

Maureen Jematia Bett

USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES IN HIGHER
EDUCATION IN KENYA

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ABSTRACT

In this study, I investigated how Information and Communication Technologies (ICTs) are applied in higher education in Kenya. Research questions were; 1) What is the level of self-efficacy and ICTs integration into higher education in Kenya? 2) What is the level of awareness and adoption of ICTs in higher education in Kenya? and 3) What factors enable or hinder utilization of ICTs in higher education development?

Mixed method research was applied where 81 questionnaires and 8 semi structured interviews were carried out on lecturers and students.

Staff and students were competent in regard to ICTs. Access to ICTs resources in private universities was better than in public universities. Most students and faculty were competent with the common software but competence in regard to specialized softwares was poor. ICTs were used for teaching and learning though the adoption was poor mainly in public universities. Barriers to effective utilization of ICTs in higher education included absence of reward systems, lack of policies, poor support and limited financial resources.

In conclusion, the demand for higher education in Kenya surpasses the physical resources at the disposal of higher education institutions in the country. The use of ICTs is essential to ensure that quantity and quality of higher education with the limited resources. Universities therefore need to have their top leadership supporting ICTs plans and strategies, have policies regarding the use of ICTs and have support for ICT tools.

Keywords: Higher education, information and communication technologies, adoption, integration, enabler, utilization.

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1. INTRODUCTION

1.1 Background and the Context of the Study

The topic of this Master's thesis study in media education is to examine how Information and Communication Technologies (ICTs) are applied in furthering access to education and enhancing reach, reform and education policy in higher education in Kenya. The government of Kenya has a national strategy for university education which seeks to improve enrollment and quality of education in higher education institutions by 2015 (Republic of Kenya, 2010). The strategy is to be implemented by 2015 and points out ICTs adoption in the institutions as one way of implementing the strategy. This is because the strategy acknowledges that ICTs is in vogue in education. In general, the term ICTs encompasses all electronic media such as computers, video, internet, mobile devices and the associated hardware, software and networks that enable them to function (Mascarenhas, 2010). This study is timely as it will seek to establish the enabling factors in ICTs adoption and at the same time indicating the challenges that have been encountered by higher education institutions in the path towards applying ICTs in education. This study assesses how well ICTs is incorporated in higher education by both the learners and the institution and establishes the various factors shaping effective utilization of ICTs for sustainable higher education development in Kenya.

Kenya is a sovereign state in East Africa South of the Sahara. Nairobi is both the administrative and commercial capital of Kenya. The country neighbours Ethiopia to the north, Southern Sudan to the North West and Somalia to the North east. To the west of Kenya is Uganda, Indian Ocean to the south-east and Tanzania to the south. Kenya lies along the equator with its climate ranging from temperate in the inland, tropical along the coastline with Indian Ocean to being semi arid in the Northern and North eastern parts of the country. The major economic activities of the country are agriculture and tourism (Fengler, 2012). On human development, the country has a human development index of 0.519 ranking as low in human development (UNDP, 2013). Kenya has a presidential system of government where the president who is elected in a general election after every five years is both the head of government and head of state.

Kenya's first system of education after independence from British colonialists in 1963 was the 7-4-2-3 system. This involved seven years of primary schooling, four years of lower secondary education, two years of high school or upper secondary and three years of university education. This system was changed in 1985 to the current 8-4-4 system which involves undergoing eight years in primary school, four years of secondary education and four years in university (Eshiwani, 1990). The Government of Kenya introduced free primary education in 2003 where it made basic education free and compulsory. This made enrollment in primary schools in the country to increase by about 70%. This increase in enrollment in primary schools in 2003 is expected to result to a remarkable increase in enrollment in secondary schools and universities in the near future. This has made the current Kenya's literacy level to stand at 85% of the whole population while enrolment rates at universities stands at 3% of the total population (Gudo, Olel & Oanda, 2011). However, this enrollment in higher education institutions is still low compared to the other countries of the world where Kenya is ranked 124th.

University education in Kenya began after Kenya gained independence in 1963 with the first university being Nairobi University College currently known as The University of Nairobi (Eshiwani, 1990). Before 1963, education in Kenya was governed by the philosophy that Africans required just basic technical skills to enable them do menial jobs. Higher education was a preserve of the whites and a few Africans which was received from higher education institutions outside Africa. Most of the colleges in Kenya were affiliates of foreign universities like the Royal Technical College (currently University of Nairobi) which was affiliated to University of London. Since 1963, university education has undergone massive changes and reformations to the current 27 universities at the time of this study. Universities in Kenya are categorized into public and private. Public universities are those that are established and partially financed by the government. Private universities are those that are established and financed by private investors though they have to follow rules and regulations set by the ministry of education.

Kenya introduced free primary education in 2002 and free day secondary education in 2008. Due to the high numbers of graduates from the primary and secondary levels, the higher education level needs to improve enrollment and quality of their education thus the government has turned to ICTs as an enabler. How ICTs is applied to develop education is important in order to find out areas that need improvement and find better ways that ICTs can be incorporated in education development. Africa in general and Kenya specifically have been lagging behind in engaging ICTs in areas that it can play an important role. ICTs are a major foundation of the economy in both poor and wealthy nations (Mascarenhas, 2010). ICTs can be seen as the main facilitator of the knowledge society, and ICTs can also play an important role in development and in education.

1.2 Global and Local Strategies Supporting this Study

The study sheds light on which political, social, economic or cultural factors that enables and also the one that hinder the adoption of ICTs in higher education. This is because Kenya has several of benchmarks and targets to achieve in relation to education. The country therefore needs to use all the resources available to achieve the targets. The United Nations' target of Education For All (EFA), Africa development agenda, Kenya's Vision 2030 and Millennium Development Goals (MDGs) are based upon the application of ICTS as a catalyst or enabler in the different facets of development. MDGs are eight internationally agreed development goals officially established after the Millennium Summit of the UN in 2000. These goals were reached at, following the adoption of the United Nations Millennium Declaration. The 189 UN members and more than 23 international organizations have agreed to follow these goals and seek their attainment by 2015. One of the eight goals relevant to this study is achieving universal primary education which is related to the EFA objective. The EFA movement is a global commitment by UN to provide basic and quality education to all children, youth and adults. This movement was launched in 1990 at the World Conference on Education for All organized by United Nations Children's Fund (UNICEF), United Nations Educational, Scientific and Cultural Organization (UNESCO), United Nations Population Fund (UNFPA), United Nations Development Program (UNDP) and the World Bank (Inter-Agency Commission, 1990). Participants in the conference agreed on a vision and strategy for learning and pledged to have basic education universal and free to reduce

illiteracy by 2005. The vision included ICTs as a catalyst to have many children, young and adults accessing education. However, the vision was not attained by 2005 by many countries, Kenya included, as there were many challenges which had not been managed in education policy and quality. The international community met in Senegal in 2000 and extended the period for attaining the vision for EFA to 2015 (International Consultative Forum, 2000). In the conference, it was generally agreed that the national and domestic resources including ICTs resources mobilized and committed in most developing countries was not enough to reach EFA. It was recommended in this conference that resources that enabled education to reach all which included ICTs resources should be mobilized and committed towards the cause.

The Africa development agenda has indicated that African countries can make progress in development goals by applying technology in social, agricultural, education and production industries. Mayaki (2009) maintains that appropriate deployment of technology in various developmental areas can help African countries to solve some of their development challenges. There is also consensus among many African scholars and policy makers that if ICTs are applied constructively and innovatively, it can transform the under development that have been witnessed in many African countries to opportunities with endless development possibilities.

Another strategy that has put ICTs at the centre is Kenya's Vision 2030 which is the government of Kenya's blueprint of the goals that the country needs to achieve by 2030 (Republic of Kenya, 2007). The Kenya vision 2030 provides a vision for the Kenyan education sector as a whole and the higher education sector in particular. There are indications in the vision that the education and training sub-sector requires addressing some challenges in vision planning (Ndung'u, Thugge & Otieno, 2011). One of the areas mentioned is mainstreaming ICTs at all levels of education and training by ensuring that policy and curriculum delivery is well integrated at all levels through ICTs. This underlines the importance with which the government of Kenya holds ICTs as an enabler of education delivery management and policy. However, the implementation of ICTs is also highly influenced by local circumstances and by social processes that determine the

outcomes and often have political ramifications (Nkansah & Unwin, 2010). This study examines the various factors that are affecting application and integration of ICTs as an important component of higher education development.

1.3 ICTs Enabling and Supporting Development

Technology, being a cultural product, should ideally rise from the culture of people, if it is to be directly accessible to a large section of the population and its nuances are to be fully appreciated by them. Technology plays an important role in development. However, Reynolds (2010) claims that while technology can perhaps eliminate inequalities, disparities in society are created by people and not by technology. It is believed that ICTs can advance educational goals and shape education to meet the needs of the 21st century (Hosman, 2010). Although there are some debates regarding the effectiveness of technology in education, most theorists and researchers (e.g. Neil, Pru & Neil, 2004; Moradi & Khalkhali, 2008; Yunis, Koong, Liu, Kwan & Tsang, 2012) agree that ICTs is an important and potentially effective educational tool. There are many benefits in using ICTs in education which are highlighted in various studies in Africa and beyond. A study by Martins, Steil & Todesco (2009) in Ghanaian schools illustrates that one of the most important benefits is that ICTs can help to scaffold students' concrete learning experiences. Among others, ICTs facilitates active learning and higher-order thinking, fosters cooperative learning and reflection about the content, and provides the platform for learning content differentiation and individually tailored feedback. A study by Olise (2010) revealed that computers are essential tools in the classroom in order to maximize the opportunities for curriculum activity. ICTs can reshape instruction by altering the learning environment and the mode of interaction of learners.

ICTs has been accepted and is considered indispensable as part of the world today mostly in the developed world. Most of the developing countries, societies and cultures have adjusted to welcome the challenges brought about by the digital age. The commonness of ICTs has brought quick changes in political, social and technological transformation globally. Education has not been left behind in this transformation and the penetrating influence of ICTs. ICTs have affected both the quantity and quality of research, teaching

and learning. ICTs has provided more opportunities for learners and teachers alike to share knowledge and communicate with one another effectively in ways that were not possible before the digital age. However, the inclusion of ICTs in most spheres of life including education has brought controversy due to the digital divide where the developing countries have been observed to be left behind in terms of ICTs resources and capacity building. This has brought the question of what needs to be done to bridge the digital divide and build capacity in teachers and learners considering that most developing countries do not command the resources to attain such goals. Yunis et al. (2012) observed that teachers and students need training not only in computer literacy but also in the application of various kinds of educational software in teaching and learning. Trucano (2005) observed that the factors of change, structured along the dimensions of ICTs teaching and learning environments, are content, format, infrastructure and pedagogy. At the school level, effective use of ICTs requires organizational intervention since the benefits of ICTs cannot be adequately separated from other variables that impact on learning in the larger instructional context (Draxler & Schware, 2011). Inadequate infrastructure, lack of training and personal expertise and weak technical support are frequently cited challenges that prevent education institutions in Africa from using technology fruitfully in the classroom.

There are also researchers who opine that successful ICTs implementation in schools depends on effective leadership (Getao & Wausi, 2009). Some school leaders are ICTs competent and willing ICTs champions, but many others may feel overwhelmed by the task of technology implementation as they do not have formal training or experience with ICTs. So, other than teachers, school leaders should acquire technology knowledge and skills for them to transfer this knowledge to their institutions. Education institutions and policy makers need to acknowledge that ICTs have revolutionized the traditional methods of teaching and has brought new teaching and learning experiences to teachers and students. Educational managers and educational institution leaders should take advantage of this ICTs capability to provide ease of access and sharing of information since ICTs enable the visualization of educational materials in an innovative and realistic manner.

School leaders therefore need to build their capacity in relation to ICTs usage if their institutions need to have any headway in innovative ICTs usage in education.

Many countries are reviewing and restructuring their education systems to incorporate ICTs, Kenya being among them. However, the implementation of ICTs in education is not just a matter of physical systems and tools (Raj, 2011). Rather, the underlying management approach to the implementation of ICTs in education at the education system, school, classroom and individual level has to be considered (Kottemann & Boyer-Wright, 2009). Though technology is not a substitute for a teacher, information technology enables students to learn anytime, anywhere not just when the teacher is available. Further, technology reduces the dependence on paper based learning materials which are expensive and instead relies on free and open educational tools on the web. Technology also allows interactive illustrations and simulations which produce a better and deeper concept understanding (Ragupathi, Booluck & Roop, 2007). This is so because when IT based visual simulations and illustrations are used they make some concepts easier to understand which is better than the teacher based board, talk and chalk. Technology also allows the teacher not to be the major facilitator of the learning process and students can be given assignments and projects which they can investigate using IT tools where they can learn even at the absence of the teacher. Empirical evidence has uncovered many limitations on the value returned by investments in ICTs in education and this study focuses on finding the gains and costs of incorporating ICTs in higher education in Kenya.

1.4 The Aims and Structure of the Research

I was motivated to conduct this study due to the differences in incorporation of ICTs in higher education in Kenya. For a higher education institution to be successful in investing and adopting ICTs, its policy and strategy must involve all the stakeholders mostly the students and faculty. There are universities in Kenya which are rated highly in their use of ICTs while others have very poor policies and strategies on ICTs (Ng'ang'a, 2012). It is therefore important to understand the perception of students and faculty and how they perceive the use of technology in their universities to get a feel of how well the

universities are applying ICTs in teaching, learning and education management. The aspect of perception, usability, self-efficacy and acceptability of technology is less measurable and visible than the hardware aspect which motivated this study. This aspect has also received less attention than hardware issues in the universities. In this study, I applied the technology acceptance model (Davis, 1989) and the diffusion of innovations theory (Rogers, 1962) which explains the process by which technology is adopted. This model indicates that an individual's actions and behaviour are guided by beliefs and perceptions. In the case of ICTs integration and adoption in education, the beliefs of the university's management, faculty and students about the benefits and challenges brought about by using the technology guides their behaviour and intention towards making use of the technology. However, the beliefs and intentions can be formed by external factors such as self-efficacy and financial capability of affording and sustaining the technology. The study applied a descriptive study design where data was collected using questionnaires and interviews. The study involves 27 universities in Kenya where the subjects who were to respond to questionnaires were faculty and students. Two students and one faculty member were selected to respond to the questionnaires from each university campus in Nairobi. Interviews were conducted on 8 students and faculty from four university campuses. Though Kenya has made giant steps towards incorporating ICTs in almost all spheres of life (e.g. business, banking, government, agriculture, information sharing), the learning institutions are struggling to keep up with the pace of changing technology.

