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`` Challenges of Implementing E-Learning Systems In Higher Education Institutions In Kenya ɏ

By

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DECLARATION

This research project is my original work and where there's work or contribution of other individuals, it has been dully acknowledged. This research project has not been submitted for the award of a degree in any other university.

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This research project has been submitted for examination with my approval as the University of Nairobi supervisor.

Signed: _____ Date: __5/4/2011__

Mr R. Oboko

DEDICATION

I dedicate this project to my beloved wife **Jane** and my two wonderful sons who
supported me during this challenging endeavor and your encouragement and
appreciated.

I truly cherish you all.
May the Almighty God bless you today and forever more.

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Glory is to the Almighty God for the gift of life, resources, a sound mind and everything else that enabled me go through the MSC course. I will forever be grateful for His mercy and love upon me through this challenging journey.

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Abstract

When Higher Education Institutions are in the process of implementation of e-learning systems, a number
of factors come into play. Some factors are about the technology, others about the prospective users,
others about the local context of use and the associated costs. There are many aspects of socio-economic
and technological environment that need to be explicitly addressed during implementation of e-learning.
These include, among other things, connectivity (low bandwidth) and accessibility, inadequate
telecommunications infrastructure and lack of reliable power supply. This study reviewed various factors
and processes with an emphasis on university settings and after analyzing and making a comparative study
of existing frameworks and models, the study proposed a conceptual framework for assessing the
challenges hindering successful implementation of e-learning systems in Higher Educations Institutions
Kenyan context

The research design was a descriptive research survey. Stratified random sampling was used to select the
sample. Proportionate allocation of sampling fraction was used to determine the number of units to be
drawn from each stratum. Simple random sampling was then exercised within the population stratum.
Questionnaires were used to collect data. Reliability of the instruments was measured using Cronbach alpha
established via pilot study and a reliability of more than 0.70 was considered adequate. The analysis of the
collected data provided qualitative information in form of descriptive statistics such as percentages,
frequencies, correlation analysis and means. This was summarised in tables and charts and used to make
inferences

The response rate was 86.7% totaling 412 respondents. Key findings revealed that good connectivity and
high bandwidth as well as technical support and financial resources, adequate infrastructure, reliable power
supply and acceptance to technology change were statistically significant factors that could hinder
successful implementation of e-learning in HEIs. These variables emerged as recurring themes within the
data and have a practical importance for the study and the results were replicated using the correlation
analyses

The finding of the study showed that implementation of e-learning has not been given much priority in
Kenyan universities. The study also showed that Kenyan universities are making much progress though
attitude of academic staff should be improved and the staff receives more training so that their personal
capability in using e-learning improves. The university administration also needs to improve the existing
infrastructure and technology related to e-learning

Key Words: Information and Communication Technology, E-Learning Implementation, Using E-Learning
Tools, E-Learning technology, Challenges of E-learning Implementation, E-learning Framework, Higher
Education Institutions

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List of Abbreviations

AAU:	Association of African Universities
ATM:	Asynchronous Transfer Mode
AVU:	African Virtual University
CAA:	Computer Assisted Assessment
CDs:	Compact Discs
DVDs:	Digital Versatile Discs
GIF:	Graphics Interchange Format
HTML:	Hypertext Markup Language
ICT:	Information and Communication Technology
ISDN	Integrated Services Digital Network
JPEG :	Joint Photographic Experts Group
KENET:	Kenya Education Network Trust
LCMS:	Learning Content Management Systems
LMS:	Learning Management Systems
MLEs:	Managed Learning Environments
Moodle:	Modular Object-Oriented Dynamic Learning Environment
MPEG:	Motion Pictures Experts Group
ODL:	Open & Distance Learning
OSS:	Open Source E-Learning Software
PDAs:	Personal Digital Assistants
PDF	Portable Document Format
PES:	Proprietary E-Learning Software
POTS:	Plain Old Telephone Service
RTF:	Rich Text Format
SPSS:	Statistical Package for Social Sciences
VLEs:	Virtual Learning Environments
WWW:	World Wide Web

CHAPTER ONE: INTRODUCTION

The growth in Internet has brought changes in all walks of life including the education sector through e-learning. The globalization of Higher Education is increasing rapidly; students attend courses of study from all over the world, employees work and study globally. Seufert (2000) explains, "Due to the inter-activity and ubiquity of the Internet, learning is possible without space and time barriers. The long-term implications are a worldwide network and a real market place for university and college level education. This will expand naturally into vocational and adult training as well and Education might become a major export factor between countries".

As information Technology (IT) becomes more robust and easier to use, it increasingly permeates academic activities in higher education. The use of technology in education, commonly defined as E-learning, has become a standard component in many courses. As institutions adopt E-learning, some important new issues arise:

- Institutions must provide an adequate and reliable technical infrastructure to support E-learning activities
- Instructors and students must possess the technical skills to use E-learning tools.
- Instructors must redesign their courses to incorporate E-learning effectively into their pedagogy.

However, ICTs have not permeated to a great extent in many higher learning institutions in most developing countries due to many socio-economic and technological circumstances. On the other hand, there are a number of challenges that face universities in developing countries as they seek to implement the E-learning systems (Sife *et al*, 2007).

