

The Context of Education Initiatives, Importance and Inhibitors of ICTs towards improving teaching and learning in Tanzania: A Critical Literature review

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Abstract

This paper provides a comprehensive review of articles related to initiatives towards integrating Information and Communication Technologies (ICTs) in Tanzanian education. The review summarizes the relevant research on the use of ICT in education, importance and inhibitors or challenges encountered towards improving teaching and learning from primary to higher education in the country. By having a deep understanding of the opportunities available and inhibitors of ICT towards improving learning and teaching, will be of great importance in improving the integration and utilization of ICT in the educational system in Tanzania. This review will be useful for educators, ICT policymakers and other decision makers who are directly involved in introducing ICT into education in Tanzania. In addition, the review also provides the directions for future research studies in addressing the gap between ICT and education in Tanzania.

Keywords: ICT, teaching and learning; Inhibitors of ICT; Student learning, Higher Learning Institutions (HLIs).

1. INTRODUCTION

The implementation and integration of ICT for Education (ICT4E) has become an important topic in research on educational reform over the past two decades (Drent and Meelissen 2008) with findings such as (Mumtaz, 2000; Hattie, 2009) providing some positive effects on the use of ICTs on students' learning. Universities have been accepting and integrating ICTs for teaching and learning process and also in research activities (Ouma 2003; Agbonlahor 2005). The potential impact and the actual benefits is the one that triggers the integration of ICTs in teaching and learning process. This benefit arises from the experience that is gained from the use of ICT when students are put at the centre of an engaging and an active learning process which enable them to have an expanded access to education and improved educational quality (Takiya, Archbold *et al.* 2005, Komba, 2009; Sanga *et al.*, 2013). Higher Learning Institutions (HLIs) today have turned their teaching and research mainly focusing on sustainability and real-world issues for lifelong learning, ICT-mediated social networks and globalization (UNESCO, 2008). According to the UNESCO report of 2008, HLIs also have equipped into the relevance in education and human resource development which is attributed by the increased interest of the private sector or NGOs investment. Mahmood and Hussein (2012) prevails that new technology based models for teaching and learning are needed to be designed and be implemented for improving students' educational outcomes and departments should establish computer Assisted Instructions (CAI) systems to impart knowledge in a self directed and constructive way (de Corte *et al.*, 2003).

1.1 The importance of using ICTs in teaching and learning process

The study by Sánchez and Alemán (2011) has indicated that ICT assists in transforming a teaching environment into a learner-centered one and enables learners and instructors to be equipped with more educational affordances and possibilities (Shan, 2013). Researchers have also found that computers provide enhanced teaching and learning environments by providing opportunities to practice and to analyze, offering better access to relevant articles and teaching and learning materials (Shahadat *et al.* 2012). Students or learners are authorized by teachers to make their own decisions and plans because of an active involvement in the learning and teaching processes in ICT classrooms (Lu, Hou and Huang 2010).

The UNESCO report of 2008 on the UN decade of education for sustainable development indicates that, ICTs promote student-centred learning and appear to be speeding the rate of educational change in all learning institutions. Saddam *et al.* (2012) concludes that, students' perceptions change when they are continually exposed to the capabilities of ICT, and the more they become positive towards ICT use, the more likely that students can develop better skills on ICT use and be encouraged to engage themselves in deeper forms of learning (Mukelabai, 2011). Primary, secondary and higher learning institutions in Tanzania are witnessing a paradigm shift brought about by the use of ICT and have seen ICT as an indispensable tool in the teaching-learning process (Sanga *et al.*, 2013; Komba, 2009; Sedoyeka and Gafufen, 2013; Josephat *et al.*, 2013; Swarts and Washira, 2010; Tedre *et al.*, 2009).

In order to cater to the needs of the 21st century, teachers should learn to adopt with the change particularly in the new trends of teaching and learning. Findings from Maurice *et.al* (2012) shows that ICTs facilitate students to search for information and other instructional materials, it also enables communication among students themselves. Maurice and his colleagues further stress that; the use of ICT in educational delivery and in any other field of endeavor cannot be over emphasized in this era of science and technology. By using ICT, students are now more frequently engaged in the meaningful use of computers (Sánchez and Alemán 2011). Students can develop new understanding in their areas of learning (Chai, Koh and Tsai 2010), their creativity can be optimized and may discover new multimedia tools and create some learning materials in the styles readily available to them through games, CDs, and television (Gee, 2011). The studies (Cavas *et al.* 2009; Steel 2009; Mwalongo, 2011) have indicated that ICT use for teaching is likely to motivate teachers and learners/students and help them to clarify difficult concepts, save time, make learners active, and simplify teachers' work. However, it is the ICT use experience that makes teachers see the value of the technology they use (Brady 2011). Shan (2013) pointed out that, ICT in education cannot be implemented in isolation but should be applied in combination with diverse teaching methods and approaches, especially constructivists' perspective, which is rooted in student-centred learning. ICT can change the role of students they play in the classroom (i.e. from the traditional passive recipients to learning initiators) and can also cope many of the criteria in the teaching and learning process using learner-centred approach. In addition, the roles of teachers also change to facilitator of student learning through contextualizing and monitoring learning functions (Mukelabai, 2011). The International Society for Technology in Educational (ISTE) also puts emphasis on teachers of today to provide technology-based learning opportunities for their students (Hamidi *et al.* 2011). However, in order to promote effective implementation and integration of ICT throughout the curriculum by student-teachers, there is the need to introduce student-teachers to more courses on ICT with needed hand-on experiences (Mudasiru and Modupe 2011). In order to enhance the use of ICTs in all educational sectors, there should be an improved ICT infrastructure, good ICT policies, curriculum and content to support teaching and learning in education (Hooker *et.al*, 2011).

