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The paradox of ICT integration in secondary education in Tanzania: Assessment of teachers' ICT knowledge and skills in Tanga and Mwanza regions

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Abstract

The purpose of this study was to assess the status of secondary school teachers' knowledge and skills necessary for the implementation of the Information and Communications Technologies (ICTs) policy for basic education in Tanzania. In particular, the study examined Tanga Municipality and Mwanza region secondary school teachers' ability to use computers (the basic ICT tool) for the professional practices; and solicited teachers' opinions on the integration of ICT in secondary education. Self-administered questionnaires with closed-ended and open-ended questions were used to gather data from the respondents. The sample consisted of 26 schools; 11 schools drawn from Tanga Municipality and 15 drawn from Mwanza region. From 26 surveyed schools, a total of 124 respondents were recruited, both males and females. The study found several gaps which exist between the ICT policy and the real practice or implementation of ICT objectives in education such as limited teachers' awareness and training in ICT integration, and electricity and ICT facilities supply in most schools. Education sector, in Tanzania, should strive to work shoulder to shoulder with other sectors in the country for the improvement of education in general and integration of ICT in teaching and learning processes.

Keywords: ICT policy; educational technology; basic education; professional practices; computers

The paradox of ICT integration in secondary education in Tanzania: Assessment of teachers' ICT knowledge and skills in Tanga and Mwanza regions

1. Introduction

Tanzania, like many other countries in the World, is in the course of developing 'information society and knowledge-based economy' through the opportunities brought by the Information and Communications Technologies (ICTs). Education in the country is regarded as a strategic sector for such transformation. By recognizing the role of ICT for socio-economic development, the Tanzanian government has introduced various policies and plans –such as the National ICT Policy and ICT Policy for Basic Education-, to guide the provision of ICT services in the country. It is undeniable that ICT offers new opportunities to enhance education and to improve the quality of delivery in all areas. In the same line of thinking, the Ministry of Education and Vocational Training (MoEVT)-Tanzania believes that the use of ICT in teaching, learning, administration, and management represents a powerful tool to achieve educational and national development objectives. Thus, the ministry decided to introduce the policy to guide the integration of ICT in basic education.

The promulgation of the ICT policy for Basic Education in 2007, created the national framework for integrating ICT in Basic Education: pre-primary, primary, secondary and teacher education as well as non-formal and adult education. Besides, the context of ICT policy and its implementation in education sector originates from a number of national and international policy documents: Tanzania Development Vision 2025; National Strategy for Growth and Reduction of Poverty (NSGRP); Millennium Development Goals (MDGs); National Information and Communications Technologies Policy; Education and Training Policy of 1995 (ETP); Education Sector Development Programme (ESDP); Education Sector Review; and the World Summit on the Information Society (WSIS).

The application of ICTs in Tanzanian education systems is not a new impression. It can be traced back to late 1960s and early 1970s when schools were provided with radios to enable students to listen to educational programs broadcasted by Radio Tanzania Dar es Salaam (RTD) (Senzige, & Sarukesi, 2003). However, there were little efforts to integrate the television technology that spread from the mid 1990's into education. The initiatives to integrate ICTs in education rejuvenated in 2002 when a stakeholders' workshop was called by the Ministry of Education and Culture with support from the International Institute for Communications Development (IICD), a Dutch NGO (Hare, 2007). According to Hare (2007) the workshop's roundtables identified key areas of ICT interventions and 11 project proposals were generated. These projects helped to raise awareness of the benefits and the potential gains in adopting ICTs in the education sector, which in turn elevated ICTs to a priority area in education planning.

Recognizing the potential of ICTs as a significant tool for improving education system, the MoEVT embarked on the development of an ICT Policy for Education in 2006. In 2007, the policy document was developed to guide the integration of ICT in Basic Education (URT, 2007). The policy (URT, 2007) addresses issues related to infrastructure and technical issues; curriculum and content; training and capacity building; planning, procurement and administration; management and support; and monitoring and evaluation. According to the policy document (URT, 2007), the framework provides for a variety of technologies, including

> *Radio, television, video, telephone (both fixed line and mobile), computer and network hardware and software; as well as the equipment and services associated with these technologies, such as electronic mail, text messaging and radio broadcasts* (p. 2).