1.5 Research Questions and Purpose

The main focus of the study is to assess how universities in Kenya have applied ICTs in training and learning. The study had the following research questions:

- 1) What is the level of self-efficacy and ICTs integration into higher education policy and practice in Kenya?
- 2) What is the level of awareness and adoption of ICTs in higher education institutions in Kenya?
- 3) What are the various factors enabling or hindering the effective utilization of ICTs for sustainable higher education development?

This study is motivated by the way universities and institutions of higher learning have incorporated ICTs tools in learning and training. However, not all institutions of higher education in Kenya perceive ICTs as an important tool in education. It is good to note ICTs have become an important aspect of everyday life as people use ICTs for communication, trading, banking, agriculture and in various other activities in business and social life. Universities therefore are inclined to incorporate ICTs. The institutions have to use ICTs to get the benefits that ICTs bring in education so that they remain competitive in their area of specialization. The universities need to make a choice about what technology to adopt, but not whether or not to adopt technology. This is because technology can support the strategy and plans of a university in education planning, management and development.

Technology combined with human resources and strategy of the university can provide the university with a competitive advantage. Providing quality education requires a mixture of technology and the university therefore have to implement and adopt some ICTs to support its teaching, learning and research (Yunis et al., 2012). A university therefore needs to strike the correct balance between its other resources and technological resources to employ. However, there are risks of getting the correct mix of technology, human resources and the university strategy and these risks can be hurting to the university's future. In retrospect, too little investment and adoption of technological resources can erode the university's competitive advantage and image (Gudo, Olel & Oanda, 2011) while too much investment in technology would mean huge investments and if the technology is under-utilized, the resources are lost while staff and students are demoralized if expectations are not met.

The study is built into chapters that give a detailed analysis of the various concepts included in the whole study. Chapter two provides the purpose of the study, objectives and the research questions that the study sought to answer. The chapter also provides the theoretical framework that guided the study and also the empirical review of studies that had been done prior to this and how these studies are different from the current one. In

the review of literature, the study focuses on how ICTs have been integration into higher education policy and practice in various countries, the level of awareness and adoption of ICTs in higher education institutions in different parts of the world and the various factors that have been found to hinder the effective utilization of ICTs for sustainable higher education development. In so doing, the author seeks to show a justification of why the study is important and also to see what can be borrowed from previous studies on the subject to make the current study important for theory and practice.

In chapter 3, the methodology that was applied is discussed. The data that was collected is stated and justified, the methods for data collection discussed and the study population and sampling method is also discussed and justified in this section. The methodology chapter ends with data analysis and how the various data sources were summarized and presented. Chapter 4 presents the results from the analyzed data. This chapter presents findings that were derived from the study which helped in answering the research questions and attaining the research objectives. The findings were the ones that were derived from questionnaires and interviews to the faculty and students. Chapter five provides the discussions of the findings based on the theoretical framework and previous empirical studies while chapter 6 presents the conclusions made based on the study findings.

2. THEORETICAL FRAMEWORK

Every research needs to have a theoretical model from where it is based. For the time I spent in thinking about this study, I went through a number of past studies on use of technology which had used various theoretical models. One important element that was present in all the models which I cannot exhaustively enumerate here was the individual's beliefs. Secondly was the issue of the social system and structural factors in a given society. However, among all the models that explain adoption of technology, my decision was that the technology acceptance model (TAM) proposed by Davis (1989) and the diffusion of innovations theory by Rogers (1962) were the best suited for this study. The technology acceptance model fitted perfectly to this study as it aimed at studying self efficacy, ICTs integration, adoption and challenges that hinder adoption. All these aspects are explained by the technology adoption model. The diffusion of innovations theory on the other hand explains the role played by the political, economic and the social factors that may enable or hinder diffusion of technology in a given society.

2.1 Technology Acceptance Model

Technology acceptance is defined by Arning and Ziefle (2007) as the user's willingness, acceptance, agreement and the continuous use of any technological system. This can be classified into behaviour and attitude acceptance. In technology acceptance model, attitude towards using, the intention to start using and the actual adoption or use are indicators that the individual has accepted the technology and sees it as beneficial. The TAM explains the process by which technology is adopted by individuals and can also be applied to organizations and institutions like higher education institutions. This model indicates that an individual's actions and behaviour are guided by beliefs and perceptions. In the case of ICTs integration and adoption in education, the beliefs of the university's management, faculty and students about the benefits and challenges brought about by using the technology guides their behaviour and intention towards making use of the technology. However, the beliefs and intentions can be formed by external factors such as self-efficacy and structural factors of affording and sustaining the technology. Another external factor is competition from other universities, use of ICTs in other universities, use of ICTs in the community and experience of the students or faculty in using ICTs

elsewhere. Self-efficacy is an individual's perception about their own capability of using the technology in question, their perception on the quality and functionality of the technology or perceptions about the social support that will be afforded by adopting the technology or the social support that the technology will bring (Arning & Ziefle, 2007). To be able to understand behaviour, perceptions and actions of users, it is important to understand these external factors first.

The TAM as proposed by Davis (1989) is based on how individuals reason before acting and explains and predicts user behaviour when a certain technology is introduced. This tries to explain and predicts whether an individual will accept or decline to adopt a technology based on the individual's perceptions about the technology. Based on the theory, perceived ease of use and perceived usefulness have a high relation to the acceptance of any technology. Perceived usefulness as put by Davis is a belief that the user expects that his/her efficiency would be improved by the adoption and use of a certain technology. Perceived ease of use is the user's belief that the technology will not require the user to put too much effort in operating it.

The TAM assumes that there are some external factors that influence perceived usefulness and perceived ease of use. These factors also intervene in the effect of external variables on user's attitude towards using a certain technology. The model therefore provides a basis for explaining the adoption process of the technology and the reasons behind or hindering any adoption (Pinho & Soares, 2011). In the technology acceptance model, though perceived ease of use and perceived usefulness are the major elements in the determination of an individual's or institution's acceptance, adoption and usage on ICTs, there are other factors about the technology that influence the decision. These factors include the environment within which the decision is being made, features of the technology and the characteristics of users who are being targeted.

The researcher is justified in using this model as it has been used successfully in various past studies including a study on English learning (Chang, Yan & Tseng, 2012), mobile learning (Tai & Ting, 2011), electronic-learning (Roca & Gagne, 2008), blended learning

(Tselios, Daskalakis & Papadopoulou, 2011). These previous studies revealed that the technology adoption model can be effectively applied to explain and predicts investment in, adoption and acceptance of technology systems.

This thesis is about application of ICTs in higher education in Kenya. The study seeks to establish how teachers and students in higher education institution in Kenya apply ICTs, which ICTs media are used and the challenges encountered in application of such media in education. In TAM, users are motivated to adopt a new technology by its perceived usefulness, ease of use and the user's attitude towards the technology. It is expected that an institution's faculty and students who perceive ICTs as easy to use, useful and have a positive attitude towards ICTs will report high levels of adoption in training and learning. If ICTs are perceived to be relatively easy to use, quite flexible to interact with, fun to use and enjoyable to use, they will be readily adopted in training and teaching (Pinho & Soares, 2011). Faculty and students who do not perceive ICTs as useful and easy to use and also have a negative attitude towards the technology tool will show low levels of adoption. To adopt ICTs for education purposes in higher education institutions, the institution fraternity needs to have perceived the usefulness and ease of use of the technology and also need to show a positive attitude towards the technology.

TAM has been shown to explain adoption behaviour of different information systems and technologies and based on the exponential growth of ICTs use in Kenyan education system, I consider the TAM relevant in analyzing the application or lack thereof of ICTs in higher education. This model was recently applied by Pinho and Soares (2011) in examining the adoption of social networks in educational institutions. The purpose of Pinho and Soares's (2011) study was to provide an understanding of the process of new technology adoption, notably social networks (SN), relying on the TAM in Portugal educational institutions. Zacharis (2012) also applied the model in studying college students' acceptance of podcasting as a learning tool. Zacharis (2012) observed that podcasting is one of today's most prominent trends in media and computing, but factors predicting its adoption in higher education settings remained largely unexplored. The purpose of Zacharis' study was to examine students' perceptions of enhanced podcasting

as a review and exam preparatory tool, through the use of the TAM. Another study by Shittu and colleagues (2011) noted that social software usage is growing at an exponential rate among the present generation of students. The authors however, revealed that there is dearth of empirical studies to understand the determinant of its use. The study by Shittu and colleagues (2011) therefore sought to investigate factors that predict students' intentions and attitudes towards the use of the internet based technology. Their findings revealed that perceived usefulness, subjective norm, and perceived ease of use predicted the attitude and intention of students toward social software adoption. The study further revealed that attitude towards the technology was a strong predictor of students' intention to use social software. This study had used the TAM to evaluate the factors behind adoption of social software in the higher education institutions. The current study seeks to establish the factors contributing to adoption of ICTs in higher education learning and training. Though the current study is different from the reviewed studies due to the context, it is similar in that it seeks to establish why ICTs tools are applied in higher education institutions as an aid to learning and teaching and if they are applied, to establish the factors behind. The TAM therefore fits this study as it will explain the factors for or against adoption.

The current study focuses on establishing the individual, structural, political and social factors that enable or hinder technology adoption in higher education institutions in Kenya as learning or training tool. No single theory could have explained the underlying study variables and hence I found it necessary to have another theory to cater for the political, structural and social factors.

2.2 Diffusion of Innovations Theory

Diffusion of Innovations theory (Rogers, 1962) seeks to explain the rate at which new technology diffuse within cultures. The theory also explains why and how technologies and new ideas are adopted in different cultures and societies. In the theory, diffusion is defined as the process through which a technology or new idea is communicated and accepted in a social system. In the diffusion of innovations theory, three types of decisions are made in a social system about adoption of an idea or technology. The first is

the optional innovation-decision which is made by an individual, whether to adopt or not to adopt the technology. The second is the collective innovation-decision which is made collectively by all individuals in the social system. Lastly, is the authority innovation-decision which is the decision made for the entire social system by individuals who have power or influence in the social system. This explains the reasons that lead to higher education institutions to adopt the different training and learning technologies. The social, political and economic aspects of the adoption decision are explained by this theory.

Diffusion of innovations theory on the other hand provides an in-depth view of how the social, political, economic and cultural factors enable or hinder adoption of technology. The theory explains that organizations or institutions adopt new technology through authority innovation decisions and collective innovation decisions. The collective innovation decision in the context of this study is where the adoption of technology as a training or learning tool is made by the faculty and students of a higher education institution. In this case, the decision is not formal and both the students and faculty agree to use technology as a learning or training tool. The authority-innovation comes to play where the decision to adopt any new technology in a higher education institution is made by the administration of the institution. This means that the few people who have a position of power in an institution can make the decision to adopt the technology or not (Rodgers, 2005). This theory also explains that in reaching the decisions, the benefits and costs of the innovation is considered. This theory therefore gave an insight into the political, social and economic factors that can enable or hinder adoption of technology in higher education institutions in Kenya.

2.2 ICTs as Development or Necessary Advancement

The importance of technology in education and in other aspects of life has been a subject of debate for many years. Some theorists see technology as a neocolonialism tactic while other see it as necessary in advancing education goals and aims. Kitcharoen (2007) observed that technology is credited as a significant factor in productivity improvement in various industries. Some people believe that if technology is used effectively in

educational institutions, this could improve educational quality and opportunities. Kitcharoen (2007) is of the opinion that there should be no question on whether technology should be used in educational institutions but emphasis should be on ensuring that technology is used effectively to create new opportunities for learning and to promote student learning. From this perspective, it is seen that technology use should be an integral part of the educational institutions technology plan or an overall improvement plan. Various authors (e.g. Magambo, 2007; Hosman, 2010; Tai & Ting, 2011; Zacharis, 2012; Kregor et al., 2012) have however indicated that technology is an important tool to be incorporated in the educational environment to make the process more effective.

However, not all see technology as development or as necessary advancement. This critical development school of thought questions the hidden assumptions of the development policies of the developed countries. The critical development school of thought views that these countries who originate with development agenda have hidden motives top on the agenda being to advance their own selfish interests such as profit motive or desire to rule or governance. Duffield (2007) remarks that development is more about governance and less about advancing the needs of the developing nations. Duffield also views development aid and technological developments as a part of the imperial ambitions of the developed countries to govern and control the poorer nations. Duffield (2007) indicates that;

‘If development encloses an emancipatory urge, it does not lie in the formulation of endless ‘new and improved’ technologies of betterment nor the search for more authentic forms of community—it is found in the solidarity of the governed made possible by a radically interconnected world and the insatiable will to life that flows and circulates through it’ (p. 234).

There is also the assumption that the wise use of technology will assist higher education institutions save on costs by providing diverse services such as instructing more efficiently. This assumption has led many institutions to start online programs and many students end up undertaking them. Technology is being applied in many higher education institutions to provide many services to students. However, Allen and Seaman (2011)

observed that we know very little about their effectiveness and if they indeed save money. Hieronymi (2012) also observed that computers enable new forms of communication. They also present information in previously unimaginable and well understandable ways. Hieronymi indicates that though these capacities should be celebrated, technology should not be confused with the training provided by teachers to learners. Though technology is seen as important as an enabler, it should not be thought as replacing the role of the teacher.

These differing views of the importance of technology in the learning environment are considered in this study. However, my view is that technologies have the potential to enable training and learning in all curricula by providing new ways of learning and training which were not there before. ICTs are a learning catalyst which provides tools that faculty can use to improve their training which makes illustrations of complex concepts easier. ICTs has also enabled higher education institutions to have new ways of instruction, testing and learning. This is done through online blackboards, distance learning and handing in of assignments and projects remotely. This has enabled students in geographically dispersed areas to have access to the faculty which enables their learning. ICTs have also enhanced training and learning of students with physical or intellectual disabilities. Learning for the deaf, blind and the mentally challenged has also been enhanced by use of technology. My view is that the enabling factors for ICTs adoption should be investigated and enhanced and at the same time establishing the hindering factors for them to be managed.

I will therefore seek from the respondents their view of the role of technology in their institutions. From these different view points, a question begs: do ICTs provide benefits which are greater than their costs in education? I will seek to establish how the faculty and students at higher education institutions in Kenya view technology and its role in the learning and instruction environment. This will partially inform their desire to adopt and incorporate ICTs in their institutions.

2.3 Empirical Review

2.3.1 Self-Efficacy and ICTS Integration into Higher Education

Learning in higher education is important since it determines the social, economic political and environmental development of a nation (Raj, 2011). Learning in higher education is therefore not an isolated process for the institution but it is also affected by what is happening in the corporate and social sectors of a country. Stakeholders in Kenya are increasingly playing a great role in directing, planning and managing the educational outcomes in universities. There is an increasing realization among various political and educational stakeholders that the educational challenges we face today cannot be overcome with traditional means alone. There is therefore an increasing advocacy of ICTs in various policy and strategic documents in Kenya (including vision 2030) as an important contributor to the solution of the problems in education in Africa. These problems include the problems of low access, poor skill set in graduates and poor quality. Education and political policy makers have seen the need for teachers, professors and technical and administrative staff to be provided with requisite capacity that enables them to integrate new ICTs in their teaching programs.