1.2 The state of ICT infrastructure and ICT4E policy framework in Tanzania.

The International Telecommunication Union (ITU, 2013) has developed the ICT Development Index (IDI) to measure the level of ICT use and its access, ICT skills together with evolution over time of ICT developments in 157 countries globally and to compare the digital divide and the progress made in ICT development between 2011 and 2012. ITU ranks Tanzania in 142 position out of 157 countries in their 2013 survey with an IDI value 1.65 (see table 1).

Table 1: ICT Development Index (IDI) between 2011 and 2012

Country	Rank	IDI 2012	Rank 2011	IDI 2011
Angola	139	1.68	138	1.63
Congo	140	1.66	140	1.58
Tanzania	142	1.65	141	1.57

Source: (ITU, 2013)

While there has been a progress in terms of Internet access and mobile-cellular penetration in Tanzania as shown in figure 1 below but still, Tanzania is among the Least Connected Countries (LCC) in the world.

Paradoxically, the LCCs “are the countries that could derive great benefits from better access to and use of ICTs, including in areas such as health, education and employment”

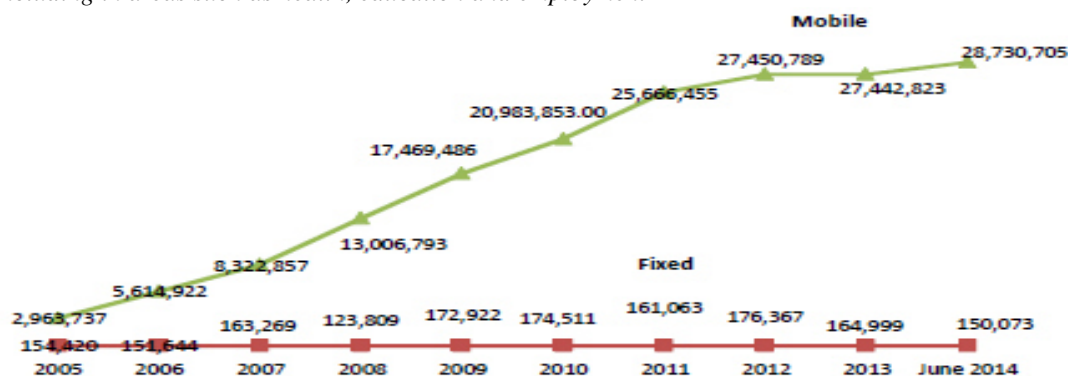


Figure 1: Trends of Mobile and Fixed Subscription

(Source: TCRA, 2014).

The telecommunication market in the country is growing very fast which implies that the cost of owning and using digital equipment continues to be low and therefore making ICTs to be accessible to the average of Tanzanian (Swarts and Washira, 2010). According to (IST-Africa, 2014), the ICT infrastructure in Tanzania is changing dramatically with the landing of the pan-African ICT enabler SEACOM and the Eastern Africa Submarine Cable System (EASSY) and the recent National ICT Optic Fiber Cable (OFC) Backbone (NICTBB) which aims at improving connectivity within Tanzania and the East Africa region. It was reported in IST-Africa (2014) that, NICTBB connected to SEACOM in July 2009 and EASSY in April 2010.

The Government of Tanzania through the Ministry of Vocational Education and Training (MoVET) formulated an ICT policy for basic education which describes a vision for ICT4E and puts emphasis on the implementation and integration of ICT in all sectors including education (Swarts and Washira, 2010; Hooker *et al.* 2011). The MoEVT recognizes the potential of ICT as a significant tool for improving education delivery (MoEVT, 2007) and implement the vision of ICT4E from a number of national and international frameworks, policies and instruments namely: The Tanzania Development Visions 2025 (2002), The Education and Training Policy (ETP) (1995), The Millennium Development Goals (MDGs) (2000), The National Information and Communications Technologies Policy (2003), The World Summit on the Information Society (WSIS) (2003), The National Strategy for Growth and Reduction of Poverty (NSGRP) (2005), Adult and Non-Formal Education strategy (AE/NFE) (2005), the Education Sector Review (2006), the Information & Communication Technology (ICT) Policy for Basic Education (2007), the Education Sector Development Program (ESDP) (2007–2011), the Primary Education Plan II (PEDP II) (2007–2011), the Public Service Reform Programme (PSRP) (2008-2012), the Framework for ICT Use in Teacher Development in Tanzania (2009), the Secondary Education Department Plan (SEDP) (2010-2014) and the Higher Education Sub-Master Plan (2003-2018) (Komba, 2009; Hooker *et al.* 2011, MoEVT, 2007).

However, there have been a number of completed and ongoing Governmental, parents and private/NGOs ICT initiatives/projects (Farrell *et al.*, 2007) as well as the East Africa Cooperation Federation (Wamakote *et al.*, 2010) to support and make sure that the above policies and programmes are implemented in accordance as explained in the following section.

2. ICT in education initiatives in Tanzania

This section describes several initiatives related to the integration and implementations of ICT ranging from primary schools to higher learning institutions. These initiatives are done at both, local level as well as at the national level and the main aim have been to improve education provision and delivery in all learning institutions (primary schools, secondary schools, teachers' training colleges, vocational education colleges, higher learning institutions (Mwalongo 2011).