In a nutshell, the objectives of the policy, according to the policy document (URT, 2007) are to:

> *Integrate the use of ICTs to achieve educational policy objectives; Promote the harmonization of*

> *activities, approaches and standards in the educational uses of ICTs; Ensure that there exists equitable access to ICT resources by students, teachers and administrators in all regions and types of educational institutions and offices; Ensure proper management and maintenance of ICT resources; Facilitate the development and use of ICT as a pedagogical tool; Promote development of local content for basic education and others; Encourage partnership; and Facilitate use of ICT resources in schools, colleges, and libraries* (p. 4).

The integration of ICT in basic education subsector, according to the policy document (URT, 2007), is expected to yield the following outcomes:

> *Improve access and equity to, and quality and relevance of basic education; Increase the number and quality of teachers, through improved pre-service and in-service training and better provision of teaching and learning materials; Enhance the acquisition and use of knowledge and skills for all learners, including those with special needs; Improve the efficiency and effectiveness of the management and administration of education, at all levels; and Broaden the basis of education financing, while optimizing the use of education resources, through partnerships and stakeholder participation* (p. 2).

According to the policy, priority levels (though implemented in phases) include teacher education, secondary education and primary education. At the same time the implementation of the policy goes hand in hand with adult education, vocational training, libraries, and administration and management. Moreover, in the policy document, policy statements revolve around infrastructure and technical issues; curriculum and content; training and capacity building; planning, procurement and administration; management, support and sustainability; and monitoring and evaluation (URT, 2007).

1.1 Statement of the problem

There are obvious huge gaps between policies and the changes in classroom practice that they are intended to affect (Cohen & Hill, 2001). That means policies are articulated but teachers are often not aware of the specifics of these policies or their goals. In turn, policies are implemented as programs, but often these programs are not effective in achieving desired change at the classroom level. A study by Cohen and Hill (2001) found that policies were most effectively implemented in classrooms where teachers had extended opportunities to learn policy-related materials. Besides, it has been widely noted that learning is a process of interaction between teachers and students as they both participate in the learning process, but with more weight given to teachers to show the way. Therefore, to effectively and efficiently integrate ICT in basic education, teachers are at the core of the process. In this sense, teachers are required to have knowledge and skills in ICTs. It is now over five years since the promulgation of the policy, however the status of teachers' ICT knowledge and skills to efficiently and effectively implement the policy remains unknown. Hence, this study intended to assess the status of secondary school teachers' ICT knowledge and skills necessary for the implementation of the policy.

1.2 Purpose of the study

The purpose of this study was to assess the status of secondary school teachers' knowledge and skills necessary for the implementation of the ICT policy for basic education in Tanzania. In particular, the study sought to assess Tanga municipality and Mwanza region secondary school teachers' ability to use computers (the basic ICT tool) for the professional practices; and solicit teachers' opinions on the integration of ICT in secondary education.

1.3 Significance of the study

The study has first identified the ICT knowledge and skills gaps, for teachers that require professional development interventions. Second, the findings from this study has provided the basis for recommendations to

inform educational stakeholders such as policy makers; decision makers; educational practitioners like managers and teachers; and educational development partners on the integration of the ICT in education in Tanzania.

2. Material and Methods

2.1 Research Design

The study adapted a case study design where Tanga and Mwanza regions constituted the study area.

2.2 Sample and sampling procedure

Both simple random and purposive sampling procedures were applied to obtain schools[1] and respondents for this study. The sample consisted of 26 schools; 11 schools drawn from Tanga Municipality and 15 drawn from Mwanza region. From 26 surveyed schools, a total of 124 respondents were recruited, both males and females. Table 1 illustrates the education level of the respondents by sex.

Table 1

Respondents by Sex and Education Level

		Education level			
		License	Diploma	Bachelor	Total
Sex	Male	2	37	42	81
	Female	1	22	20	43
Total		3	59	62	124

2.3 Methods of data collection

Self-administered questionnaires with closed-ended and open-ended questions were used to gather data from the respondents. Closed-ended questions were used to gather demographics and information on teachers' ability to use computers (the basic ICT tool) for their professional practices. Yin and Heald (1975) argues that the use of closed-ended questionnaire in policy studies that use case survey allows an analyst to aggregate the case study experiences and to assess the quality of each case study in a reliable and replicable manner. Besides, open-ended questions were sought to solicit teachers' opinions on the integration of ICT in secondary education. We decided to include these sorts of questions in the instrument to allow respondents to express their opinions without being influenced by the researcher (Reja, Manfreda, Hlebec, & Vehovar, 2003; Ballou, 2011). Moreover, this has several consequences for the quality of our survey data. The advantages of the open-ended questions include the possibility of discovering the responses that individuals give spontaneously, and thus avoiding the bias that may result from suggesting responses to individuals, a bias which may occur in the case of close-ended questions (Ibid).