Students, the society, the corporate sectors who are the future employer, the government and the community in general expect graduates from the university to be affluent in technical, social and technological aspects. The university is expected by the community to be an institution where students learn to apply almost all technological systems and are expected on completion to be reasonably adept in applying technology effectively. From this expectation, the students in turn expect to be taught through various digital technologies depending on their course specialization and they have an expectation to use their skills in ICTs throughout their lives as persons in the community and as professionals. Students who come from universities that do not employ ICTs as a norm in teaching and learning find themselves alienated in the workplace where such knowledge is required. Students, after their graduation, are expected by society to be leaders not just in their technical field but also to be pioneers and innovators in their respective specializations using ICTs. This demand push from the employers has made universities to accept to equip their students with at least the basic ICTs skills. Some universities have

gone a step further and applied ICTs in expanding their course offering (e.g distance learning) and making some processes and tasks easier (e.g. checking results, admissions, handing in assignments and tests) (Ng'ang'a, 2012). Magambo (2007) observed that ICTSs are ideally suited, by virtue of the flexibility they can provide, for fostering cognitive flexibility. In particular, multidimensional and non-linear hypertext systems have the power to convey ill-structured aspects of knowledge domains and to promote features of cognitive flexibility in ways that traditional learning environments (textbooks, lectures, computer-based drill) could not (although such traditional media can be very successful in other contexts or for other purposes).

University education is also the last stage of formal education. In this final stage therefore, there should be focus on the work readiness and skills of the graduates on the part of the universities. As students graduate from universities, they are expected to be incorporated and integrated in the social system be it in the private sector or public sector. They are integrated in these systems as employees and managers of institutions and government where various digital technologies are applied in working, solving social and economic problems and in research or further training. However, in Kenya specifically, there have been reports from employers that graduates coming out of local universities are 'half-baked' making them to be ill prepared to the challenges of the work place (Gudo et al., 2011). This points to the fact that digital expectations and skills of these students have been either largely ignored or Universities have failed to understand them. This could be the reason that most students that graduate from Kenyan universities are found wanting mostly in their ability to apply digital technologies to work related issues or to solve societal problems. Gudo and colleagues' (2011) study further revealed that as quality of higher education in Kenya is compromised, this has created a mismatch between what the students really experience in the universities and the stakeholder expectations. This has caused the digital expectancy to place more and new challenges to the policy, management and dispatch of education in universities. The universities are being called upon to be more prepared in integrating and adopting technology to enable the institutions, the faculty and learners to be proficient in ICTs application.

The continued use and innovation in ICTs in the community has meant that universities should have different goals and strategies to satisfy the students and the community. Students of today have different needs, skill requirements and goals from the students of yesterday. This made Magambo (2007) to observe that there is need for the universities to have new courses, adjust the old courses and have new disciplinary methodologies to ensure that students are provided with the skills required to be meaningful contributors to the society. This calls for the universities to redefine traditional higher education and use ICTs in planning, policy and education dispatch. The current generation of students has been labeled using many terms including ‘generation Y’, ‘Net generation’, ‘Mobile generation’, and even ‘PDA generation’. While this generation has been very adept in using technology, this has been more for social and recreational activities rather than in learning. This makes the students to have lower skill levels than it would be expected. This outcome leaves much work to the universities to ensure that these students are as good in using technology in learning as they are in artistic or recreational activities. This is important since today’s place of work requires knowledge workers who are ICTs-literate.

To ensure that their graduates provide meaningful skills to the society once they are integrated into the society after completing their course, universities must ensure that their courses are well integrated with the needs at the workplace. They should also ensure that ICTs knowledge is provided to every student regardless to which course the student is pursuing. This will bridge the gap between the employer expectations and the skills provision and student experiences in the university (Gudo et al., 2011). By doing this, Kenyan universities will manage the complaints from the society and employers that their graduates are ill prepared to handle challenges and work related duties in the real world.

There are various success factors for integration of ICTs in higher education teaching and learning. The factors reveal the importance perceived and actual self-efficacy for integration to be successful. Self-efficacy was defined by Bandura (1997) as the individuals' judgments of how able they are to do certain tasks. Self-efficacy therefore determines whether an individual requires some capabilities and tools to do some tasks.

In this study self-efficacy related to how the students and faculty perceived themselves as able to use the different technologies and whether they perceived these technologies as important in their learning or teaching.

Self-efficacy explains the degree to which learners and faculty in a higher education setting will adopt ICTs and accept to use such tools not just for recreational purposes but also for constructive educational purposes. How learners and faculty perceive themselves as competent and able to use ICTs explains their application or lack thereof of the ICTs tools in education. A study by Abulibdeh and Hassan (2011) revealed that high levels of self-efficacy can improve academic performance of learners, improve use of ICTS by teachers and also enhance the institutional environment. Universities in Kenya should first make sure that the students, faculty and staff have high skill levels in using ICTs. This can be enhanced through training and continuous support to ensure that all stakeholders in the university improve their skills on a daily basis. The university also can have a policy to reward those students or members of the faculty who show improvement and efficacy in using ICTs in training or learning. This would be a motivator for faculty and staff to employ ICTs in their day to day education duties. The university can also enhance the self efficacy of its students and staff by having workshops and seminars as have been the case in some institutions of higher learning. This ensures that users of technology are constantly updated on what is going on in the ICTs world so as to update their skills and remain current.

A continuous review of courses, policy and practices is important in universities due to the rapidity of technological change. The rapid change in technological innovations and practices challenges educational policies at the international, national and institution level. These changes mostly affect policy formulation, investment planning and systems responses. Adopting effective and relevant educational policies and responses requires considerable investment which is lacking in a developing country like Kenya. This study is meant to determine what factors are present in those universities that have self-efficacy in ICTs use and have integrated ICTs in education. This can be a learning point for those universities in Kenya who are poor in applying ICTs in education.

ICTs use in education institutions is becoming readily acceptable and the norm in today's information age. Universities in developing countries are leveraging on technology to cushion themselves from the limitations they have on resources and facilities. Gudo and colleagues (2011) observed that the ICTs such as the computers, note pads, smart phones and other digital technological tools are increasingly becoming the major textbook, notebook, storage facility and even dictionary for information for students in quality institutions of higher learning. It is therefore noted that higher education institutions that fail to utilize the digital era benefits and technology such as networked learning, IT assisted learning web connectivity cannot offer quality education. This is due to the fact that library facilities and information systems in almost higher education institutions are old and all universities are antiquated. Books and scholarly journals are not only few but very old and outdated and hence not relevant to current institutional needs and priorities. A study quoted in Gudo and colleagues (2011) done by Ndethiu (2007) at Kenyatta University in Kenya found that inadequate reading resources posed a challenge to the promotion of students' reading habits. The study further observed that lack of current and relevant books, inadequate use of internet and general lack of reading space were important constraints to students reading. Another study by Manyasi (2010) quoted in Gudo and colleagues (2011) examined how using IT could improve access to higher education through distance learning in Kenya. The study established that higher education institutions in Kenya lacked the necessary technology. The study established that most of public and a few private higher education institutions had only a few computers, which were used by lecturers to access internet services. The study also established that lecturers and institutional administrators lacked instructional competencies and information design for usage in ICTs based learning which is associated with delivery of high quality services. It is therefore generally accepted that advances in ICTs could improve access, quality and provide a solution for the demand in higher education in Kenya. Gudo and colleagues (2011) however revealed that there was insufficient institutional preparedness coupled with unsatisfactory ICTs resource provision (such as internet provision) for the learners. This as indicated by Gudo and colleagues (2011) was a great impediment to provision of quality teaching and learning.

2.3.2 Awareness and Adoption of ICTs in Higher Education in Kenya

ICTs are well integrated into the day to day life globally. It is therefore important to teach a student how he/she will use technology at work or in the community during training. This makes the student to be important in the community by blending in and giving the society the service it expects. However, the spread of technology use is not even in the society mostly in the developing countries like Kenya. There are some regions in Kenya where the use of technology in everyday life is imperative like in the major urban areas. However, in other areas such as the remote regions, even the smallest communication gadget such as a pocket radio is rare. Kenya is leading in mobile banking in the world while still there are around 40% of Kenyans who do not own a mobile phone. Ownership of computers, PDAs, and other communications gadgets is even worse while access to the internet is lower (Nganga, 2012). This makes the spread of technology to be uneven even in the learning institutions including universities. Following the ranking of universities in Kenya for their technology usage, they ranked on average better than other universities in the eastern Africa region.

Though Kenyan universities have poor ICTs usage compared to global standards, Kenyan universities are better when compared to their counterparts of the eastern African region in their adoption and use of ICTs in higher education (Ng'ang'a, 2012). Disparities, however, are seen between private universities and public universities in Kenya as the public universities are outperformed by their private counterparts. This is expected to be due to the financial challenge of public universities as they rely heavily on government financing which is limited. Kenyan universities however, are increasingly embracing ICTs in teaching and learning which is comparing well with universities globally in the use of technology.

Use of ICTs in universities can provide more opportunities for the students and faculty to share and access research and academic materials including academic information and data. A survey involving 250 higher education institutions in eastern Africa which was based on questionnaires and interviews revealed that ICTs had opened up the universities

and had provided various avenues of learning and sharing best practices among them and among the universities and corporate bodies and government (Nganga, 2012). The universities were reported to engage in subscription to academic journals, use of websites, use of intranet, e-learning and use of social media which had dramatically revolutionized the learning and teaching environment in the universities. However, this study was different from this survey since this survey focused on the Kenyan universities and sought to establish ICTs usage, self efficacy of faculty and staff and the challenges that universities face that hinder application of ICTs in learning.

The universities in Kenya have invested heavily in ICTs development and application in education policy, management and training. However, the ratio of ICTs facilities to students in Kenya was reported to be affected heavily by the double intake that was performed in 2012 to reduce the back log of admissions. To clear out a backlog of 40,000 students, Kenya has been rolling out a double-intake plan which has lowered the ICTs facility to student ratio (Ndung'u et al., 2011). The backlog was brought by many strikes in public universities which made students eligible for admission in public universities to wait for up to 2 years before securing the position. Private universities perform better on application of ICTs in learning since they are open to wider funding sources and can command huge resources for ICTs resources.

Various ICTs can be applied in universities for the purposes of learning and teaching. There can be both hardware and software resources that can be open to the university or student fraternity. The ICTs resources can be owned by the university or they can be owned by the students or trainers themselves. No university in Kenya lacks the basic of ICTs facilities such as computers as it is the policy of the government to have all universities having the basic ICTs facilities. However, the question that may arise is the question of access, adequacy and reliability of these resources (Nganga, 2012). The hardware resources that are usable include computers, laptops, PDAs smart phones, video cameras, digital boards, cassette and video recorders. The software resources applied in universities include internet, data analysis software, graphic software, intranets, websites, blogs and online blackboards. The incorporation of ICTs in university education opens

many opportunities for universities and makes teaching and learning easier and convenient as compared to application of traditional teaching modules.

Students and faculty alike are frequent users of internet as the major ICTs module for disseminating and sharing learning items and resources. There are indications and instances where both students and faculty make frequent use of internet through social networking, instant messaging, e-mails and blackboard (Gudo et al., 2011). In some instances, some faculty members who are more technologically adept require their assignments and tests to be type out and not hand written and other require the assignments to be handed in through e-mail. However, the use of these mediums does not mirror the university policy but it is a personal preference of the faculty member involved (Nganga, 2012). The internet mostly the black board, intranet and e-mail is used to share and distribute learning resources mostly notes and reference materials.

ICTs are also used in administration in some of the higher educational institutions the world over. Some universities have online registration for courses where students do not need to physically go to the admissions office. Others use ICTs to deliver results to students for exams or continuous assessment tests and assignments. ICTS resources such as intranet, e-mail and blackboard are used to communicate important information to students such as commencement dates, new regulations, graduation dates, workshops, seminars and any other important announcement to the faculty, students and staff. These ICTs have replaced traditional communication and learning channels such as notice boards, libraries and class rooms. The current study will seek to establish how these technology tools are applied in Kenyan higher education institutions.

Use of ICTs has also been credited to the development and sustainability of new learning modules such as distance learning. The availability of training and reference materials through intranets, websites and e-mail has enabled students who are far away to access such materials conveniently and cheaply. This has made it possible for universities and students to have the distance learning option as a feasible and effective way of learning. The availability of ICTs facilities such as mobile phones, laptops and PDAs have made it

possible for the emergence of mobile learning. Mobile learning is where mobile technology is used to deliver materials. Mobile learning is closely related to e-learning and incorporates the benefits of mobile technology. Mobile technology provides more benefits than e-learning due to the advantages of immediacy, convenience and expediency. Wireless networks which are a part of ICTs provide immediate connection and data transmission which enables learners to interact with other learners and instructors and have access to the learning content. They provide the students and faculty with a convenient way of getting and delivering content. This study will investigate how PDAs and mobile phones have been applied in learning and training in Kenyan universities.

2.3.3 Enabling Factors and Hindrances to Effective Utilization of ICTs in Education

Though ICTs are indicated to have a lot of benefits if incorporated in education delivery, many institutions have not been able to effectively incorporate ICTs in education mostly in the developing nations. Some universities have also invested heavily in ICTs but have not received the full benefits expected from application of ICTs in education. There have been various factors which have been theorized or found to enable or hinder the integration of ICTs in education. These factors are country specific or institution specific.

The first factor that can enable or hinder application of ICTs in university education is access of the ICTs resources in the universities (Ragupathi et al., 2007). Those universities that have ICTs resources that are adequate or generally very efficient to use will presumably have high levels of ICTs adoption for education. This enables adoption of such ICTs tools for training and learning in such universities. However, those universities with inadequate and inaccessible ICTs resources are expected to have low adoption of ICTs for education. Some universities also do not update their ICTs resources regularly which makes them have resources which are not fit for use due to their obsolescence. This also hinders application of such tools in education. In such circumstances, students and faculty find these resources unusable and prefer working through the traditional teaching and learning methodologies. This study seeks to determine whether the universities in Kenya have adequate ICTs that are up to date. The

study also seeks to establish whether access to ICTs is a factor that motivates or challenges use of ICTs in Kenyan universities.

The other factor that enables or hinders investment in ICTs and its application in learning in universities in Kenya is perceived usefulness. Perceived usefulness incorporates the concerns on how the ICTs in question can effectively improve the quality of learning or teaching in a university. For university administration to approve funding for ICTs resources, they have first to buy in to the notion that the cost will add value by improving the quality of teaching in the institution. Faculty and university administration value teaching and student learning and they would only approve investments which have a high chance of enhancing the learning outcomes. This therefore means that university administration may be reluctant to approve funding for ICTs resources which have not been tried and tested as universities in Kenya operate under very constrained budgets. Many ICTs resources are not funded in universities because the administration do not understand how that cost is justified since they do not perceive any value in learning and training for such resources (Tselios & Papadopoulou, 2011). Since most ICTs resources change a lot, many administrations are reluctant to tie their funds into such resources due to the risk of failure involved. When ICTs tools are perceived to be useful, their adoption in higher education institutions will be high and vice versa.