2.1 ICT4E in Primary and Secondary schools

The Ministry of Education (currently known as, MoEVT) designed educational programmes for students to listen through radios and televisions since 1960s. The state radio station currently known as TBC1 and Star TV broadcasts programmes on various subjects for secondary schools in English. The Tanzania Institute of Education (TIE) has developed an ICT curriculum, known as *Teknolojia ya Habari na Mawasiliano* (TEHAMA) for primary and pre-primary education which is currently implemented in few schools near district headquarters and the schools that have ICT facilities (Hare, 2007; Mwalongo 2011).

The *Bridge-It* initiative was formed in 2007 by the MoEVT and the International Youth Foundation (IYF) to increase the quality of teacher instruction and achievement among primary school students in standards 5 and 6 in math, science and life skills through the innovative use of cell phone and digital technology (Foundation 2007).

2.1.1 Distance Education Learning Services (DILES)

The DILES project develops and provides the teaching and learning materials for secondary school students in printed and electronic format. These materials help to supplement the “*chalk and talk*” conventional teaching methods by the use of remote and virtual methods using the Internet and multimedia (Tilya, 2007) The *Bright Education Trust Fund (BETF)* initiative develops the capacity of teachers and school administrators by teaching them how to use ICT to improve both classroom teaching and the administrative tasks of their respective schools (Swarts and Washira 2010).

2.1.2 TanEdu Educational Website and Wanafunzi website project

The TanEdu project operates an educational website where important information about schools can be accessed (Tilya, 2007). TanEdu produces a newsletter that is distributed to rural areas for the purpose of raising public awareness about the benefits of ICT4E. The *Wanafunzi* project runs a website in key-Swahili (national language) to encourage and promote the exchange of knowledge and information among students and

collaboration in learning activities activities (Hooker *et.al*, 2011).The **ICT-Connect-TED** is the fore-runner of the ICT in Teachers Training Colleges (TTCs) project supported by SIDA, which is the Swedish development agency. ICT-Connect-TED connected successfully TTCs throughout the country. The project also provided training on ICT use, ICT cost management, maintenance, and an ICT help desk (Swarts and Washira 2010).

2.1.3 Procurement of Computers for Tanzania Secondary Schools (TCLSS)

The Tanzania Computer Literacy for Secondary Schools Trust Fund (TCLSS) procures computers for secondary schools and helps them to set up computer laboratories. The project also teaches computer literacy and computer maintenance to students and teachers in schools and is now operating successfully in 20 schools within Dar es Salaam region(Mwalongo 2011).The **Model School** project provides examples on how to use ICT in schools located in remote areas, promoting active participatory learning, and demonstrating cost-effective and sustainable ways to use ICT. It was reported that, the ICT projects had positive effects on end-users in the education sector in many areas of their lives (Tilya, 2007; MoEVT, 2007).

Other secondary school initiatives includes the **e-Schools** project formed in 2005 which was meant to equip schools with ICT equipment (including access to the Internet), adopt educational management information systems at both the school and ministry level, and develop curriculum and online content for secondary schools(Philemon *et.al*,2006;Hare,2007;Swarts and Washira,2010; Hooker *et al.*2011).The **NoPC pilot project** which hopes to install computer systems in 4372 secondary schools in Tanzania in order to improve the teaching of Maths, Science and English. The **Barclays Bank and Digital Links International** distributed 100 computers in 5 schools in Tanzania by end of 2009, the aim of which was to improve teaching and learning in secondary schools (Hare,2007;Swarts and Washira,2010).

2.2 ICT4E in Teachers Training Colleges (TTCs)

ICT-Based In-Service Teacher Education for Secondary (ICT-BITES) school teachers project was formed by the MoEVT and Mid Sweden University (MiUn) supported also by the Open University of Tanzania (OUT) and the University of Dar Es Salaam (UDSM).The aim of this project is to train teachers through ICT-based short courses which will be tailored to the needs of teachers in particular subject area. The MoEVT also with support from the Swedish International Development Agency (SIDA) introduced ICTs in teacher’s training colleges in 2005.The aim is to improve the quality of teacher education in both pre-service and in-service education.(Swarts and Washira,2010,Lujala,2010).

The MoEVT in jointly support of the World Bank and Global e-Schools and Communities Initiative (GESCI) formulated and implemented the ICT Competency Framework for Teachers in Tanzania (ICT-CFT) (Hooker *et al.*2011) in 2011. The competency framework for Tanzania draws on multiple global standards like those captured by the ICT-CST framework by UNESCO and educational and industry partners (UNESCO, 2008). As shown in figure 2, the framework covers 15 skill areas for teachers in five educational domains, and 3 progressive levels namely *technology literacy*, *knowledge deepening* and *knowledge creation*.

The framework also promotes a teacher development model for effective ICT integration and improved teaching across six education system domains of “*Policy and vision, Curriculum and Assessment, Pedagogy, ICT, Organization and Administration and Teacher Professional Development*” (UNESCO,2008,Swarts and washira,2010,Hooker *et.al* 2011).