2.4 Data Processing and analysis

Quantitative data were analyzed by using SPSS (Version 16.0) and qualitative data were subjected to thematic analysis. Quantitative data are presented in form of percentages, frequencies, graphs, tables, and many others whereas qualitative data are thematically presented. As researchers, we acknowledge the existence of many possibilities for analyzing data, however, we gave priority to those analyses which most clearly help

[1]The schools were selected by virtue of being Teaching Practice centres where researchers had access. Researchers collected data while they were on duty to supervise undergraduate students in their Teaching Practice exercise.

summarize the data relative to the study purpose and which will make the most sense to our audience.

2.5 Reliability and validity

According to Golafshani (2003) the definitions of reliability and validity in research reveal two strands: Firstly, with regards to reliability, whether the result is replicable. Secondly, with regards to validity, whether the means of measurement are accurate and whether they are actually measuring what they are intended to measure. Therefore, to ensure reliability and validity in this study, pre-test of questionnaire was done before actual collection to determine their clarity and relevance to the objective of the study. Pre-test questionnaires were administered to ten respondents drawn from the schools that were in the survey prior to the commencement of the study. Those respondents had similar characteristics as the respondents included in the main study. The questionnaires were modified to incorporate lessons drawn from pre-testing. Finally, all the respondents who were involved in the pre-testing were excluded from the sample of the main survey.

2.6 Ethical considerations

In this study, we considered ethical issues as an integral part of the research planning and implementation process, not viewed as an afterthought or a burden (Mertens, 1998).For the participants, we obtained informed consent and ensured privacy and confidentiality. We also ensured the voluntariness in the participation in this study. Besides, as academic staff, we requested a research clearance from the Vice Chancellor of the University of Dar es Salaam who is legally empowered to issue research clearance to the staff and students of the University on behalf of the government and the Tanzania Commission for Science and Technology. The clearance letters introduced us to the Regional Administrative Secretaries of the case regions who also introduced us to district/city level administrators who granted us permission to conduct research in schools in their administrative areas.

3. Results and Discussion

3.1 Time of graduation from teacher training college

Time of graduation from pre-service teacher training in this study was considered as a background variable. Teachers were requested to mention the year in which they graduated from college. This was important in this research to differentiate between graduates before and graduates after the ICT policy was put into place in 2007. The study finds that, majority (66.1%) of the surveyed teachers graduated after the policy was operational. Out of the 124 teachers, 22.6% graduated before the policy was promulgated. Unfortunately 14 respondents (11.3 %) didn't indicate their graduation year. Moreover, majority (80.5%) were teaching Ordinary Level of secondary while very few (4.9%) were teaching Advanced Level (high school) and 14.6% were teaching both levels. The findings further indicate that those who graduated after 2007 are more computer literate than their counterparts who graduated before 2007. Figure 1 clearly indicates the teachers' response on whether they can use Word Processing and Internet for the teaching and learning.

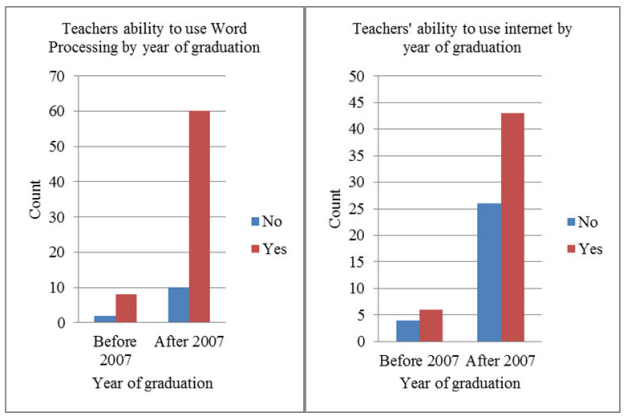

Figure 1: Teachers' ability to use Word Processing and Internet by year of graduation

3.2 Opportunity to take part in computer training

The study was interested to discover whether teachers had opportunity to take part in ICT trainings particularly computer courses. As indicated in figure 2, majority, 87 (70.2%) of our respondents indicated that they had taken part in computer training by the time of data collection for this research. However, 37 (29.8%) of teachers admitted that they had never attended any training in computer and they are computer illiterates.