Perceived usefulness also can emanate on the side of the users. For ICTs to be adopted and used continually, the users, in this case faculty and students must have seen perceived usefulness in the ICTs for them to accept the ICTs. Even if administration invests in ICTs and the users do not see any useful value in such assets, the adoption of such ICTs will be poor. This study sought to establish whether perceived usefulness was a factor that determines the adoption of ICTs in universities in Kenya.

Perceived enjoyment is another factor that can hinder or motivate application of ICT resources in education. Perceived enjoyment can motivate faculty or students to apply a certain ICTs if they think that they would enjoy the experience but would be very reluctant to apply the resource if they think they would not enjoy the experience.

Perceived enjoyment includes factors such as the opportunity the ICTs brings in the use of new technology, the challenge intellectually brought by the ICTS resource and the social value coming with the use of the ICTs and the overall satisfaction of the assignment if the Gadget or resource is used. ICTs which bring very low perceived enjoyment are not likely to be adopted and continually used by faculty and students.

Some institutional factors can enable or hinder the application of ICTs in learning and teaching in universities. These factors include planning time, technical support and incentives from the university administration, financial outlay available to invest in ICTs and the orientation of the university towards use of ICTs. Faculty or students in a university which have a culture of using technology are more inclined to using technology than those who attend universities which do not have a culture of using technology in teaching and learning. Some universities also encourage the use of ICTs in teaching and learning by providing support and grants for online or digital resources. A university that has a lot of faculty members using ICTs in teaching motivates other faculty members to use ICTs also. Likewise, a university with the financial capability to invest in ICTS is likely to have higher ICTS adoption rates than the university with fewer financial resources.

Having rewards and incentives for use of ICTs in either teaching or learning or lack of them is another important factor determining usage of ICTs in universities. Lack of rewards and incentives for use of ICTs indicate that the university is not very serious in encouraging use of ICTs in education (Roca & Gagne, 2008). Lack of rewards and incentives to motivate faculty members and students encourages the traditional methods of teaching and learning in such universities. The university that has incentive or reward structure on the other hand encourages innovative and effective learning or teaching methodologies that use ICTs.

Time can also enable or hinder use of ICTs in university education. Preparing materials based on technology requires time and many faculty members may lack this important resource. The teaching fraternity in a university requires time to train, familiarize

themselves and prepare to use ICTs in teaching and research. Faculty also needs time to experiment and perfect with new ICTs before they can comfortably integrate these resources in their teaching and courses. This takes time and since ICTs are ever changing, faculty needs time to continually update themselves with the changing ICTs environment. In such a case, faculty members need to be trained on how to use ICTs effectively since they can save on the same time if their use is efficient. Having adequate time enables ICTS application in education and vice versa.

Support and training is another enabler to ICTs usage in university education. Support and training refers to the assistance and technical support that students and faculty are provided with either in the classrooms, library or any laboratory where ICTs are being used. Support and training can also be provided online through active websites, instant messaging or through any other online or offline support module. Adequate support and training encourages the faculty and students to use ICTs in their training or learning. However, lack of training and support discourages students and faculty to apply ICTs due to the hardships expected from their use.

Self efficacy and having knowledge and skills to use the specific ICTs is another factor that can enable or hinder ICTs usage in education (Tai & Ting, 2011). For any ICTs resource to be easily adopted and continually used, it must be user friendly. ICTS resources that are not user friendly are not likely to be adopted nor accepted. This study will seek to establish whether user self efficacy and knowledge and skill levels are enablers or hindrances to adoption of ICTs in university education in Kenya.

3. RESEARCH METHODOLOGY

3.1 Research Design

To get a good understanding of ICTs adoption and application in higher education institutions in Kenya, I applied a descriptive study design. This descriptive design was cross sectional which involved an inquiry from a cross section of higher education institutions in Kenya. Cooper and Schindler (2006) indicate that a descriptive research design is a scientific method which involves observing and describing the behavior of a subject or a number of subjects without influencing it in any way. In this study, I had an aim of assessing the extent to which ICTs are applied in higher education, the enabling factors and the barriers thereto. The aim of the research was to describe the situation and report it as is while interpreting the variables under study in their natural contexts. Robson (2002) posited that this method can enable the researcher to acquire a lot of information through description of the situation without affecting it in any way. Welman (2005) indicated that descriptive research design is the best in learning about situations or conditions as they are in a particular setting. The method was suitable for my purposes since it assisted in describing and clarifying how ICTs are being applied in education at higher education institutions. The design also enabled an interpretation of the survey responses from questionnaires and interviews. Furthermore, the descriptive design enabled the study to have in-depth data and a lot of detail. This enabled me to retrieve more information and meaning from the research.

This descriptive research was aimed at gaining different perspectives and drawing attention to the different factors and considerations in higher education institutions in Kenya that affected the adoption and application of ICTs in teaching and learning. Descriptive methods seek to give a description, observation and a documented analysis of phenomena that is occurring naturally that cannot be objectively ascribed a value. This design helped me in coining questions that looked to describing relationships and explaining what things are like without predicting direction of relationships or relationships between variables. The variables in this study that needed to be studied are ICT tools, teaching, learning and the human subjects which in this case are the faculty and students in these higher education institutions.

I applied a cross sectional survey research since the study required data from different universities in the Kenyan higher education system. A cross-sectional study is a descriptive study seeking to get information at a particular point in time from the whole population or from a subset of a population (Gall, Gall & Borg, 2007). This study is cross sectional since it sought information from all the universities in Kenya. The cross sectional methodology is aimed at getting information from different higher education institutions in Kenya to get a feel from different perspectives. This study sought information from various institutions in the Kenyan higher education system and hence provided a general view of how ICTs is applied in the Kenyan context as a whole and the factors that stimulate or hinder such adoption and application.

The descriptive study and the cross sectional perspective gave an overall feel of how ICTs are applied in universities in developing countries of Africa. This research design had been successfully applied before by researchers such as Teo and colleagues (2011) in assessing e-learning acceptance by university students in Thailand and Hung (2011) in a study on ICTs use by journalism professors in Colombia.

In this chapter, I present the methodology that was applied in the study. As a researcher, I have a belief and a way of interacting and viewing the surroundings. However, I have to follow certain standards and rules which guided my selected methodology and actions. The chapter provides in detail the research design chosen and the data sources including a detailed explanation of the study site. I also present the research instrumentation, data collection exercise and data analysis.

Data was collected from 27 universities in Kenya from their Nairobi campuses. Eighty one (81) questionnaires and 8 semi-structured interviews were used to collect data. The questionnaires included closed-ended and open-ended items designed to collect quantitative and qualitative data. The interviews were semi-structured to collect qualitative data aimed at corroborating the data from questionnaires. The study was carried out in Nairobi Kenya. Nairobi is the capital and largest city of Kenya. The city is

also the most populous city in East Africa, with a current estimated population of about 3 million. The 2009 Census in Kenya established that in the administrative area of Nairobi, there were 3,138,295 inhabitants who lived within 696 km² (Central Bureau of Statistics, 2009). Nairobi is currently the 12th largest city in Africa. The city is one of the most prominent cities in Africa both economically and politically. It is home to thousands of Kenyan businesses and over 100 major international companies and organizations, including the United Nations Environment Programme (UNEP). It is also the home of the main coordinating headquarters for the UN in Africa & Middle East, the United Nations Office in Nairobi (UNON) (Bauk, 2007). The city is also home to national and international higher education institutions which have campuses or liaising offices in the city.

The mixed research was applied in this study in a way that the resulting combination or mixture of the qualitative and quantitative methods gave the study an advantage in complementing the strengths of the two methods and ensuring that there were no overlapping weaknesses. The mixed models approach was able to provide insight into ICTs usage in these universities in a way that one model could not have made possible (Creswell, 2013). This gave me a deeper insight into how ICTs are adopted in universities, whether it is seen as valuable and any hindrances or shortcomings that emanate from ICTs usage. The mixed methods approach also enabled me to get perceptions and respondent views on the subject matter. This enabled a discovery of some elements that would have been missed if only a quantitative or a qualitative approach had been used. The two research models were also applied to focus on the same phenomenon (ICTs adoption in universities) and the results compared to establish corroboration which means that the study would have superior evidence for the result.

3.2 Data Collection

Data for this study was collected using two instruments in a triangulation approach. This was through questionnaire and interviews. Creswell (2008) observed that triangulation provides an inquiry with in-depth data and also increases the confidence in the research findings. The triangulation approach in this study enabled different dimensions of ICTs

adoption and application in higher education institutions in Kenya to be considered. This is due to the observation that a combination of different methods in an inquiry improves the accuracy of the data received and also improves constituency as a more complete picture of the issues under study is provided. This triangulation approach enabled me to capture a holistic and a more complete perspective of ICTs adoption and application in higher education teaching and learning in Kenya.

There was one set of questionnaire to both the students and faculty. Informants were contacted face-to-face at the university campuses in Nairobi. Further communication was through e-mail or telephone whichever the informant selected. Subsequent communication was important to ask for clarification or provide a query about returning or mailing of the questionnaires. The questionnaire was semi-structured with questions on the level of self-efficacy and ICTs integration into higher education policy and practice, the level of awareness and adoption of ICTs in higher education institutions and the various factors hindering the effective utilization of ICTs for sustainable higher education development. Data collected through the questionnaires was both quantitative and qualitative.

The questionnaire (Appendix I) had four sections. Section A had six questions about level of awareness and adoption of ICTs in the higher education institution. This was aimed at establishing how aware the faculty and staff were about different ICTs and their level of adoption of these ICTs specifically for learning and teaching. The section had questions on how satisfied the respondents were with ICTs facilities in the institutions. The section also had Likert scale questions where rating was on a scale of 1-5 (1 = No competence and 5 = Very competent) which were aimed at establishing the level of competence of the faculty and students in applying the stated software and instructional tools and materials. The section also had questions aimed at establishing the frequency of usage of the listed instructional tools and materials. The questions were rated on a scale of 1-5 (1 = Never and 5 = Everyday). Likert scale questions were also posed on the professional development provided to students and faculty about the listed ICTs in the university. Rating scale was on 1-5 (1 = Never and 5 = Everyday).

Section B of the questionnaire had 2 questions aimed at investigating the level of self-efficacy and ICTs integration into higher education policy and practice. The two questions had several Likert scale sub-questions on a scale of 1-5 (1 = Never and 5 = Monthly) that were aimed at investigating the level of self efficacy of the students and faculty in ICTs application. The section also had 15 sub-questions involving factors that encourage or discourage use of ICTs in learning. These sub-questions had a 1-5 Likert scale rating (1 = Disagree totally and 5 = Agree totally) involving an analysis of perception of the respondents about ICTs usage at their respective universities.

Section C of the questionnaire was aimed at establishing the factors hindering the effective utilization of ICTs in education. Some barriers which had been reviewed from previous studies were listed and respondents were required to rate the challenges on how they applied to their context. The rating was on a scale of 1-5 (1 = Disagree totally with 5 = Agree totally). The section also had an open question which was aimed at soliciting recommendations that the respondents had for the university administration, faculty or students regarding effective application of ICTS in learning or instructions. This question was aimed at getting the view of the respondents on how application of ICTs in learning at the institutions could be improved.

The questionnaire method was used due to its economy, ease of administration and its standard form. An earlier study by Teo and colleagues (2011) which assessed e-learning acceptance by university students in Thailand utilized questionnaire method to collect data which was the same instrument utilized by Laxman (2011) in a study on the adoption of clickers in higher education. The questionnaire was successful in collecting the required data in both these cases.

Before final administration of the questionnaires to the study subjects, the questionnaire was tested for validity and reliability. Validity means that the questionnaire items are measuring what they are expected to measure (Mugenda & Mugenda, 2003). There are various types of validity that need to be tested. These include content and face validity

which were both important in this study. Face validity entails having questions in the questionnaire that seem to be measuring the study constructs to a reasonable person. This usually applies a common sense approach but can also rely on experience of how subjects respond to survey questions. I relied on the supervisor to determine face validity of the questionnaire where various amendments were suggested which I considered.

Content validity according to Gall and colleagues (2007) tells whether an item measures or describes what it is supposed to measure or describe. Content validity indicates whether all important aspects of the variable under study are covered. Clear definitions of the construct and its components are useful for content validity. I determined content validity of the questionnaire through the results and comments of a pilot study. A pilot study was conducted where 7 faculty and 8 students from the University of Nairobi were used as a pilot study sample. The subjects in the pilot study were requested to indicate their understanding of the questions, any questions with ambiguities and comment on the time required to complete a questionnaire. Recommendations and comments from the pilot study sample were used in drafting the final questionnaire that was used to collect data. Items that failed to measure the variables they were intended to measure were amended or removed. The subjects that were used in the pilot study were not included in the main study.

On reliability, Best and Khan (2002) contend that a test is said to be reliable to the degree that it measures consistently and accurately what it is expected to measure and also yields comparable results when administered many times. I used Cronbach's alpha technique of measuring internal consistency or reliability. The reliability of the scales used was assessed for reliability with a target reliability alpha of 0.7. All scales had a reliability between 0.82 and 0.88 which was above the 0.7 required. This therefore indicated that the items in the questionnaire were reliable. Using the Cronbach's alpha was made possible since only respondents from the University of Nairobi participated in the try out. It could not have been possible if the pilot was done in various universities due to the different

contexts of the different universities. After the final amendment to the questionnaire, administration was done between July 8th and August 16th of 2013.

On the interviews, the rating that was applied to get the sample was the one on ICTs application and integration of the higher education institutions in East Africa (<http://www.4icu.org/topAfrica/>). A sample of two public and two private universities were selected for representativeness. This formed a total of 8 interviews. The interviews were carried out to complete the triangulation methodology which was aimed at getting in-depth information on the social constructs of how ICTs are perceived, adopted and applied in learning and teaching at the higher education institutions. The interviews with the 8 participants were arranged and conducted face to face between July 15th and August 30th 2013. I arranged the interviews with the 8 selected interviewees at either their offices (faculty) or lecture rooms or any other designated places for the students. The interviews were arranged to take place during normal working hours in Nairobi which are from 8.00 am to 5.00 pm.

I used an interview (Appendix II) guide which had questions that needed to be asked if the interview was to contribute by giving more information for the inquiry. The interview guide had some open questions which were aimed at collecting qualitative data. The interview guide had four sections. Section A had 6 questions aimed at establishing ICTs facilities and common practices in the specific institution regarding the application of ICTs in education. This entailed questions regarding ICTs facilities the university have, adequacy of the facilities, currency of the facilities and the tasks that faculty and students use ICTs facilities for.