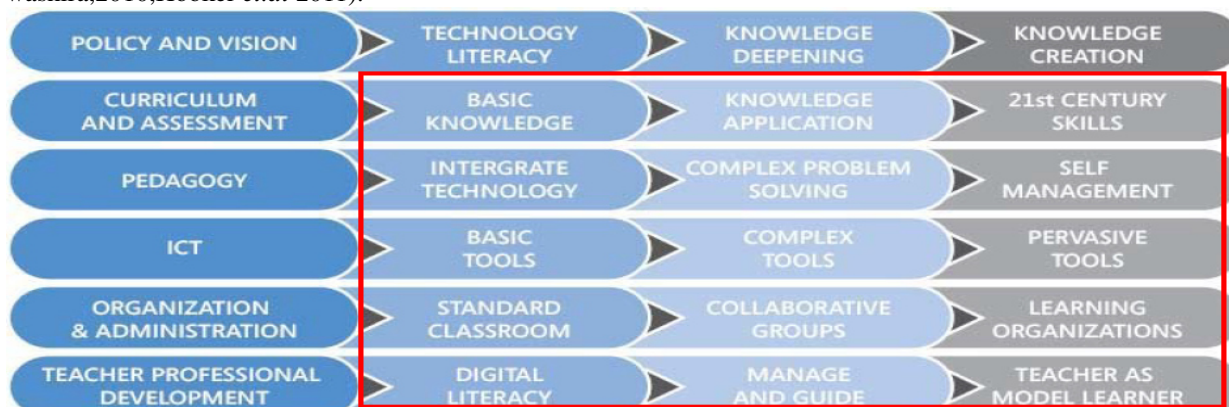


Figure 2: ICT Competency Standards for Teachers Framework in Tanzania (Source: UNESCO 2008; Hooker *et.al* 2011)

2.3 ICT in Higher Education

The situational analysis by Swarts and Washira (2010) and the study of Hooker et al.,(2011) stress that, the Higher Education Institutions (HEIs) in Tanzania has taken and continues to take concrete steps to use ICT to address the main challenges that the sector faces. A status report for HEIs in Tanzania (2008) indicates that most universities have dedicated computer centres, research networking activities and e-learning are becoming central as a strategy in order to improve teaching and learning process in HEIs.

The Tanzania Education and Research Network (TERNET) is the National Education and Research Network (NREN) for Tanzania. TERNET provides research facilities and an electronic network that connect all HLIs in the country as well as TTCs (Swarts and Washira, 2010). TERNET also provide network infrastructure that facilitates Education Management Information Systems (EMIS), support for e-libraries and electronic information access, research databases, and enhancement of e-learning capacity Swarts and Washira,2010).It was reported in 2008 that, 21 institutions were members of TERNET and many of this institutions including University of Dar Es Salaam(UDSM), Sokoine University of Agriculture(SUA) and Muhimbili University of Health and Allied Sciences (MUHAS), have high bandwidth connections through satellite (VSAT).It is hoped that TERNET will take full advantage of the National ICT Optic Fiber Cable (OFC) infrastructure Backbone (NICTBB) which is currently being laid to realize its mandate and objectives. NICTBB when completed will facilitate connectivity to; villages with ICTs and establish community access points to universities, colleges, secondary schools and primary schools; scientific and research centres ; public libraries, cultural centres, museums, post offices, archives; health centres, hospitals; as well as local and central government departments(MCST,2013;Swarts and Washira,2010).

The Science Technology and Higher Education Program (STHEP) is a World Bank funded project to the Government of Tanzania, implemented through the MoEVT with support from the Ministry of Communication Science and Technology (MCST).STHEP is a seven-year(2008-2015) program broken down into two phases of activities and four program components(IST-Africa, 2014).Component 1A prioritizes investments in Economic Growth and three components in higher education sector as follows: Component 1B aim to provide an expanded human capacity for teachers' preparation and for graduate's studies in education; Component 2A aims in strengthening the key higher education agencies and institutions; component 2B provides investments in ICT based higher education systems. Component 2B of STHEP is focusing on four (4) major areas being; the National Research and Education Network (NREN), Education Management Information system (EMIS), e-library, and e-learning(IST-Africa, 2014).The shared mechanisms to support the implementation of component 2B of STHEP have been established between all 128 Higher Education Learning Institutions(HELIs) under this program. According to the regional impact of science and technology in Africa (IST-Africa), the long-term purpose of STHEP is to improve development of human capital in area of Science and Technology (S&T) and create a knowledge-based economy within the next ten years (IST-Africa, 2014).

The African Union (AU), Association of African Universities(AAU) and UbuntuNet, submarine cable service providers alliance negotiated a model for accessing educational and research networks for higher learning institutions through the access to the national NREN (hosted by COSTECH) in Tanzania. The submarine cable providers SEACOM, EASSy and TEAMs are also offering a discounted education and research bandwidth price, knowing that this circuit has been terminated at a NREN network for education purposes through SEACOM connectivity at the capacity of Synchronous Transport Module level-1(STM-1) (IST-Africa, 2014).

TANZICT is an Information Society and ICT Sector development bi-lateral project between the Government of Tanzania and the Government of Finland from 2011 to 2015 which is hosted by COSTECH and commenced in August 2011. It is focused on strengthening the Tanzania Information Society through a revision of the national ICT Policy and associated implementation, strengthening the institutional capacity of Ministry of Communication Science and Technology (MCST) and creating a Tanzania innovation programme. TANZICT is providing hands on support to the emerging Living Labs in Iringa, Kigamboni, Mwanza, Mbeya, Zanzibar and Arusha(Apiola *et. al*,2012,IST-Africa,2014).

According to (MCST, 2013), the Pan-African e-network (tele-education) initiatives inTanzania is being implemented through a grant from the Indian Government. The project aims at connecting all higher learning institutions in African countries and those of India in order to expedite information sharing and exchange in the bid to harness the building of information and knowledge society. The project also aims to promote the use and application of ICT services thus bridging the Digital Divide (Kasumuni, 2012).

