.	Project schools	Age of the Project (in years)	Mean score
1.	Bondeni, Lunyofu, Makina, Masavi, Tiekunu	5	67
2.	Il Bissil, Il Motio and Lorngosua	1	61
3.	Kinungi, Malomba, St. Cecilia and Uhembo	2	53

Ideally, duration of existence of a project indicates the level of achievement of the objectives, which in turn would influence the mean learning achievement of the supported pupils. Accordingly, the older the project, the greater the achievements and the better the learning achievement scores. By contrast, the younger the project, the less the achievement and effects on the learning achievement scores.

4.0 SUMMARY OF THE FINDINGS

This summary of findings is given based on the research questions in the study as follows:

1. **To what extent have the ILO/IPEC projects contributed to learning achievements of pupils?**

   This study found out that those children in project schools performed better than their counterparts in non-project schools and that this performance was significant. These results were based on the literacy, numeracy and life skills tests administered to them during the study whose validity and reliability indexes were determined as explained in this study. This impressive performance is attributed to the interventions initiated by ILO/IPEC projects which came in the form of school uniforms, books, beddings, food and economic empowerments for families.

2. **What are the challenges to effective learning achievement in project and non-project schools?**

   The study identified a number of challenges as follows:

   - Inadequate teaching and learning resources
   - Household poverty
   - Health and nutrition
   - Parental attitudes towards education

- ❑ Violence
- ❑ Frequent absenteeism

3. **How does the learning achievement resulting from the projects vary by type of project activity in school?**

   This study found that there were differences in learning achievement by pupils by type of project as they were implemented by the three agencies whose project schools were studied, namely KUDHEIHA, Dupoto-e-Maa and CEPED. These differences could be attributed to efficiency of the implementing agencies as all of them used the same implementation strategy. From this study, it would appear that CEPED is the most efficient implementing agency.

4. **How does the learning achievement resulting from these projects vary by duration of the project?**

   This study found out that there are differences in learning achievement by duration of project and that these differences are significant. The study confirms that the longer the project is in existence, the better the results.

5.0 CONCLUSIONS

On the basis of the findings above it can be concluded that school based interventions by ILO/IPEC made substantial contributions to learning achievements. This is because the test results showed that the project-supported pupils performed better than their counterparts in the non-project institutions. It can therefore be concluded that these interventions were useful in improving the learning environment in the school. However, it is noted that the differences in learning achievement were not very significant. This can be attributed to weaknesses in implementation strategies; not on the actual project interventions. However there were variations by project duration and the type of project undertaken.

6.0 RECOMMENDATIONS

On the basis of the findings the following recommendations were made:

1. Increase funding to enable comprehensive implementation of the designated project interventions targeting pupils, teachers, physical facilities and IGAs. Interventions should be reasonably resourced to make meaningful impact on target groups.
2. Interventions should be linked to national programmes and processes like CDF and LATIF for sustainability. The success of the projects, to a great extent,

depends on local resources, not overseas funding. It should be clear that the ILO/IPEC is only showing the way. It is upon communities to come in and add impetus to the action.

Initiate new interventions to meet the needs of the pupils, teachers and the entire learning environment. It is the conviction of this dissertation that school-based activities are the most important if child labour is to be eliminated. However, for them to succeed, a comprehensive menu of school-based intervention should include the following: teachers should be trained not only on child rights and child labour but also on innovative teaching/learning methods. The project should make available books to the teachers and children. The school based IGAs should be related to subjects being taught in schools. The teachers should use them to teach relevant subjects. It emerged from the study that large families contribute the largest number of children to child labour. There is a clear need to introduce family life education programmes in child labour prone areas. Other important interventions include school feeding programmes, which should be supported by the government and the communities to ensure sustainability; provision of health services; direct support to parents through revolving funds; contact with policy makers and provision of physical facilities.

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