Section B had 10 questions involving competence of faculty on ICTs usage. This interview section was aimed at the faculty and questions asked included the level of expertise in ICTs usage among the faculty, number of years the faculty member had been using ICTs in teaching, planning on using ICTs, support for ICTs usage and application of ICTs in tasks and whether the faculty use ICTs to share best practices and reduce bureaucracy.

Section C of the interview guide was aimed at establishing the level of student's competence in ICTs usage in learning. Six questions in this section were aimed at establishing the skills and competencies that students have, that enable them employ ICTs in learning. There were also questions on whether students use ICTs to support other aspects of learning except IT related courses, whether students like to employ ICTs in learning activities and whether students are taught legal and ethical practices related to ICTs use.

The last section of the interview guide was on ICTs policy and strategies by the university. This section was focussed on determining the importance or lack thereof with which the university perceives ICTs as an enabler in education. This section had questions aimed at determining the policy interventions and strategies put in place to improve ICTs adoption and application in teaching and learning. The section also had questions on policy interventions recommended to enhance ICTs adoption and application and whether the university administration has policies to enable equitable access to ICTs resources for all students and faculty.

The purpose of the interview guide however was not to restrict me on the questions that I had to ask the interviewees, but to remind me of the important questions that had to be asked. This guide helped me a lot in the interview sessions as I did not overlook any part and I ensured that all levels of inquiry were given equitable weight. The guide also helped me in getting the information which was relevant to the inquiry. The data that was received from the interviews was taken in short note form and compiled into manuscripts that were later used in qualitative analysis.

Primary data was the only type of data that I collected for the purpose of this thesis. This data was collected through questionnaires and interviews. Both of these were conducted in English which is the formal language in higher education institutions in Kenya. Questionnaires were administered to the sampled subjects (both faculty and students) at their Nairobi campuses. Both the paper based questionnaire and its electronic format

were provided as per preference of the subjects. Those who agreed to the paper questionnaire were administered with it and an agreement between I and them was arrived at, for collection purposes. Those respondents who preferred the electronic questionnaire were provided with the questionnaire electronically through their emails. I gave these respondents my e-mail address where they were expected to mail the questionnaire after filling. I also requested for their phone contacts in order to follow up if the need arose.

In this study, I adhered to ethics in research, the first issue being consent (Best & Khan, 2002). This is the procedure by which research subjects choose whether or not they wish to participate in a research study. Consent involves three elements: capacity, information, and voluntariness (Gall, Gall & Borg, 2007). All three elements must be satisfied for consent to be given. Capacity is defined as the ability to acquire or retain knowledge, and the authority, or legal qualification, to perform an act. Each subject in this study was given an opportunity to decide if he/she wanted to participate. Information consists of insuring the subjects are told, and they understand, the purpose of the study and their roles as subjects. In this study, I expressly informed the respondents that the information provided was for the academic thesis where the findings could be applied to inform policy and practice in ICTs application in higher education. Voluntariness means that the subject chooses to be in the study of his/her own free will and are free to withdraw from the study at any time (Mugenda & Mugenda, 2003). There was no element of force, fraud, deceit, duress, ulterior form of constraint or coercion to get a subject to participate. I respected the wish of those respondents who did not like to participate in the inquiry. I also informed the respondents that there was no reward for participation prior to the study. Since this inquiry did not involve any experiments, there was no harm expected to occur to the respondents. The subjects needed only to spare some time to respond to the questionnaires and interviews. For consent to be voluntary, the informants were made aware of the number of questions on the questionnaire and amount of time expected to be spent on a single interview.

The other ethical issue that was observed in this study is privacy (Best & Khan, 2002). Every subject had the right to keep private the fact that he/she had participated in the study, and the right that information given to me was not linked to them. Research often is based on information obtained from the subjects. The information provided by the subjects was used in the study but no personal information was collected to ensure that the individual's anonymity was upheld.

Finally was the issue of deception. Deception in research involves the misrepresentation of facts related to the purpose, nature, or consequences of a research study (Gall et al., 2007). Subjects in this study were fully informed in order to give consent. An introduction letter (Appendix III) accompanied every questionnaire where the purpose, nature and consequences of the research were explicitly provided.

3.3 Participants

I collected both qualitative and quantitative data. Quantitative data was collected through questionnaires while qualitative data was collected through interviews. First, a survey was conducted where 81 questionnaires were distributed in the 27 universities in Kenya. This involved randomly selecting two students and one faculty member in each university. The sample though small was justified as the method of selecting respondents was random and the study was more on the institution rather than the person. The questionnaire was composed of multiple closed-ended (quantitative) type items as well as several open-ended (qualitative) type items. This questionnaire survey was followed by eight semi structured interviews where qualitative data was collected. The questionnaire and interview guide is attached in the appendix of the completed thesis. The eight interviews were done in four universities. Of these four universities, two were top rated universities (one private and one public university) in relation to application of ICTs whereas two (one private and one public university) were the bottom rated in ICTs usage. The study focussed on both private and public universities as it required a holistic view of how ICTs are applied in higher education. The public and private universities in Kenya are very different in respect to funding, establishment and their clientele. Public universities are funded by the government and have better physical structures than their

private counterparts. Further, public universities are given first priority when it comes to selecting students to join them from secondary schools. The private universities on the other hand serve most of the clientele that do not get places in the public universities. They are funded by private sponsors or churches. However, both public and private universities are very important in meeting the higher education needs of the country as a majority of those who qualify for university places in Kenya do not get a place at the public universities. This makes a study on how ICTs are adopted in higher education incomplete when a study focuses on either one type of higher education institution. It is therefore my view that a study on the universities had to incorporate both the private and public institutions.

Data for the purposes of this study was collected in university campuses in Nairobi. Nairobi is home to several universities including the oldest which is The University of Nairobi. Various other universities have cropped up in early 2010s following the president of Kenya giving several institutions a charter for university status. However, the population of this study was the universities that were registered and accredited by the Commission of University Education to operate and offer their services in Kenya. As at December 2012 there were a total of 27 universities provided by the commission website (www.scienceandtechnology.go.ke). Universities having branches (campuses) in Nairobi, Kenya formed the target population from which subjects for the study were derived from. Selection of universities with campuses in Nairobi was necessitated by the need to narrow down the scope and also by accessibility since some universities are situated in inner and remote parts of the country which would have brought enormous challenges if they were included in the study. However, every major university in Kenya has a campus in Nairobi which makes this study site justifiable.

The study applied different sampling techniques to make the study subjects representative of the target population and also to make the study scope manageable for the thesis purposes. These included multistage sampling technique and stratified sampling (Freedman, Pisani & Purves, 2007). Multistage sampling technique was applied on the study levels and lecture halls. This involved randomly selecting one year of study from

the Nairobi campus of every selected university. Students belonging to the selected study year were randomly selected using admission numbers. Faculty members were selected randomly from each selected Nairobi campus. There were 3 potential respondents from each campus (2 students and 1 faculty member). This formed a total of 81 potential respondents. Quantitative data through questionnaires was collected from these 81 subjects.

Qualitative data was collected through interviews. Interviews were arranged with one student and one faculty member from four universities (two private and two public). The selection was based on the best rated in each category and the worst rated (<http://www.4icu.org/topAfrica/>). This formed a total of 8 interviews. The interviews were performed after analyzing data from the questionnaires to establish what requires to be investigated further. I focused on two top rated and two bottom rated universities for the interviews to get a feel and deeper insight on both of these scenarios. The top rated universities were expected to provide a deeper insight on how they view ICTs, how ICTs are applied in training and learning, the financial investment in ICTs, media used, enabling factors and the challenges these top rated universities have dealt with in relation to applying ICTs in education. The bottom rated universities were incorporated in the interviews in order to give the researcher a deeper insight into why the universities are challenged in applying ICTs in education. This is in line with the research question which aims at establishing the overriding hindrances to ICTs application in education.

3.4 Analysis Methods

After data collection was data analysis. I checked the data collected through the questionnaire and interviews for completeness. I then coded the quantitative data and summarized it on the basis of summary statistics through the aid of statistical package for social sciences (SPSS). Summary statistics such as percentages, means and measures of location were utilized to indicate how ICTs are applied, enabling factors and barriers to adoption of ICTs. Presentation of the summary statistics was in form of charts and tables.

Data from interviews was in note form which is in line with what Robson (2002) had observed. This was analyzed using content analysis and thematic summary analysis where the information was put into themes and discussed. I arranged the data into themes and then gave a discussion and interpretation of the data.

Analysis of data in an interview environment is a continuous process that progresses as the interview progresses. Data analysis was done through content analysis (Mugenda & Mugenda, 2003). This data analysis technique involved five steps according to Taylor-Powell and Renner (2003). Step one involved careful reading of the notes and clearly understanding them. I then wrote down any interpretations and impressions that I might have had as I went through the data. This step also involved revealing whether the data was quality or if it had any meaning. In this study, this step involved arranging the different responses into the three major categories. These include level of self-efficacy and ICTs integration into higher education policy and practice, the level of awareness and adoption of ICTs in higher education institutions, and the various factors enabling or hindering the effective utilization of ICTs for sustainable higher education development.

The second step involves focusing the analysis to the ability of the data in answering the research questions. Data analysis was in this case be focused and arranged according to the research questions (Cooper & Schindler, 2006).

The third step involved categorizing the information. This entailed identifying the themes and organizing the themes in distinct categories (Taylor-Powell & Renner, 2003). This involved reading and re-reading the narrative data and identifying the categories that the data relate to. The three major categories related to the research questions on self-efficacy and ICTs integration into higher education policy and practice in Kenya, the level of awareness and adoption of ICTs in higher education institutions in Kenya, and the various factors enabling or hindering the effective utilization of ICTs for sustainable higher education development.

Step 4 involved identifying patterns within and between different categories (Taylor-Powell & Renner, 2003). The data was organized by research questions in this study. I identified similarities and differences both within and outside the questions and assessed the relative importance of different responses. I then highlighted the variations in responses from the different universities. The information pertaining to every research question was then summarized.

Step five involves interpretation. The themes, similarities and dissimilarities were used to explain the findings (Taylor-Powell & Renner, 2003). The meaning that is depicted by the data was brought out in this stage. This step brings out the major lessons learnt, the new things that are brought out, what findings concur with findings from other studies and synthesizing the information and getting its meaning. In this section, direct quotes from the interview were provided to give credence to the data. I also gave my interpretations and the meaning I gave to the research responses. I compared the responses to what other studies had found and established how this study related to the previous studies.

4. Results of the Study

The results of the study are presented putting into consideration the research questions in need to give answers to. The research questions in the study were based on the research theme which aimed at establishing use of information and communications technology in higher education in Kenya. The research questions for the study were: 1) What is the level of self-efficacy and ICTs integration into higher education policy and practice in Kenya? 2) What is the level of awareness and adoption of ICTs in higher education institutions in Kenya? and; 3) What are the various factors enabling or hindering the effective utilization of ICTs for sustainable higher education development? As per my theoretical framework, the answers to these questions were provided from the survey and in this section, I provide the quantitative and qualitative results. Eighty one (81) questionnaires and 8 interviews were planned. All interviews planned were conducted while 67 of the 81 distributed questionnaires were successfully collected. This was a response rate of 82.7%.

The 67 respondents were distributed as follows; 48 were students and 19 were lecturers. Further analysis indicated that there were 38 responses from private universities and 29 from public universities. In addition to the 67 questionnaires, there are also 8 interviews in the data.

Data from questionnaires was analyzed quantitatively through descriptive statistics and presented in tabular form. Data from interviews was analyzed qualitatively. Coding is depicted as the first process in qualitative data analysis. The process involves identifying themes, relationships and patterns in the data and making sense of it (Best & Khan, 2002). This is where the researcher takes part in the data analysis and gives an interpretation to the data. Coding entails identifying themes, concepts, patterns, and relationships. In this study, this exercise entailed reading through all the responses from the 8 interviews. Reading through the notes entailed taking notes and identifying the major themes. The 8 interviews were planned to have 4 interviews from private universities and 4 from public universities. Interviewees were coded such that

interviewee numbers 1 – 4 were from private universities while numbers 5 – 8 were from public universities.

4.1 Level of Awareness and Adoption of ICTs

There were specific questions in the questionnaire and during interviews that sought to determine the availability and access of ICTs to the different subjects: both the students and the faculty. The availability and access to ICTs is the basic minimum for any institution to apply ICTs in education. Both the faculty and the students were asked about the ICTs they had and results from the question are presented in table 1.

Table 1: Students and faculty with access to ICT resources

ICTs resource	At University	At home/hostel
Desktop computer	100%	33%
Laptop/notebook computer	27%	43%
A tablet device	15%	32%
Smartphone	0%	65%
Internet connection	100%	56%

Availability of ICTs was not regarded as critical in most cases as results indicate in table 1. This is because all respondents (100%) indicated that they had access to desktop computers in the university with 33% having access to the same in their hostels or rooms. All respondents (100%) had access to Internet connection at the university with 56% having access to Internet at hostels or at their homes. This is made possible by the increase in the number of smart phone and tablets holders in Kenya. This is further stressed by interviewee number 4 who retorted in the interview that,

‘With smartphones these days, you don’t need to have a desktop, laptop or be linked with the wide area network (WAN) to have access to hardware and software; you just need a smartphone that has 3G or WiFi enabled.’

Further results indicate that 65% of the responding students and faculty had access to smartphones and these were not available at the university. This is understandable as the university mainly provides desktops, laptops or tablets as the major hardware to access ICTs. Regarding accessibility of lap tops, 27% indicated to have access to them in university with 43% indicating to have access to laptops at their hostels or at home. This is still low as it indicates that less than half of the responding faculty and students had access to laptops at home/hostel.

However it is noted that all the respondents indicated that they had access to desktop computers at university with the same number indicating to have access to internet connection at the university.

Access to ICTs in private universities was on average better than in public universities. Though many private universities had fewer ICTs, these ICTs served a less number of students as most of the private universities have low student numbers. Interviewee number 3 stressed this as follows;

‘Access to ICTs resources such as internet and computers is not a problem in this campus as there are enough resources for the faculty and student population. In any case, most of the time, the resources are idle since the students and faculty have their own ICTs’.

This indicates that resources for use by faculty and staff in private universities were easily accessible. However, access to these resources and services was poor in public universities as it was indicated by interviewee number 8;

‘Access to ICTs is poor. Sometimes it is frustrating when you are in need of a computer to do an assignment or type some class work. You can spend a whole week trying to find a computer not in use in vain. Sometimes we are forced to outsource these services outside the campus when the deadline is looming’.

This frustration was echoed by interviewee number 7 who observed that;

‘Many times students are late in handing in their assignments or term papers and they cite inaccessibility of computers as the main issue. The situation is critical as there are about 80 computers to serve a student population of 1800’.