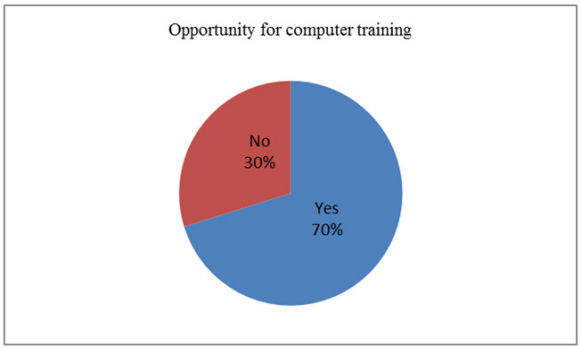

Figure 2: Teachers' opportunity to take part in Computer training

Different stakeholders initiated ICT trainings and its application in education that teachers attended. The findings indicate that, the stakeholders included the Ministry of Education, schools, and Non-government organizations (NGOs). Other initiatives were part and parcel of pre-service teacher training colleges/universities. However, it is also found that, some other teachers used their individual efforts to get computer trainings.

On part of strategy used to acquire computer skills, majority (73.4%) of the surveyed teachers responded that a combination of strategies were used including: online resources for self-study, one time workshops, school-based training with peer support, short-term training course, school-based training with support from outside experts and computer skills being an integral part of the teacher training course.

3.3 Relevance of the training and ability to integrate ICT in education

Researchers were interested to discover whether ICT training given to teachers were relevant to their professional practices. When we asked "*was the training content linked to the curriculum and how can you integrate ICT in real classroom instruction?"* majority (79.1%) replied that they can somehow integrate ICT in real classroom context. The findings as indicated in table 2, shows that only 1.1 % of the 91 respondents who had received ICT training can competently integrate ICT skills in the classroom practices while 19.8% were not sure whether they can or cannot integrate ICT in classroom at all.

Table 2

Teachers' ability to integrate ICT in the classroom practices (N=91)

		f	P	Cumulative Percent
Valid	Not at all/I am not Sure	18	19.8	19.8
	Some how	72	79.1	98.9
	Very much	1	1.1	100.0
	Total	91	100.0	

When analyzing the issue of relevance of the training, the critical question one should ask; *who planned the content?* When asked who planned the content for those teachers who received computer training and other ICT training as part of their continuous professional development, majority received expert planned and delivered

training. Table 3 summarizes teachers' responses on who planned for the content in the ICT training they ever attended.

Table 3

Teachers' response on who planned their content in the ICT training they attended

		Expert		ECT		Trainees	
		f	P	f	P	f	P
Response	No	31	34.1	80	87.9	74	82.2
	Yes	60	65.9	11	12.1	16	17.8
	Total	91	100.0	91	100.0	90	100.0

Note. ECT=Expert in Consultation with Trainees

This study also looked at the computer knowledge and skills acquired by surveyed teachers. Majority of teachers indicated mastery of word processing, excel and internet. On the other hand, computer maintenance and database management were the knowledge and skills not acquired by majority (89.1%) of respondents in the studied schools. Table 4 below summarizes teachers' responses when asked whether they are proficient in the selected computer applications.

Table 4

Computer Knowledge and skills acquired by surveyed teachers(N=92)

AK & S		W. P		Excel		Database		Power Point		Internet		C.M	
		f	P	f	P	f	P	F	P	f	P	f	P
Response	No	14	15.2	35	38.0	59	64.1	48	52.2	34	37.4	82	89.1
	Yes	78	84.8	57	62.0	33	35.9	44	47.8	57	62.6	10	10.9
	Total	92	100.0	92	100.0	92	100.0	92	100.0	91	100.0	92	100.0

Note. AK & S= Acquired Knowledge and Skills; W.P= Word Processing; CM= Computer Maintenance

Given the computer knowledge and skills surveyed teachers have, we enquired on their ability to comfortably integrate their knowledge and skills in teaching and learning. That is, what teachers can do comfortably with computers in their pedagogical activities? The results as shown in table 5, indicates that half of the surveyed teachers (50.5%) were unable to use computers in preparing their lesson plans while the majority (81.5%) indicated that they can comfortably look for educational resources on the internet. Overall, the majority (97.8%) indicated that they can at least do something related to teaching and learning with a computer.