The Tanzania ICT Technology Park which is a public and private partnership between the Government of Tanzania and SEACOM is aiming to house universities for research and development in the long run(IST-

Africa, 2014). Other initiatives related to HLIs includes: The National Science, Technology Innovations Systems Reforms Project(2007); Science, Engineering and Technology (SET)(2002) for female students; National Fund for Advancement of Science and Technology (NFAST)(1995) aiming in funding research activities carried out by individuals or institutions in relation to the development of science and technology, training of educational researchers in HLIs(MCST,2013). The Development and Promotion of Science and Technology Education project in Tanzania is aiming in promoting and synthesizing science education using ICT at Primary, Secondary and Tertiary level.

2.4 ICT4E inhibitors for improving teaching and learning.

Although the Government of Tanzania is committed in implementing and integrating ICT in education, the process is inhibited by a number of factors which are divided into external (first-order) and internal (second order) factors (Keengwe, Onchwari *et al.* 2008; Tezci 2011a). These factors are explored in this section by showing how they inhibit the process of teaching and learning in Tanzanian education.

2.4.1 Lack of ICT infrastructure in learning institutions

Despite various initiatives as described above by the Government of Tanzania, many learning institutions from primary to HLIs are conducting teaching and learning process with limited ICT facilities which include: few computer laboratories with few computers, few computer access points, limited electricity supply(Hare,2007,Swarts and Washira,2010), some websites require subscription fee to access journals(Sanga *et.al.*,2013), inadequate infrastructure, limited fixed telephone networks in many areas of the country and the cost of bandwidth is still out of reach of many schools(Hare,2007;Mwalongo,2011;Velaga,2012). Studies by (Whelan,2008;Howie and Blignaut,2009;) highlights that the integration of ICT4E requires availability of adequate infrastructure.

2.4.2 Technology affordability and accessibility

In order for ICT to be adopted in learning institutions, the available technology should be affordable by schools and HLIs(Hennessy *et.al.*, 2010; Lujara, 2008; Ndume *et.al.*, 2008). Technology affordability at the national level is limited by the high cost of putting infrastructure in place, and is linked with the issue of poverty and political will of the Government (Sedoyeka and Gafufen, 2013). At the individual or institutional level, expensive hardware and software as well as high costs of communication and services restrict access to ICT(Kizza, 2013; Sedoyeka and Gafufen, 2013;Sanga *et.al.* 2013). Most schools and HLIs in Tanzania do not have the means to purchase expensive computers and hardware, and provide training for their staff.

2.4.3 Lack of public community facilities

According to Hennessy *et al.* (2010), public access to internet and computers, through public schools and HLIs, libraries and community centres in Tanzania is also another way to make technology affordable and accessible to local communities. This is because they provide a range of services such as computer training, internet access, conference facility and meeting, secretarial and consultancy services, telephone and fax services and community radios (Methusela, 2007). Despite their promise, these public places such as public schools or libraries to access the Internet are very limited (Sedoyeka and Hunaiti, 2008; Sedoyeka, 2012) and these tele-centres also suffer from issues related to sustainability and lack of skilled staff and technicians for ICTs, high prices of ICT facilities and lack of information in local content in the internet (Akca *et al.*, 2007; Mtega and Malekani, 2009; Kizza, 2013).

2.4.4 Gender and institutional policy on ICT use

Within secondary schools and HLIs, students have different levels of ICT access based on the subjects or courses they opt to study. It is reported that, students taking computer studies as a subject have greater access to computers and in schools that have cyber schooling and computer clubs, science students and club members often enjoy greater access to the computer rooms (Ndidde *et.al.*, 2009). Sanga *et.al.* (2011) highlights that female students do not access ICT resources proportionally as males due to some gender factors and when there are scarce resources male students tend to benefit more if gender is not considered in allocation of ICT resources(Nawe 2002). The studies by Blum *et al.* (2007) and Reagle (2012) therefore suggest that gender balance should be considered when allocating ICT resources to students in all levels of education.

2.4.5 Corruption, Socio-cultural and linguistic factors

According to (Mutula, 2004; Kozma *et al.* 2004; Khan *et.al.*, 2012; Hare, 2007; Hennessy *et.al.*, 2010; Josephat *et.al.*, 2013), social cultural factors such as age, gender, low social status, physical mobility, HIV status, geographical location, climatic conditions, religion, language, literacy rate and certain cultural domains are all

potential barriers to access and use of ICT in teaching and learning process in developing countries including Tanzania. Menda (2006) argue that, with the dominant language of technology being English and the Tanzania national language (Kiswahili) which constitute only less than 2% of the internet content there is a need to develop enough ICT-based Kiswahili content before ICTs can be fully integrated in education. Hare (2007) and Kessy et.al (2006) also point out that language has been identified as one of the inhibitors of ICT in improving teaching and learning in Tanzania since over 95% of the Tanzania population can only speak, read and write in either Kiswahili or tribal languages and only less than 12% of the relevant age group proceeds to secondary schools Menda (2006). However, the misuse of government funds which could have been used to develop other sectors like the integration of ICT in education is channeled in other directions such that few people benefit from those funds by pocketing all the money (Kessy *et al.*, 2006; Khan *et al.*, 2012).