These sentiments from the interviewees point out that though students and faculty may have access to ICTs and services at the university, this access is inadequate in some universities mostly public due to the high student to ICTs ratio.

Satisfaction over the ICTs and services at the institutions was assessed. Students and faculty were required to indicate how satisfied they were with the ICTs facilities provided by the university. Rating was on a scale of 1-5, with 1 indicating very unsatisfied and 5 indicating very satisfied. Results from this question are presented in Table 2.

Table 2: Satisfaction with ICTs facilities at university

Satisfaction	Frequency	Percent
Very unsatisfied (5)	5	8
Unsatisfied (4)	17	25
Neutral (3)	12	18
Satisfied (2)	27	40
Very satisfied (1)	6	9
Total	67	100

Study results indicate that 40% of the respondents were satisfied with 9% being very satisfied. The rest were either neutral or unsatisfied as the results show. These results indicate that more than half of the respondents were both unsatisfied or neutral regarding ICTs and facilities at their universities.

Interviewee number 7 was satisfied with ICTs facilities in the University and observed as follows;

‘The university has state of the art ICTs facilities both in hardware and in software. They are updated on a regular basis in order to keep tabs with the technology advancement of today. The university though faced with high demand for ICTs resources has a low ration of computers to students and faculty’.

Interviewee number 2 further reinforced the satisfaction with ICTs facilities and resources by stating that;

‘The internet age in a higher education institution is very important and the university seems to understand this. They are using this powerful tool to enable students to research and learn effectively through research and interaction with global community’.

However, some respondents indicated dissatisfaction with ICTs facilities in their universities with interviewee number 8 indicating that;

‘While the university has a good number of computers, most of the computers are in a state of disrepair and some are very outdated. The university does not seem to have a strong ICTs policy on how the internet technology is supposed to be integrated into the education system. There seems to be a poor or non existent ICTs maintenance and repair policy in this university. One can walk into the computer lab only to find that all idle computers are not working. This is very frustrating regarding that this is an institution of higher learning’.

Respondents were also required to indicate their view on whether the university had provided adequate financial resources for ICTs to enable its application in teaching and learning. Results presented in table 3 indicate that 50% of the respondent students and faculty were of the view that the university had not provided enough financial resources for ICTs while 42% were of the view that the university had provided enough financial resources.

Table 3: University has provided adequate financial resources for ICTs

Satisfaction	Frequency	Percent
Yes	27	42
No	32	50
Don't know	5	8
Total	64	100

The study sought to determine the software competence among students and faculty. The study aimed to establish how knowledgeable the students and faculty were in using ICTs software which is a requirement for efficient use of ICTs. Results presented in table 4 indicate that word processors (46.5%), Search Engines (44.8%), Electronic Mail (40.3%) and Chat, forum and blogs (40.3%) were the softwares where most competence was observed. These softwares had the highest number of respondents indicating that they were highly competent in them. Softwares with most of the respondents having no competence were Web Page Development Tools (59.7%), Discussion Lists and Newsgroups (52.2%) and Electronic Encyclopedia and/or Atlas (33.3%). Softwares that are important in education that respondents did not have enough competence in were computer aided instruction software where 24.2% had no competence with 33.3% having little competence. Discussion lists and newsgroups was another education related software where 52.2% of the respondents had no competence with 31.3% reporting a low competence.

Table 4: Software competence among students and faculty

Software	1	2	3	4	5
Word Processors (Word etc.)	0	0	31.3	22.4	46.3
Spreadsheets (Excel etc.)	10.4	22.4	32.8	16.4	17.9
Presentation Software (PowerPoint etc.)	14.9	25.4	26.9	19.4	13.4
Databases (Access etc.)	29.9	25.4	23.9	11.9	9.0
Computer Aided Instruction Software	24.2	33.3	13.6	9.1	19.7
Web Page Development Tools (FrontPage, dream weaver etc.)	59.7	31.3	1.5	1.5	6.0
Web Browsers (Mozilla, Netscape, Explorer etc.)	0	1.5	32.8	40.3	25.4
Search Engines (Google, yahoo etc.)	0	0	29.9	25.4	44.8
Electronic Mail (e-mail)	0	0	29.9	29.9	40.3
Discussion Lists and Newsgroups	52.2	26.9	3.0	13.4	4.5
Chat and/or Forum of blogs	0	0	31.3	28.4	40.3
Electronic Encyclopedia and/or Atlas	33.3	15.2	12.1	21.2	18.2
Instructional Films (video, CD, VCD etc.)	0	3	31	39	27

The frequency of usage of instructional tools was also investigated in the study where respondents were required to indicate how often they applied or used listed instructional tools. Rating for frequency of usage was on a scale of 1-5 where 1 = Never, 2 = Seldom, 3 = a few times per month, 4 = more than once a week, and 5 = Everyday. Analysis of the results was through percentages for each response with results being as presented in table 5.

Table 5: Frequency of usage of instructional tools

Instructional Tools and Materials	1	2	3	4	5
Board	0	0	29.9	40.3	29.9
Overhead Projector	13.6	27.3	30.3	27.3	1.5
Opaque Projector and/or Document Camera	16.4	28.4	26.9	26.9	1.5
Multimedia Computer	0	1.5	28.8	37.9	31.8
Computer – Projector System	11.9	25.4	32.8	28.4	1.5
Internet/Web Environment	50.7	28.4	7.5	10.4	3.0
Television/Video	55.2	31.3	6.0	7.5	0
Radio Cassette Recorder	50.7	32.8	7.50	9.0	0
Video Camera	55.2	29.9	4.5	10.4	0
Slide Projector	14.9	25.4	32.8	26.9	0
Printed Materials (journals, books, worksheets etc.)	0	4.5	32.8	41.8	20.9

Study results as presented in table 5 show that multimedia computer, boards and printed materials had the highest proportion of respondents using them everyday with 31.8%, 29.9% and 20.9% respectively. Video camera, television and the web environment were the instructional tools where most of the students and faculty had never used with 55.2% for the former two and 50.7% for the latter.

To effectively apply ICTs in training and instruction effectively, both the faculty and students require professional or peer development. The study sought to establish professional development provided to the faculty and students on the different information and support resources. Rating scale for support was on a scale of 1-5 where, 1 = Never, 2 = Seldom, 3 = a few times per month, 4 = more than once a week, and 5 = Everyday. Responses were analyzed based on percentages for each response and results are as presented in table 6. Results point out that support services available everyday were mainly for internet (29.9%), from colleagues in the university (23.9%) and support from experienced faculty and support staff on ICTS (22.4%). Resources that were likely to never have support were printed materials (52.2%), self experiment (52.2%) and support from other colleagues in other universities (25.4%).

Table 6: Professional development provided to students and faculty about the following ICTs

Information Resources	1	2	3	4	5
Internet	0	10.4	26.9	32.8	29.9
Printed Materials (manual or journal etc.	52.2	28.4	7.5	10.4	1.5
Self experiment	52.2	34.3	4.5	9.0	0
Participating seminars or taking courses	0	55.2	31.3	7.5	6.0
In-service Education	0	52.2	34.3	7.5	6.0
Support Resources					
Experienced faculty and support staff on ICTs	10.4	7.5	23.9	35.8	22.4
Colleagues in the university	0	0	31.3	44.8	23.9
Other colleagues in other universities	25.4	43.3	31.3	0	0
Technical support units in the university	0	20.9	43.3	19.4	16.4
Collaboration and joint projects with ICTs organizations	17.9	61.2	20.9	0	0

4.2 Level of Self-Efficacy and ICTs Integration into Higher Education

The study also had an objective of establishing the level of self efficacy and the level of ICTs integration in the surveyed universities. The first task for the study was to establish the factors that enabled or encouraged adoption of ICTs in the higher education institutions. In the questionnaire, there were factors that encourage ICTs adoption and application in learning and instruction that were listed. The sampled students and faculty were required to indicate the ones that applied to the university and the level to which they were present. The rating used was on a scale of 1-5, with 1 = Never, 2 = once around 2 years, 3 = Once a year, 4 = more than once a year, 5 = Monthly. Percentages were used to analyze the responses with results as indicated in table 7. Results indicate that respondents who pointed out that developing the policies and plans for diffusion of ICTs in learning and teaching were done monthly were 25.4% with 37.3% indicating that this was done more than once in a year. Encouraging and rewarding the technology application, design and usage in curricular activities was mainly done once a year

(42.4%) while investments of the institution on ICTs infrastructure were also mostly done once a year (41.8%). As indicated in the table 7, most of the enabling factors and practices for ICTS adoption were mostly performed once a year.

Table 7: Factors that encourage ICTs adoption

Policy or Practice	1	2	3	4	5
Rewarding the technology usage efforts of faculty in instructional activities	0	27.3	40.9	31.8	0
Encouraging and rewarding the technology application, design and usage in curricular activities	22.7	34.8	42.4	0	0
Investments of the institution on ICTs infrastructure	0	34.3	41.8	23.9	0
Investments of the institution on in-service education programs for staff and students	10.8	23.1	30.8	29.2	6.2
Investments of the institution on the support services of instructional technologies	11.9	29.9	28.4	29.9	0
Developing the policies and plans for diffusion of ICTs in learning and teaching	0	9	28.4	37.3	25.4
Carrying out the studies for integration of technology into curriculum	10.4	22.4	28.4	32.8	6.0

Further to establish self efficacy in ICTs adoption, respondents were required to indicate their perception about use of ICTs in the listed statements. The statements were aimed at forming an opinion about the individuals and their efficacy in ICTs skills. The rating was also on a scale of 1-5, where 1 = Disagree totally, 2 = Disagree partially, 3 = Neutral 4 = Agree partially 5 = Agree totally. Responses were also analyzed using percentages with results being as presented in table 8. Most respondents (56.7%) strongly agreed to the statement that ‘I know what to do when using computers in learning or instructional environments’ with a similar percentage strongly agreeing to the statement that ‘I think that I can use instructional technologies in class activities more effectively day by day’. These two statement showed high self efficacy with most respondents having a belief that

they are capable of using computers and other ICTs instructional tools. A percentage of 56.7% also strongly agreed to the statement that 'Faculty can handle different learning preferences of students having different learning styles by using instructional technologies'. Study results also point out that 52.2% of the respondents strongly agreed to the statement that 'I believe that tools like e-mail, forum, blogs and chat will make communication with faculty and students easier'.

Further study results show that 56.7% disagreed strongly with the statement that 'I don't prefer to be assessed about my ICTS instructional or learning ability by faculty or by any other professionals' with 55.2% strongly disagreeing with the statement that 'I don't want to use computers and other ICTs media in learning or instruction. These results indicate that technology in its different form had been accepted by both the faculty and students in these higher education institutions. The respondents are seen to take technology as an enabling tool for instruction, as a communication tool between faculty and students and also as an enabler to make learning and instruction more flexible.

Table 8: Perception about use of ICTs

Statement	1	2	3	4	5
I don't use computers as much as other resources (books, overhead projectors etc.) for learning or instructional purposes	44.8	26.9	3.0	10.4	14.9
I know what to do when using computers in learning or instructional environments	0	4.5	7.5	31.3	56.7
I don't want to use computers and other ICTs media in learning or instruction	55.2	32.8	7.5	4.5	0
I think that I can use instructional technologies in class activities more effectively day by day	0	10.4	6	26.9	56.7
I believe that tools like e-mail, forum, blogs and chat will make communication with faculty and students easier	0	0	0	47.8	52.2
I think that technology supported teaching makes learning more effective	3.0	6.0	29.9	41.8	19.4
I think the use of instructional technologies increases the interest of students toward courses	4.5	25.4	31.3	32.8	6.0
I think that usage of instructional technologies makes it easier to prepare course materials (assignments, handouts etc.)	0	11.9	14.9	28.4	44.8
Faculty can handle different learning preferences of students having different learning styles by using instructional technologies	0	9.0	7.5	26.9	56.7
I think technology makes effective use of class time	7.5	29.9	0	56.7	7.5
I think using instructional technologies makes faculty more productive in training	11.9	3.0	26.9	35.8	22.4
I think that using technology makes it easier to reach instructional and learning resources	0	0	31.3	31.3	37.3
I don't prefer to be assessed about my ICTs instructional or learning ability by faculty or by any other professionals	56.7	43.3	0	0	0

Technology in this case is seen as an enabler in training, access to resources and communication. Students and faculty through the questionnaire responses and interviews seem to welcome the educational opportunities brought about by technology. They also seem up to the task as they have welcomed technology in their day to day learning and instruction. This is supported by interviewee number 2 who observed that;

'This era has seen both the faculty and students in the cyber space. Through chat, blogs and e-mail, education has been more enabled as students can hand in their assignments and projects through e-mail, receive notes and hand out through e-mails and access their instructors through linked in, Facebook and chat'.

This has made technology more useful not just in training but also in the interaction between the faculty and students and between the students themselves and the faculty themselves. Interviewee number 6 also pointed this fact out thus;

'It is possible to access your lecturer even when out of the country through chat and e-mail. This has removed the barriers we had earlier where the lecturer had to be physically present in the university to offer any support'.

4.3 Factors Hindering the Effective Utilization of ICTs in Education

The last objective of the study was to establish the barriers to effective utilization of ICTs in higher education. To accomplish this, barriers to ICTs adoption and application in learning and instruction in higher education were listed in the questionnaire. Respondents were required to indicate which barriers apply to the university using a scale where 1 = Disagree totally, 2 = Disagree partially, 3 = Neutral 4 = Agree partially and 5 = Agree totally. Analysis was through percentages and results presented in table 9.

The results indicate that 56.7% of the respondents strongly agreed that 'Absence of reward systems for encouraging technology usage' was a hindrance to adoption of ICTs in education. Guidance and support by administration was perceived by 55.2% of the respondents to be a strong hindrance to adoption of ICTs. 'Inadequacy of ICTs media

used by learners and faculty' was another barrier where 53.7% strongly agreed to it being a hindrance. Respondents who strongly agreed to 'Inadequacy of the courses of technology offered to students' as a hindrance were 43.3% whereas 42.8% strongly agreed that 'Inadequacy of the University's computer laboratory' was a hindrance to ICTs adoption in education.