Table 5

Teachers' ability to use computers

TA CU		PSW & LP		LERI		PLPfPPT		PST/E &R		CDAC	
		f	P	f	P	f	P	F	P	f	P
Response	No	46	50.5	17	18.5	60	65.2	37	40.2	89	97.8
	Yes	45	49.5	75	81.5	32	34.8	55	59.8	2	2.2
	Total	91	100.0	92	100.0	92	100.0	92	100.0	91	100.0

Note. TACU= Teachers' ability in Computer Usage; PSW &LP=Prepare Schemes of Work and Lesson Plan; LERI= Look for Educational Resources on Internet; PLPfPPT= Prepare Lesson for Power Point Presentation; PST/E &R= Prepare student's tests/exams and results; CDAC= Can't do anything with Computer.

Besides, this study was also interested in soliciting teachers' opinions on what computer knowledge and skills need to be provided to teachers in education sector for effective integration of ICT in secondary education. Majority of teachers were of the opinion that internet use (94.8%) and Ms Office (97.4%) are the most needed for teachers to be able to integrate ICT in their pedagogical activities. Table 6 summarizes their opinions.

Table 6

Required computer knowledge and skills for teachers

RCK & S		IC		Internet Use		Ms Office		CM	
		f	P	f	P	f	P	f	P
Response	No	71	61.2	6	5.2	3	2.6	85	73.3
	Yes	45	38.8	109	94.8	113	97.4	31	26.7
	Total	116	100.0	115	100.0	116	100.0	116	100.0

Note. RCK & S=Required Computer knowledge and skills; IC=Introduction to Computer; CM=Computer Maintenance

3.4 Teachers' opinions on the education sector ICT policy and the integration of ICT in education

One of the objectives of this study was to solicit teachers' opinion on the ICT policy for basic education and the practical integration of ICT in secondary education. The participants' opinions were diverse and centred on the theoretical and practical aspects of the policy. Their opinions are categorized into the themes discussed below.

ICT Policy and teachers' awareness - Teachers' awareness is centered on their understanding, recognition and appreciation of the benefits woven around ICTs in education and their inclination towards its adoption (Oladosu 2012). Particularly for the policy, Oladosu argues that awareness about policies forms the backbone of the utilization and productivity of a program. When an individual is aware of the guiding principles, he/she then cultivates the right attitude which will result in an improved productivity. The findings of this study reveal that there is little or inadequate awareness of the policy among teachers that can potentially affect the implementation although they have demonstrated a considerable awareness of the potential of ICT in enhancing their professional practices. Some teachers were keen enough to admit that they don't know anything about the policy. Others were of the opinion that if the policy is to succeed, teachers should be aware about the policy and have access to the document. One teacher suggested that

> *The education sector could be advanced if ICT policy were accessed and made available to all educational stakeholders. Therefore, I appeal that the education sector ICT policy be availed to teachers so that they can be knowledgeable and improve the teaching using modern ways associated with ICT.* (Teacher's response, Questionnaire)

This finding correspond to recent findings by Muhoza, Tedre, Aghaee, and Hansson (2014) which shows that, there is a gap between the existing ICT policy at the national level and the availability and use of the policy in learning institutions in Tanzania. As a result, students, teachers and even institutional leaders are not able to compare the ICT implementation at their institutions to the government educational ICT policies and plans mainly because they have no access to these documents.

ICT and teachers' preparation - One of the important aspect to implement any educational policy particularly at the classroom level, teachers need to be well prepared for such an activity. Teachers can be trained to learn HOW to use ICT or teachers can be trained via ICT. ICT can be used as a core or a complementary means to the teacher training process (Jung, 2005). Overall, the governments and teacher training institutions seem to recognize the importance of integrating ICT in education and teacher training. However, their efforts seem not to reach all teachers, either at pre-service or in-service level. In this aspect, one teacher noted that

> *Teacher training colleges should provide the computer skills training to their pre-service teachers so as to make them up to date… this will help teachers to cope with the world of globalization.* (Teacher's response, Questionnaire)

Although teacher training in the application of ICT in education is given a high priority but majorities of teachers are computer illiterate. In this study, for example, we found that only 62.9% declared that they can use Word Processing, a basic computer application. Teachers hold a crucial position in the integration of ICT in education. With this in mind, our respondent commented that "it is better for the ICT policy to focus on educating teachers because teachers are at the center of the policy implementation."