2.4.6 Economic and political factors

The political will of the people in the corridors of power is one of the inhibitor to the use of ICT in education in developing countries (Sharma, 2003; Sedoyeka, 2012). Sedoyeka and Gafufen, (2013) stress that politicians and Government officials are the ones running the schools in an indirect way and many public schools and HLIs rely heavily on government subsidy for day to day operations. (Elzawi and Wade 2012; Sanga et.al 2013) therefore recommend that, the most important area to start with should be on policies and the governments should have good policies that guide and assist schools.

2.4.7 Teachers' attitudes, pedagogy, Skills, Knowledge and Beliefs about ICT

Major predictors of the use and integration of ICT in teaching and learning is teachers' attitudes and their beliefs (Mumtaz, 2000; Almusalam, 2001). However, the lack of ICT-related knowledge of teachers is one of the main inhibitors to student's learning and their ICT-related goals (Pelgrum, 2002). Previous research studies in Tanzania indicate that teachers use ICT (MoCT 2003; Foundation 2007; Tilya 2007; Swarts & Wachira 2010; Mwalongo, 2010; Hooker et.al 2011; Sedoyeka & Gafufen, 2013; Ndibalema, 2014), but it is evident that ICT is rarely used as a teaching and learning tool (MoCT 2003; Senzige & Sarukesi 2003; Unwin 2005). The recent research by Ndibalema (2014) to investigate the altitude of teachers' towards using ICT as pedagogical tool shows that teachers are not aware of the potentials of ICT in their teaching. In addition, the preference of teacher-centric instruction, memorizing as a mode of self-study, and discouragement of critical thinking are quite typical attitudes among new IT students-teachers in Tanzania (Apiola *et al.* 2011; Tedre *et al.* 2011).

2.4.8 Students' ICT literacy

According to Kawooya (2004), ICT literacy means "the ability to realize the need for finding and effectively using" ICTs. Hooker et al., (2011) shows that, ICT in education is a recent occurrence in Tanzania and students are equally ICT literate as there is obvious evidence of digital divide between students in urban and rural areas in Tanzania (Sedoyeka, 2012; Sedoyeka and Gafufen, 2013; Josephat *et al.* 2013; Sanga *et al.* 2013). Moreover, the education systems in Eastern Africa including Tanzania are examination-based where practical subjects like computer science are taught theoretically with students being drilled to pass only exams (Hooker et al., 2011).

2.4.9 Effective leadership and Administrative support in learning institutions

Leng (2008) contends that, effective leadership is a key element of success in any innovation and integration of ICT in education. Josephat *et al.*, (2013) highlight that, the lack of appropriate leadership and administrative support on guidelines, training on the pedagogy of ICT in Tanzania has been among the challenge for facilitating teaching and learning. The study in Swarts and Washira (2010) also shows that although policies and plans are in place there is limited strategic leadership to pioneer and champion activities related to ICT4E and on the other hand the efforts are largely uncoordinated and piecemeal. In order for the integration of ICTs to be effective and sustainable, school administrators themselves must be competent in the use of the technology, and they must have a broad understanding of the technical, pedagogical, administrative, financial, and social dimensions of ICTs in education (Sife *et al.* 2007).

2.4.9.1 Lack of Government ICT4E Policy awareness

Recent findings from Muhoza *et al.* (2014) show 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. 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. However, low awareness on the importance of ICTs among the university top management has been great obstacle to ICT development in the university libraries (Sife *et al.* 2007, Grace and Sife, 2008). The concern about the lack of ICT policies in various learning institutions make it more challenging to acquire, provide users' training and be able to use these tools appropriately and effectively to suit the educational purposes and needs of the learners as well

as the abilities of the users (Josephat *et al.*, 2013; Sanga *et al.* 2013). The government has to design ICT policy documents and make the documents available at every teacher's reach for reference Muhoza *et al.* (2014).

2.4.9.2 Maintenance and Technical Support

There is a lack of technical supports to implement and maintain ICTs in most of the developing countries including Tanzania (Hooker *et al.*, 2011; Bakari *et al.*, 2001; National Committee for WSIS Prepcom II 2003; Swarts and Washira, 2010; Tedre *et al.* 2010; Sedoyeka and Gafufen, 2013; Josephat *et al.*, 2013). Appropriate strategies should be in place to ensure that integration of ICTs in teaching and learning process goes together with the recruitment, training, retaining and retention of required staff (Sife *et al.*, 2007; Sanga *et al.* 2013). This is so because issues like installation, operation, maintenance, network administration and security are very crucial for the implementation and integration of ICT in education system (Sife *et al.*, 2007).

2.4.9.3 Lack of Time and dynamic nature of technology.

Lack of time has been reported as one of the constraints also to the integration of ICT into the teaching and learning process (Beggs, 2000; Komba, 2009; Afshari *et al.*, 2009; Marshall, Elgort & Mitchell, 2003; Newhouse, 1999; Ihmeideh, 2009; Tondeur *et al.*, 2009; Sanga *et al.* 2013). Kessy *et al.* (2006) stress that, due to the dynamic of technological systems, most people in African countries including Tanzania are not aware of the new developments in the ICT solutions for education and therefore they stick to the old/traditional teaching methods or they use the less effective computer based education techniques.

2.4.9.4 ICT4E Transformation in HLIs

According to Sife *et al.* (2007), many HLIs in Tanzania fail to integrate ICTs into teaching and learning because they are using ICTs to replicate their traditional practices, content and control. Their plans appear to be driven by ICTs and not by pedagogical rationale and focus (Ehrmann, 1995). Bates (2000), narrates that, effective integration of ICT in teaching and learning requires a transformation process where all stakeholders are involved to re-examine their existing structures and practices. Sife *et al.* (2007) also contends that, if universities and colleges are to successfully adopt technologies for teaching and learning then, adjustments in current practice, revolution and restructuring universities and colleges by changing the way are planned, managed and organized is a must.