Table 9: Barriers to ICTs adoption and application

Barrier	1	2	3	4	5
Inadequate time to prepare materials based on technology	0	0	31.3	41.8	26.9
Inadequacy of faculty's technical knowledge to prepare materials based on technology	7.7	18.5	27.7	35.4	10.8
Problems about accessibility of existing hardware (computer, overhead projector, video players, ipads etc.)	0	10.4	28.4	29.9	31.3
Inadequacy of the University's computer laboratory	3.0	9.0	15.4	29.9	42.8
Inadequate number of media (printer, scanner, projectors etc.) for effective use of computers	9.0	10.9	6.9	31.3	41.9
Shortage of ICTs media used by faculty	16.4	14.9	1.5	29.9	37.3
Absence of reward systems for encouraging technology usage	4.5	10.4	0	28.4	56.7
Inadequacy of ICTs media used by learners and faculty	10.4	6.0	0	29.9	53.7
Guidance and support by administration	0	9.0	7.5	28.4	55.2
Insufficient financial resources allocation to ICTs	0	17.9	22.4	28.4	31.3
Deficiency in professional development opportunities for gaining knowledge and skill	13.4	16.4	4.5	25.4	40.3
Deficiency in support services in material development/technology usage	9.0	19.4	3.0	28.4	40.3
Lack of interest of faculty in technology usage	0	16.4	26.9	40.3	16.4
Difficulties of improper teaching methods for technology usage	28.4	26.9	25.4	19.4	0
Inadequacy of the courses of technology offered to students	0	22.4	6.0	28.4	43.3

However, access to ICTs resources was a hindrance mainly in public universities. Though the public universities on average had more ICTs resources in terms of numbers, they had a poor facility to student ratio according to interviewee number 5 who indicated that,

‘This university has huge resources in ICTs but the high number of students and faculty makes accessibility a challenge due to the low facility to student ratio’.

The case of private universities was reinforced by interviewee 1 who stated that;

‘The issue of barriers in ICTs usage in this university does not come up. This is because this university is always at the forefront to make education accessible through as many ICTs media as possible. However the major challenge is that students are willing to use the technology for social and entertainment purposes more that for educational purposes. It is common to find a student in the computer laboratory spending more that four hours in one sitting in social networking sites. This is regardless of the fact that there is a policy against use of university resources for such purposes’.

This observation brings to the fore the issue of misuse of resources for unintended purposes. This is observed as a barrier where students, and in some few cases, the faculty use the ICTs facilities for social and entertainment purposes instead of using them more as education enablers. Another observation by interviewee 7 reinforced this;

‘It is very annoying to find a student chatting on Facebook and there is no other computer available whereas you have an assignment to do. Sometimes when you try to talk the person into letting you use the computer is not received kindly. Many people misuse the facilities at the expense of the once who want to use the facilities for educational purposes.’

Another factor which mainly hindered adoption of technology in public universities was inadequacy of facilities. This was mainly due to limited financing for ICTs. As technology is improving everyday, many public universities are finding it hard to keep up with the new technology. The need for ICTs in higher education is becoming increasingly important where the administration of the universities acknowledge the fact. However as interviewee 8 indicated;

‘Most of the administrators know the importance of ICTs in education. However, there are too many needs competing with ICTs and ICTs in most cases is seen as dispensable’.

There were observations by interviewees that keeping up with the pace of technology has proved elusive for many universities in Kenya. The policies and reward structures were also not encouraging ICTs use as focus is put more on other resources.

5. Discussion

The study findings agreed to the two theories that were adopted in the study's theoretical framework which were technology acceptance model (Davis, 1989) and the diffusions of innovations theory (Rogers, 1962). The technology acceptance model tries to explain the factors that may hinder or motivate adoption of technology. This theory suggests that self efficacy, beliefs and perceptions guide the people's behaviour towards technology. This was observed in the case of Universities in Kenya where lecturers and students have a belief and perceive ICTs as enablers for education. This has made them to accept and integrating these tools in their learning and teaching. They have accepted ICTs and necessary advancement and their adoption has been seen as a way forwards for higher education in Kenya. However, the theory suggests that there are hindrances that can make people to fail to accept a technology. This was seen in the case of University education in Kenya where some students did not prefer technology as a mode of handing in their assignments when the ICT facilities in the universities were wanting. Training, development and support were other factors that could be used as enablers of ICT adoption in education. Senior administration in some of the universities also seems not to believe that ICTs are important in education and hence do not have strategies, policies, plans or budgets for ICTs. This has led to the Universities being poor adopters of technology. It is only when ICTs are considered important in some of the higher education institutions that necessary financial and human resources are budgeted for ICTs.

Diffusion of Innovations theory (Rogers, 1962) seeks to explain the rate at which new technology diffuse within cultures. The theory also explains why and how technologies and new ideas are adopted in different cultures and societies. In the theory, diffusion is defined as the process through which a technology or new idea is communicated and accepted in a social system. In the diffusion of innovations theory, three types of decisions are made in a social system about adoption of an idea or technology. The first is the optional innovation-decision which is made by an individual, whether to adopt or not to adopt the technology. The second is the collective innovation-decision which is made collectively by all individuals in the social system. Lastly, is the authority innovation-

decision which is the decision made for the entire social system by individuals who have power or influence in the social system. This explains the reasons that lead to higher education institutions to adopt the different training and learning technologies. The social, political and economic aspects of the adoption decision are explained by this theory.

The study findings also established an agreement with the diffusion of innovations theory. This theory indicates that social, political, economic and cultural factors can enable or hinder adoption of technology. The decisions of senior administration of higher education institutions regarding integrating ICTs in education were observed to be the overriding factors that establish whether an institution is a good adopter or a poor adopter of ICTs in education. Those institutions that were good adopters of technology had senior management who provides financial resources and drew strategies and policies on how ICTs are incorporated in education to enable education and ensure that higher education is available to the masses. The collective innovation decision in the context of this study is where the adoption of technology as a training or learning tool is made by the faculty and students of a higher education institution. In some cases, the decision is not formal and both the students and faculty agree to use technology as a learning or training tool. However, there were higher education institutions that had formalized policies on ICT as they had online repositories, ICTs usage code and programs like distance learning that are supported by ICTs. The authority-innovation comes to play where the decision to adopt any new technology in a higher education institution is made by the administration of the institution. This means that the few people who have a position of power in an institution can make the decision to adopt the technology or not (Rodgers, 2005). This theory was supported by findings into the social and economic factors that can enable or hinder adoption of technology in higher education institutions in Kenya.

Further, I observed that adoption of technology for teaching and learning in the universities surveyed depended very much on the willingness, acceptance, agreement and the continuous use of the different ICTs by the faculty and students. Those universities whose students and faculty viewed ICTs as a necessary enabler in education had good

facilities, self efficacy in their students and faculty and also high levels of adoption. The culture at universities was seen as having wholly accepted ICTs as a necessary advancement. Not only the universities have accepted ICTs but the community and the corporate sector have indicated the need to have use and mastery of ICTs both at work and for other social purposes.

5.1 Value of ICTs in Kenyan Higher education

There is a period of rapid change that is affecting higher education today due to the technology advancements. Universities all over the world seem not to have a choice on whether to incorporate ICTs in education or not. The reach of university education in Kenya is low as is the case with other developing countries, it can reap the benefits of ICTs and increase the reach and strive to satisfy the high demand for higher education. This study sought to establish how universities in Kenya have integrated ICTs in teaching and learning and in so doing get the enabling factors and the barriers thereto. A study by Kregor, Breslin and Fountain (2012) had similar observations where they indicated that universities have to adopt ICTs for teaching and learning purposes to remain relevant and competitive in the fast changing world.

The universities also seemed to believe that technology is essential both for the faculty and the students. This is manifested in the study results where availability of ICTs resources was good. Students and faculty had access to desk top computers, internet connection and a good proportion had access to smart phones, tablets and laptops. This enabled the students and faculty to access teaching and learning materials through the various ICTs media available. The introduction of smart phones which have multiple capabilities for both voice and data has increased access to academic resources, e-mail and data for both students and faculty.

However, there was a disparity between accessibility of various ICTs resources between the private and public universities. Though public universities have more ICTs facilities in terms of hardware and software, the number of students they have are much more compared to their private counterparts. This has made the facilities to students' ratio to be

very poor in public universities. There was an indication that access to ICTs facilities in private universities was not a problem but the same cannot be said for public universities. There were indications that students would have to wait for a long time to get a free computer at the designated computer labs.

Results from the survey show that access to both hardware and software in the universities was not an issue since materials for learning and teaching was accessible through different media. The students also had access to desk top computers, lap tops and smart phones at their hostels and homes. This finding agrees to results from a study by Kregor et al (2012) who established that laptops and smart phones have become readily accessible in homes and schools. The use of laptops, tablets and smart phones have increased in higher education institutions in Kenya such that they are standard resources for many students.

5.2 ICTs Skills and Competence in Kenyan Higher Education

On self-efficacy and mastery of different ICTs, findings indicated that students and faculty had skill and competence in using computers in learning or instructional environments. Most of the respondents also perceived that their mastery of the different technology tools was increasing as they increased the usage of such tools in education or other social activities. The belief in their ability to effectively use ICTs tools and their belief that their mastery improved with use indicated a high degree of self-efficacy. The findings on self efficacy also indicated that both students and faculty of the surveyed higher education institutions in Kenya had accepted the important role that ICTs play as an enabler of education. These results indicate that technology in its different form had been accepted by both the faculty and students in these higher education institutions. The respondents are seen to take technology as an enabling tool for instruction, as a communication tool between faculty and students and also as an enabler to make learning and instruction more flexible. Faculty staff in some universities were however poor in mastery of usage of ICTs and were deficient in its use but this was the exception rather than the rule. These were mostly in public universities where the traditional paradigms of teaching through lecturers are still preferred. Lack of confidence or know-how on how to

handle the different ICTs media would make both students and faculty shun ICTs in training or learning. Robertson and Al-Zahrani (2012) had made similar observations that teachers who had high levels of self efficacy and mastery of ICTs skills were more likely to access computers and other ICTs tools at the university. Increasing training on ICTs and access of ICTs skills was expected by the respondents to increase the levels of self-efficacy for both the faculty and students.

On user capability for the various ICTs hardware and software, the study established that most of the students in the universities surveyed have integrated technology into their daily and academic life such that most of them cannot go three days without accessing the web, blackboard or the e-learning portals that most of the institutions have established. Apart from using the web and associated technologies for learning, reports indicated that they used them for communication, socializing, information and entertainment. The study results therefore confirm that most of the students and faculty are comfortable in using the web and associated hardware and software for both curricular, business and social activities. However, knowledge and efficacy in using the more specialized software that is not mostly used in non-ICTs related subjects was poor. The use of technology for non-academic related tasks has made both the students and faculty to also be at home in using the same ICTs tools for academic purposes. However, the mastery of ICTs to enable faculty to prepare materials was still wanting. This finding agrees with findings from a study by Robertson and Al-Zahrani (2012) done in Saudi Arabia where the level of self-efficacy and skills in ICTs were positively related to use of ICT tools by teachers for teaching.

Findings on satisfaction over the ICTs resources and services at the institutions was assessed where just below half of the surveyed students and faculty indicated to have been either very satisfied or just satisfied. A walk through the findings established that those that were not satisfied with ICTs facilities in their institutions were mostly from public universities. Their counterparts from private universities were mostly satisfied with the ICTs resources their institutions had. This was supported by the finding that half of the respondents thought that their universities had not provided enough financial

resources for ICTs while less than half were of the view that the university had provided enough financial resources. This finding was supported by an earlier finding by Wong, Teo and Russo (2012) which established that availability of computers and computer teaching efficacy were major determinants of whether computers are used by teachers for teaching. The study sought to determine the software competence among students and faculty. The study aimed to establish how knowledgeable the students and faculty were in using ICTs software which is a requirement for efficient use of ICTs resources. The results indicated that word processors, search engines, electronic mail and chat, forum and blogs were the softwares where most competence was observed. Most of the respondents indicated to have high competence in the use of these softwares. This can be due to the availability of these softwares in the universities and hence students and faculty have easier access to them. These softwares had the highest number of respondents indicating that they were highly competent in them.

There were other softwares such as web page development tools, discussion lists and newsgroups and electronic encyclopedia and atlas which the students and faculty did not have good mastery on. There were other software that were important in teaching and learning which the subjects did not have good competence in their usage which include computer aided instruction software, discussion lists and newsgroups. This poor skill set and incompetence in use of such ICTs software can be due to the poor access of such tools in the institutions.

There were instructional tools such as multimedia computer, boards and printed materials which were used everyday by the faculty for teaching. However, other media such as video camera, television and the web environment were the instructional tools where most of the students and faculty rarely in instruction. These tools were usually used for assignments, homework and other individual or group work that the students were given by their trainers. The faculty seldom used video camera and TV for instruction and in few circumstances did they indicate that they used the web for instruction. Web was reported to be used for e-learning and distance learning programs and for research purposes. These results concur with earlier findings from a study by Lai (2011) who observed that with

the advent of web and other ICTs tools and systems, there has been a growth of online based programs in universities which has increased access to higher education. Andrews and Tynan (2012) in their study observed that there have been various trends in the last decade mostly involving online learning and distance education which have been made possible by various institutions of higher learning adopting ICTs in learning and training. The study by Lai (2011) that in the US alone, more than 77% of higher education institutions offered distance learning courses enabled by the internet. This was observed in the study where most of the higher education institutions in Kenya had online courses more so the private ones.

It was the premise of this study that to effectively apply ICTs in training and instruction effectively, both the faculty and students require professional or peer development. The study established that there was support services available everyday for internet in various higher education institutions. Support was also available from colleagues in the university and also from experienced faculty and support staff on ICTs. Support for traditional training and learning methods and support coming from outside the institution was rare in most of the institutions. The universities surveyed however did not put an important emphasis on support and development and mostly depended on self learning of the students and faculty. Most respondents however decried the lack of adequate support and training for use of different software and hardware in training and learning. This was the same observation made from a study Kregor, Breslin and Fountain (2012) who established that support and training for students were very important. This is despite the perception that being regular users of the different ICTs tools would make them have a mastery that is required. Support is required to assist the users in dealing with various challenges that may arise when using the different technologies. Having ready support and development is therefore expected to increase the self efficacy and ease of use of the different technologies will lead to increased adoption of the different ICTs tools.

Factors that encourage ICTs adoption in the universities included rewarding the technology usage efforts of faculty in instructional activities, developing the policies and plans for diffusion of ICTs in learning and teaching and investments of the institution on

in-service education programs for staff and students. The universities that rewarded the staff and faculty due to technology usage for innovation, teaching and learning motivated more staff members and students to adopt technology tools in education. There was also a perceived relationship between the institutions that had formal policies on how to use ICTs in education and the adoption of ICTs tools in that institution for education purposes. Having a formal policy shows intent to all the institutional members on the importance the institutions places on technology usage as a teaching aid or an enabler to learning. The Kenyan universities that had policies and plans for educating their faculty and students on how to apply ICTs in their training and learning had made big strides towards improving the quality and accessibility of their educational resources. These universities were reported to have adequate budgets not only for procuring ICTs hardware and software required but also for developing competence and skills for their staff and students.