ICT and infrastructural availability - The availability of ICT infrastructures is also an important aspect of the integration of ICT in education. This has been highlighted in several studies (Whelan, 2008; Howie & Blignaut, 2009). As argued by Ndibalema (2014), while there are no official estimates on the use of ICT on teaching in Tanzania, there appears to be a very small number of secondary schools with ICT facilities and the government initiative to provide them for schools seems to be very minimal. Based on the findings of this study, basic ICT facilities are lacking or/and in short supply. One teacher was of the opinion that

> *The ICT policy is much based on theory since the education sector has not yet prepared the environment for undertaking the ICT program countrywide. In addition to that, no facilities to make the ICT programs effective. This is to say the environment is not supportive…* (Teacher's response, Questionnaire)

Besides, the efforts are compounded by the limited supply of electricity in rural areas. In this aspect, one teacher added that "ICT policy may be effective if all schools could have electricity supply". The other went on arguing that "the MoEVT and other stakeholders should make sure that every school/college is provided with electricity if ICT integration in education is a goal we want to achieve as country". It has been found in this study that the provision of ICT teaching and learning resources both in teacher training institutions and schools where these teachers are to work is a must to make this policy a reality. In this aspect, a teacher was quoted giving opinion that

> *The ICT in teacher education should be given priority by provision of enough teaching and learning resources as well as trained and competent teachers be prepared for effective integration of ICT policy in schools and the classroom in particular.* (Teacher's response, Questionnaire)

Many teachers acknowledge the problem of electricity and ICT facilities supplies in their schools. Moreover, talking in a general sense, they were more concerned with rural schools where the situation is even worse.

Teachers' capacity-building in ICT integration - Fullan (2005), a great advocate of capacity-building in educational policy implementation argues that capacity-building synergizes three powerful collective phenomena of new skills and dispositions; more focused and enhanced resources; and great shared commitment, cohesion and motivation. The aim of all these efforts is to increase the collective power or efficacy of whole groups, organizations, or systems to engage in continuous improvement of student learning. Moreover, teachers' use of ICT and their practice of creating teaching/learning materials largely depend on teachers' skills and experience of ICT use, and their awareness and motivation to make materials (Sugiyama, 2005).

The findings of this study indicate that teachers were in great need of being capacitated in the integration of ICT in their professional practices. One teacher, for example, argued that "we, teachers need on-the-job-training as far as ICT is concerned". This argument is supported by another teacher who argued that

> *Most teachers are very eager to understand the use of ICT in their daily professional activities, but the problem is electricity and costs are too high to learn the ICT application for themselves.* (Teacher's response, Questionnaire)

It is evident that despite having inadequate ICTs facilities at their disposal, teachers are not well prepared to use those facilities if available. The ICT policy for secondary (and basic education) is not well implemented in the sector particularly to teachers because most of the teachers have no training concerning computer equipment and ICT at large as we found in this study. To improve the situation, one respondent suggested that

> *The education sector has to put more effort to ICT because majority of teachers do not know how to use computer and are living in rural areas.* (Teacher's response, Questionnaire)

Additionally, those who are trained or happened to experience some sort of computer training and general ICT integration in education have nowhere to practice (especially teachers in rural areas) so they tend to forget after some years. This indicates the lack or inadequate capacity-building for teachers before and after promulgation of the policy. It is undeniable fact that in order to effectively integrate ICT in education (public secondary in particular), the government must strive to create a favorable environment that will eventually support this course. Capacity-building is not an option if the policy is to yield the desired outcomes. However, as Levin (2008) argues, capacity-building is something much more extensive than training; it implies a developmental process that changes settings as well as the people working in them.

4. Conclusion and Recommendations

There are several gaps between the ICT policy and the real practice or implementation of ICT objectives in education. First, many teachers are not aware of the existing policy and in case of the integration they are not prepared too. Second, teachers' training in ICT knowledge and skills were not made in accordance with the requirement of the ICT policy objectives, therefore it is difficult to put the ICT policy objectives into practice based on the meager training some teachers received. Third, there is a challenge of electricity and ICT facilities supply in most schools. In some schools the environments are not conducive to install computer facilities; in such cases ICT integration is less possible for the time being. Having these gaps in the ICTs integration in secondary education in Tanzania, the following recommendations are put forward:

- There is a great need to revisit the training process, especially the preparation of teachers, for effective and efficient integration of ICT in education sector.
- Electricity and ICT facility supply is not an option rather the must action to be taken immediately to facilitate the commencement of ICT integration in schools where some teachers have knowledge and skills to implement ICT integration.
- Education sector, in Tanzania, should strive to work shoulder to shoulder with other sectors in the country for the improvement of education in general and integration of ICT in teaching and learning processes.

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