2.4.9.5 Over-dependency on donors support

According to Mushi (2010), there is no local manufacturer of ICT equipment in Tanzania and most of the dealers or agents import these products from abroad. The use of open-source software is still low in the country which is contributed by low awareness among people and limited accessibility of ICT facilities.

2.4.9.6 Law, Ethics, Moral, and Work Ethic

Tanzania's laws regarding electronic mail and electronic evidence for instance, the Tanzania Evidence Act No.6 (1967) lag behind technological progress. Although there are some legislative amendments that address issues of electronic communication such as Tanzanian Communications Regulatory Authority Act (2003) and Electronic and Postal Communications (EPC) Bill (2005), there is no single regulatory legal framework for ICT (Mollel, 2008). It is very important that students know the laws and regulations concerning ICT. However, due to the incoherent and fragmentary nature of the legal framework concerning ICT in Tanzania, a special course is necessary (Tedre *et al.* 2009).

2.4.9.7 Interdisciplinary and lack of Innovation Skills

Innovation involves creativity, risk taking, and perseverance, and is highly dependent on experimentation (Thomke, 2003). By following textbook guidelines, Tanzanian students lack innovative skills and there is a high need for new techniques, methods, or solutions to be invented in the Tanzanian education system (Tedre *et al.*, 2009). The study conducted by Tedre *et al.* (2009) shows that, the country's Uncertainty Avoidance Index (UAI) of Hofstede's (1997) model in the matter of education in Tanzania is relatively low. The interdisciplinary among ICT teacher professionals in Tanzania is very low (Sife *et al.* 2007). There is the need therefore for ICT professionals who work in different education sectors to ready to understand people from different disciplines and learn from each other such that the learned knowledge can be also used effectively in improving teaching and learning in Tanzania (Sife *et al.* 2007).

2.4.9.8 Human resources Capacity constraints

The human resource capacity is another factor that hinders the teaching and learning process in any learning institution. The lack of human capacity at all educational levels to integrate and use ICT effectively has been cited as a major concern towards improving teaching and learning in Tanzania (Swarts & Washira,

2010). Building the necessary capacity for education transformation and innovation, translating vision and policy into implementable activities requires appropriate organizational structures, with the right human resources and skill sets (Swarts & Washira, 2010). Table 2 provides a brief examination of institutional human capacity constraints focusing on the current learning institutional status, challenges and its implications towards improving teaching and learning in Tanzania.

Table 2: Teaching and learning institutional human capacity constraints in Tanzania (Source: Swarts & Washira, 2010)

Constraint	Current situation	Institutional challenges	Implications
Human resources	<ul style="list-style-type: none"> The department of information and planning at MoEVT is responsible for all matters related to ICTs including the EMIS. All departments in the ministry of education have a responsible person for ICT related matters. No educational technologies unit from primary to HLIs in Tanzania. 	<ul style="list-style-type: none"> ICT4E initiatives in units and departments are driven by the technology but with limited staff who have IT professional skills. Limited number of staff in all units and departments which results in staff overstretching. The end-to-end components of ICT in Education initiatives from the international best practice are insufficiently covered. Lack of human capacity in strategic ICT4E areas such as policy formulation, e-learning, Teacher Professional Development (TPD) in using ICTs and digital content development. All education sectors lack of a coherent framework and an apex body to address the Human capacity gaps/challenges. 	<ul style="list-style-type: none"> Skewed development driven by technology rather than by educational objectives Inability to leverage ICT4E towards improving teaching and learning and its development in all education sectors. Important areas are not integrated with ICT which results in skewed development. A team of education and IT professionals should manage the ICT4E initiatives in order to avoid these initiatives from being driven by technology. There is a need for enough human capacity for auditing and identifying major challenges or gaps, and map out plans for addressing these challenges and to explore the needs of educational technology and psychology, curriculum development and its assessment, project management, Monitoring and Evaluation of ICT4E. All departments and units in the ministry of education and its associated institutions should have a common goal towards ICT4E in Tanzania. Long term planning and a comprehensive capacity building is required in all education sectors.
Strategic leadership and Institutional structures.	<ul style="list-style-type: none"> Plans and ICT policies like the national ICT policy are already documented. All departments have a responsible person for ICT. Lack of coordination mechanism for ICT and ICT Integration activities in all institutional structures. 	<ul style="list-style-type: none"> Lacks of strategic leadership to plan, implement and integrate ICT4E in all educational sectors. The efforts to implement the existing policy documents are usually uncoordinated among institutions. No apex body and an appropriate structure in the ministry of education to handle ICT integration and its deployment effectively. There are no common visions among leaders regarding integrating ICT4E. Also; their coordination of strategies and ICT4E activities is very limited in all education levels. Lack of quality assurance and control for ICT in all educational sectors in Tanzania. 	<ul style="list-style-type: none"> Institutional structures and cultures are not aligned in the process of facilitating the ICT integration in education. The existing policies and plans are partially implemented or not implemented. The monitoring and evaluation processes are not properly executed which results in poor implementation of ICT4E initiatives.
Financial resources	<ul style="list-style-type: none"> The deployment and support of ICT4E initiatives is mainly dependant on donors (NGOs, Civil society organizations). 	<ul style="list-style-type: none"> Limited budgetary funds allocation for ICT4E and ICT4D regardless of its potential in addressing the educational challenges. Limited electricity and connectivity throughout the country which is due to low budgetary allocation. 	<ul style="list-style-type: none"> The integration and implementation of ICT4E cannot be sustainable because of donors' dependency in acquiring ICT facilities. Limited ICT teachers' in-service training and its associated infrastructure hinders ICT integration and use in education sector in Tanzania.
Processes and programme management	<ul style="list-style-type: none"> Data is collected in a timely manner and stored in the EMIS. All examinations results are uploaded in the ministry of education website for 	<ul style="list-style-type: none"> All levels of education from primary to higher learning institutions have no baseline data regarding the integration of ICTs. 	<ul style="list-style-type: none"> With the technology availability and the potential of ICT tools in managing and collecting data, the decision making is not harnessed for human capacity building, education planning and