5.3 Barriers to ICTs Integration in Kenyan Higher Education

The study's third objective was to establish the barriers to effective utilization of ICTs in higher education. Results from the study indicated that absence of reward systems for encouraging technology usage was not helping the institutions in encouraging adoption of ICTs in education. This supports the earlier finding from the study by Lai (2011) that presence of rewards for usage of ICTs both for learning and teaching can go a long way in encouraging ICTs application in education. This was also the observation made in a study by Kregor et al (2012) who established that support for ICTs resources available and development of ICTs competencies among the teachers and students were major maximizers of e-learning potential.

It was also established that the administration did not provide enough guidance and support on the direction or policy on ICTs usage in education. This therefore leaves the faculty and staff in such universities to chart their own path on how to employ ICTS in training and learning. Lack of leadership and direction on the path to take in integrating ICTs in education indicates that top level management of the institution have placed an important role for ICTs in education. Lack of enough and up to date facilities in some of

the universities was also indicated to be a major challenge in ICTs application in education purposes. However, as indicated in previous results from the current study, the issue of adequacy of ICTs resources mostly concerned public universities. It was observed that though the universities which had poor accessibility of ICTs facilities had huge resources and facilities, they had huge student numbers which made the ratio of facilities to students poor. As accessibility of resources becomes poor, this affects the self efficacy of both students and faculty in usage of ICTs resources and the likelihood of using the various ICTs media is low. Poor accessibility can also deny such universities the advantages that come when ICTs are used as an enabler to learning and teaching. Financing was another major hindrance since technology field is a dynamic field where changes happen very fast and the facilities and systems that an institution has need to be upgraded continuously. In most cases in Kenya, financial resources are very limited thus making ICTs to compete with other needs which are seen as more important. However, it is important to note that application of ICTs in teaching and learning can save the higher education institutions many resources if ICTs are utilized properly. This can be seen in the case of distance education where lecture hours, residential space and physical facilities are not required which can result in massive savings. A study by Allen and Seaman (2011) in the US revealed that ICTs can lead to massification of higher education which according to the authors meant moving towards increasing access of eligible people to higher education. there is great need to increase enrollment of high school leavers in Kenya to university as many eligible school leavers do not proceed to university currently due to limit of places in the existing higher education institutions. Adoption of ICTs can therefore go a long way in improving accessibility in higher education institutions apart from making the cost of higher education affordable to many.

6. Conclusions

The demand for higher education in developing countries is surpassing the physical resources and time that are at the disposal of higher education institutions that are in these developing countries. Given that there are limitations on physical resources and on academic time, the use of ICTs is essential to ensure that both quantity and quality of higher education is not compromised by the high demand experienced. Access to computers, Internet, laptops and tablets was perceived to be adequate in most of the universities. Accessibility to technologically based education was also enhanced by availability of ICT resources in the homes or hostels of the students. Smartphones were also reported to have revolutionized access to online learning materials. However, despite the revelation that ICTs are essential in making higher education accessible to the masses, some public universities in Kenya still lack adequate resources to serve its students and faculty. This becomes a challenge when the universities want to integrate ICTs in education as the students and faculty lack the requisite skills and competence to enable them apply technology in education. It is therefore important that the universities in Kenya that lag behind in technology should learn from those universities that are excelling in this arena.

Despite the inadequacy of ICT resources in some universities, most universities in Kenya have adequate resources which can be applicable to educational purposes. Higher education institutions in Kenya and their students have not been left behind by the ICTs revolution. Most higher education institutions in Kenya are in a continuous process of upgrading and updating their hardware and software to ensure that the facilities are of the right quantity and quality to support not just education but also recreational and other social uses. The universities were observed to have used ICTs to develop new programs such as online degree programs which have increased enrollment in these institutions considerably. However, considering the developments in ICTs in higher education institutions in developed countries indicates that Kenya's higher education institutions have a long way to go towards integrating ICTs in education. Higher education institutions were also reported to have e-portals where online journals are kept and blackboards where students interacted with other students and with their teaching staff.

Institutions were also engaged in social media tools such as Facebook, Twitter, LinkedIn and WhatsApp which has greatly enhanced interaction between the faculties and students. The level of self efficacy in the universities for both the faculty and students was above average but this could be improved with improved accessibility to ICTs resources and enhancement of support services and development.

There were various factors in the leading ICTs adopting institutions which included top leadership support, strategy for use of ICTS and rewards for those students and faculty who excelled in use of ICTs in education and support services. Universities that are lagging behind on the technology front should learn from the best technology adopters by ensuring that factors that motivate ICTs adoption as an education enabler are present. Most of the top leadership is however perceived to acknowledge the fact that technology is important in massification of education and also enhancement of quality education. Most of the universities are constantly engaged in efforts to ensure that they do not lag behind and be branded as technologically inept by the community and prospective students. However, in coming up with policy and facilities, the universities consider the need and investments where financial capacity is usually a challenge.

Kenyan higher education institutions are aware that ICTs are essential in education. They have embraced the new age of technology which has opened doors that can enable the leadership of such universities to solve one of the biggest challenges to higher education in Kenya which is access to education. However, they are faced with various challenges which hinder adoption of ICTs as an education enabler. These challenges need to be countered to ensure that ICTs play their proper role in education. Universities therefore need to have their top leadership supporting ICTs plans and strategies. This would start with having a budget for ICTs facilities and upgrades every year. Universities also should have strategic plans and policies regarding the use of ICTs for both education and recreational purposes. Access to ICTs facilities would not entirely ensure that the ICTs tools are put to good use and hence having support for every ICTs tool procured is important to ensure that users put the ICTs tool to the intended use. Training both the faculty and students on the different ICTs hardware and software would go a long way in

ensuring that the universities do not buy the ICTs resources in vain. Training and development of both staff and students would ensure that self efficacy and competence in application of ICTs is enhanced. This would be a strong motivator in ensuring that application of ICTs in education is enhanced in these institutions.

7. Suggestions for Further Research

I suggest a study that will establish how higher education institutions in developing countries in general and Kenya in particular apply ICT to enable education for students with special educational needs. Such a study would aim at determining whether higher education institutions have fully exploited the potential of ICTs to support the learning needs of students with special learning needs. This comes from the finding that higher education institutions are currently, utilizing ICTs to mainly support the dissemination and acquisition of literacy. However, there are suggestions that ICTs have the capacity to be widely applied in special education settings in mainstream classrooms to support learners with special educational.

Further research is also suggested on how ICTs can be monitored so that their use and efficiency in enabling higher education is determined. This will ensure that higher education institutions do not under or over invest in ICTs. A study on how staff members are instructed and trained on how to assess effectiveness of ICTs in learning and teaching is important to enable the teaching staff to establish how well and where to apply ICTs in teaching.

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APPENDIXES

Appendix I: Questionnaire on ICTs Usage

SECTION A: LEVEL OF AWARENESS AND ADOPTION OF ICTs

1) For the following questions on ICTS resources, tick where it applies to you. Which of the following ICTs facilities do you access At University? At home/hostel?

- Desktop computer
- Laptop/notebook computer
- A tablet device (e.g. iPad)
- Smart phone
- Internet connection

2) On a scale of 1-5, (1 indicating very unsatisfied and 5 very satisfied) indicate how satisfied you are with the ICTs facilities provided by the University? []

3) Do you view the University as providing adequate financial resources for ICTs in this University?

- Yes []
- No []
- Don't know []

4) On a scale of 1-5 (1 indicating no competence and 5 indicating very competent) indicate your competence level in using the stated software.

Software	1	2	3	4	5
Word Processors (Word etc.)					
Spreadsheets (Excel etc.)					
Presentation Software (PowerPoint etc.)					
Databases (Access etc.)					
Computer Aided Instruction Software					
Web Page Development Tools (FrontPage, dreamweaver etc.)					
Web Browsers (Mozilla, Netscape, Explorer etc.)					
Search Engines (google, yahoo etc.)					
Electronic Mail (e-mail)					

Discussion Lists and Newsgroups					
Chat and/or Forum of blogs					
Electronic Encyclopedia and/or Atlas					
Instructional Films (video, CD, VCD etc.)					

5) Indicate the frequency of usage of the listed instructional tools and materials. Rating scale is 1 = Never, 2 = Seldom, 3 = a few times per month, 4 = more than once a week, and 5 = Everyday.

Instructional Tools and Materials	1	2	3	4	5
Board					
Overhead Projector					
Opaque Projector and/or Document Camera					
Multimedia Computer					
Computer – Projector System					
Internet/Web Environment					
Television/Video					
Radio Cassette Recorder					
Video Camera					
Slide Projector					
Printed Materials (journals, books, worksheets etc.)					

6) Indicate the professional development provided to students and faculty about the following ICTs resources in the university. Rating scale is 1 = Never, 2 = Seldom, 3 = a few times per month, 4 = more than once a week, and 5 = Everyday.

Information Resources	1	2	3	4	5
Internet					
Printed Materials (manual or journal etc.					
Self experiment					
Participating seminars or taking courses					
In-service Education					
Support Resources					
Experienced faculty and support staff on ICTs					
Colleagues in the university					
Other colleagues in other universities					
Technical support units in the university					
Collaboration and joint projects with ICTs organizations					

SECTION B: LEVEL OF SELF-EFFICACY AND ICTS INTEGRATION INTO HIGHER EDUCATION POLICY AND PRACTICE

1) Below are factors that encourage ICTs adoption and application in learning and instruction. Indicate the ones that apply to the university and the level to which they are present. Use the following rating scale (1 = Never, 2 = once around 2 years, 3 = Once a year, 4 = more than once a year, 5 = Monthly)

Policy or Practice	1	2	3	4	5
Rewarding the technology usage efforts of faculty in instructional activities					
Encouraging and rewarding the technology application, design and usage in curricular activities					
Investments of the institution on ICTs					

infrastructure					
Investments of the institution on in-service education programs for staff and students					
Investments of the institution on the support services of instructional technologies					
Developing the policies and plans for diffusion of ICTs in learning and teaching					
Carrying out the studies for integration of technology into curriculum					

2) Indicate your perception about use of ICTs in the following statements. Use the following rating scale (1 = Disagree totally, 2 = Disagree partially, 3 = Neutral 4 = Agree partially 5 = Agree totally)

Statement	1	2	3	4	5
I don't use computers as much as other resources (books, overhead projectors etc.) for learning or instructional purposes					
I know what to do when using computers in learning or instructional environments					
I don't want to use computers and other ICTs media in learning or instruction					
I think that I can use instructional technologies in class activities more effectively day by day					
I believe that tools like e-mail, forum, blogs and chat will make communication with faculty and students easier					
I think that technology supported teaching makes learning more effective					
I think the use of instructional technologies					

increases the interest of students toward courses					
I think that usage of instructional technologies makes it easier to prepare course materials (assignments, handouts etc.)					
Faculty can handle different learning preferences of students having different learning styles by using instructional technologies					
I think technology makes effective use of class time					
I think using instructional technologies makes faculty more productive in training					
I think that using technology makes it easier to reach instructional and learning resources					
I don't prefer to be assessed about my ICTs instructional or learning ability by faculty or by any other professionals					

SECTION C: FACTORS HINDERING THE EFFECTIVE UTILIZATION OF ICTs IN EDUCATION

1) Below are barriers to ICTs adoption and application in learning and instruction in higher education. Indicate which barriers apply to this university using the following scale (1 = Disagree totally, 2 = Disagree partially, 3 = Neutral 4 = Agree partially 5 = Agree totally)

Barrier	1	2	3	4	5
Inadequate time to prepare materials based on technology					
Inadequacy of faculty's technical knowledge to prepare materials based on technology					
Problems about accessibility of existing hardware (computer, overhead projector, video players, ipads etc.)					
Inadequacy of the University's computer laboratory					
Inadequate number of media (printer, scanner, projectors etc.) for effective use of computers					
Shortage of ICTs media used by faculty					
Absence of reward systems for encouraging technology usage					
Inadequacy of ICTs media used by learners and faculty					
Guidance and support by administration					
Insufficient financial resources allocation to ICTs resources					
Deficiency in professional development opportunities for gaining knowledge and skill					
Deficiency in support services in material development/technology usage					
Lack of interest of faculty in technology usage					
Difficulties of improper teaching methods for technology usage					
Inadequacy of the courses of technology offered to students					

2) What are the recommendations you provide to the university administration, faculty or students regarding effective application of ICTs in learning or instructions?

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Appendix II: Interview Schedule on ICTs Usage

SECTION A: ICTs FACILITIES & COMMON PRACTICES

1. Which ICTs facilities does this university have for use by faculty
2. Which ICTs facilities does the university have for use by students
3. Are the facilities in place adequate for faculty/students
4. Are the ICTs facilities available in the university current and up to date?
5. What are some of the tasks that faculty and students use ICTs facilities for
6. Does the university practices in assignments and projects encourage use of ICTs

SECTION B: ICTs FACULTY COMPETENCE

1. What is the level of expertise in ICTs usage among the faculty?
2. How many years have you been using ICTs in teaching
3. Do faculty members plan for use of ICTs in their schemes of work
4. Has there been any ICTs training, seminar or workshop for the faculty in the last three years
5. What skills and competencies do faculty require to enable them incorporate ICTs in teaching
6. Does the faculty design appropriate learning opportunities that apply technology to support diverse needs of learners
7. Does the faculty identify and locate ICTs resources and evaluate their potential value in classroom use
8. Does faculty apply ICTs in assessing student learning
9. Does faculty use ICTs resources to collect data, interpret results and communicate findings to improve instructional practice
10. does faculty use ICTs to share best practice and reduce bureaucracy

SECTION C: ICTS STUDENTS' COMPETENCE

1. What is the level of expertise in ICTs usage among the students?
2. What skills and competencies do students have that enable them employ ICTs in learning

3. Do students use ICTs to support other aspects of learning except IT related courses
4. Do students like to employ ICTs in learning activities
5. Do the university faculty apply ICTs to develop student's higher order skills and creativity
6. Are students modeled and taught legal and ethical practice related to ICTs use

SECTION D: ICTs POLICY AND STRATEGIES BY UNIVERSITY

1. What policy interventions and strategies have been put in place to improve ICTs adoption and application in teaching and learning
2. What policy interventions do you recommend to enhance ICTs adoption and application in teaching and learning
3. Does administration have policies to enable equitable access to ICTs resources for all students and faculty
4. Does the university have a policy to promote safe and healthy use of ICTs resources for learning purposes

Appendix III: Introductory Letter

**Maureen Jematia Bett,
University of Lapland,
Finland.**

Dear Respondent,

RE: ACADEMIC RESEARCH

I am undertaking a Masters degree in media education at University of Lapland. As part of the degree requirements, I am required to do a Masters thesis. My thesis topic is ‘Use of information and communications technology in higher education in Kenya’. You have been selected to represent thus University in the study.

I herewith attach a questionnaire which you are requested to complete with the relevant information and data. Your response will be treated with utmost confidence. The provided information will only be used for academic purpose.

Thank you in advance for your contribution.

Yours truly,

Maureen Jematia Bett