Constraint	Current situation	Institutional challenges	Implications
	parents and students to see how the performance is in relevant academic year.		project management.
External environment	<ul style="list-style-type: none"> The ICTs which are used in external environment like in banking sectors, business e.t.c together with the increasing rate of mobile penetrations in Tanzania gives a better and more affordable connectivity through sub marine cables like EASSY and SEACOM. The existing policy documents and plans regarding the integration of ICT4E show the Government commitment to ICTs in all education sectors in Tanzania. The Government of Tanzania has recognized the significant impact of ICT4E and attains the national educational goals. 	<ul style="list-style-type: none"> Although the Government of Tanzania is committed to integrate ICT in education but the policies and strategies are not fully implemented. Institutional fragmentations and unsystematic measures towards ICT4E initiatives in education sector. 	<ul style="list-style-type: none"> Education and training sector lagging behind The capabilities and the power of ICT4E are not harnessed enough for development goals in all levels of education in Tanzania which results the education and training sectors to lag behind.

2.5 Exploiting and utilizing existing opportunities

Despite the above mentioned challenges, there are still a lot of opportunities that the government, learning institutions, teachers and students can still use to enhance their technology integration in education. In order for any education policy or innovations, to be successfully implemented it needs to be accepted by teachers (Kafyulilo, Fisser & Voogt, 2011). According to different studies conducted in Tanzania concerning ICT in education, teachers agree that ICT is a useful tool for transforming classroom practices (Muhoza et.al, 2014; Mwalongo, 2011; Tedre et.al, 2008; Hardman et.al 2011). This is a good sign and is an instrument towards a successful integration of ICT4E in Tanzania since teachers will also be able to create, deepen and digitize their knowledge (Becker, 2000, Frank et.al. 2004). The recent development of Technological Pedagogical Content Knowledge (TPACK) and the ICT Competency Standards for Teachers Framework in Tanzania which guide the integration of technology, can help teachers to understand how ICT is used in education (Hooker et.al 2011; UNESCO, 2008; Kafyulilo, 2010). The learning of TPACK can have a far reaching impact in the development of technology integration competencies among teachers as it enables teachers to acquire the knowledge required for integrating technology into their teaching in any content area (UNESCO, 2008).

According to Nihuka (2011), the increasing teacher's collaboration in design team using ICT is a useful opportunity for teachers to share their knowledge, skills, abilities and experiences as they design their technology integrated lessons (Muhoza et.2014). In addition, the increasing penetration and access to mobile phones among Tanzanians (see figure1) brings up new opportunities of having technological tools available in learning institutions. This is so because a mobile phone can play a role of a radio, a TV, a computer, a digital camera, iPod or mp3 and newly emerging mobile phones have internet and supports programs such as Ms words, Excel, PPT, e.t.c etc (Kafyulilo, Fisser & Voogt, 2011). If more teachers will have access to internet through their mobile phones and laptops then, There are can be more internet use in the teaching and learning environment.

The Government of the United Republic of Tanzania should take advantage of all these ICT4E initiatives and integrate them into the national implementation levels. In addition, the government should give support by strategizing and encouraging the local production of ICTs and open the ICT industry where the first priority should be given to education sector in order to go in line with the ever changing technological world of the 21st century.

CONCLUSIONS

This review paper has attempted to contribute to a better understanding to the existing ICT4E initiatives, importance of ICTs in education and inhibitors towards improving teaching and learning in Tanzania. The review has highlighted a number of factors that pull back the process of teaching and learning. These factors includes: lack of ICT infrastructure in learning institutions, technology affordability and accessibility, lack of Government ICT4E policy awareness, lack of public community ICT facilities, Teachers' attitudes, pedagogy, skills, knowledge and beliefs about ICT, student's ICT literacy, social, political, corruption and economic factors, lack of effective leadership and administrative support in learning institutions, gender and institutional policy on ICT use, law, ethics, moral, and work ethic and human capacity constraints. It has also reviewed existing and provided some opportunities which are resulted from: the increasing accessibility of mobile phones and the Internet in Tanzania and the development of TPACK.

This review recommends that, the Government of Tanzania should promote affordability, availability and

adoption of ICTs in learning institutions, open the ICT industry, and integrate ICT4E into the national wide implementation level. In addition, concentration should not only focus in providing ICT facilities in leaning institutions, but also on the impact of the level of investment in achieving the set objectives especially through researches. Coordinated efforts from various ICT players and decision makers are needed to avoid reinventing the wheel and waste useful time. By knowing to which extent these inhibitors affect teachers, students and learning institutions may help in taking a decision on how to tackle the ICT educational challenges (Becta, 2004).

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