Universities have been faced with the daunting task of having to re-adjust and re-organise themselves in preparation for the incorporation of e-learning within their institutions. Institutional leaders have also been faced with the challenge of having to align their institutional objectives to meet the needs and demands of the e-learning dispensation.

When Higher Education Institutions start the process of implementation of e-learning, a number of factors come into play; "Some factors are about the technology, others about the prospective users, still others about the local context of use and the associated costs"(Wilson et al 2002). (Alexander 2001) views that successful e-learning takes place within a complex system composed of many inter-related factors. On the other hand (uys et al 2004) pointed out that during technological transformation in the developing countries; there are many aspects of the socio-economic and technological environment taken for granted in developed countries that need to be explicitly addressed. These include among other things; connectivity (low bandwidth) and accessibility, inadequate telecommunications infrastructure, and lack of reliable power supply.

Learning Management Systems (LMS) are slowly being introduced in Kenyan Universities to improve learning and instruction as well as to gain competitive advantage (Wannemacher, 2006). Consequently,

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universities must face the challenge in having to get academic staff to adopt and make effective use of them in teaching and learning since technology rejection is common (Davis F. D., 1989; Davis, Bagozzi, & Warshaw, 1989; Venkatesh & Bala, 2008). Therefore there is a need for more successful mechanisms of increasing the adoption of LMS technologies by academic staff in universities since it is an ideal solution for improving access and the quality of teaching and learning (Yun & Murad, 2006).This need is even more urgent for universities in a developing nation like Kenya where large scale deployment of LMS has not taken off in the past due to internet bandwidth cost and internet limitations (Gerhan & Mutula, 2005). Now that the fibre cable is to connect Kenya with the rest of the world, a window of opportunity for Kenyan universities has opened for them to exploit these technologies to the full.

This study reviewed various factors and processes with an emphasis on university settings and after analyzing, synthesizing and making a comparative study of the frameworks and models, the study proposes a conceptual framework for implementation of e-learning in Higher Education Institutions in Kenya.

Under language and conventions, *Higher Education Institutions (HEIs)* means Universities

1.1 Global Trend

According to the report (Norman et al 2003), the global market for e-learning in various parts of the world which include; USA, Europe, Asia, and Africa is significant and increasing. It is reported that e-learning is one of the fastest growing sectors in the U.S and Europe education and training market with the total dollar value of all e-learning products and services projected to reach dollars 40.2 billion and 6 billion respectively in 2005. By giving the details of e-learning developments which have taken place in Asia and Africa, the report concludes that more than 120 universities in Japan have installed a communications satellite system for organizing lectures, seminars, and meetings, while developing countries are also making extensive use of distance learning.

The prospects of e-learning are immense. It continues to grow at a tremendous rate both in education and training. There is a drastic need for skilled workers in the technology-related area and it is envisaged that such a demand could be met by providing training programmes in the ODL setting via e-learning. Corporate training in areas such as banking, finance and insurance is already moving into e-learning because of immense cost savings and an increase of employee productivity (Frost & Sullivan, 2004). The advent of e-learning is changing the global education and economic system. It presents a number of prospects and challenges with economies evolving into knowledge-based areas fully supported by electronic technology.

1.2 General statement of the problem

Technological innovations have not only brought benefits to business, but to Higher Education Institutions (HEIs) where an unprecedented demand for tertiary education has seen students enrolling for courses, some

doing so through distance education. The application of Information and Communication Technologies (ICTs) is already changing the organization and delivery of higher education.

However, ICTs have not permeated to a great extent in many higher learning institutions in most developing countries due to many socio-economic and technological circumstances. There are a number of challenges that face universities in developing countries as they seek to implement the E-learning systems. Most African countries have inefficient ICT-related infrastructure such as electricity, telecommunications, computers and trained personnel (Sife *etal*, 2007).

Internet connectivity in tertiary institutions in Africa is inadequate, expensive and poorly managed (Twinomugisha, Magochi & Aluoch, 2004). Therefore, the three pillars of the ICT revolution, that is, connectivity, capacity and content, are yet to be realized in Africa. The average African university has bandwidth capacity equivalent to a broadband residential connection available in Europe, pays 50 times more for their bandwidth than their educational counterparts in the rest of the world, and fails to monitor, let alone manage, the existing bandwidth. As a result, what little bandwidth that is available becomes even less useful for research and education purposes (Steiner, Tirivayi, Jensen & Gakio, 2005). The problem in Africa is generally not just the near absence of e-learning programmes but also the inability of students to gain access even to the few that do exist.

This study was intended to assist in identifying some of the challenges that face e-learning implementation in Higher Education Institutions in Kenya.

1.3 Problem statement.

Many institutions of Higher Education and Corporate Training Institutes are resorting to e-learning as a means of solving authentic learning and performance problems, while other institutions are hopping onto the bandwagon simply because they do not want to be left behind (Govindasamy, 2002:287).

Increasingly, a number of universities worldwide including some in Africa are making positive attempts to implement e-learning strategies in order to enhance equity, quality, share instruction technology resources, compete in global environment of higher education and meet the rising demand for tertiary education. Some of them have implemented e-learning systems but have not been quite successful whereas others have implemented successfully.

There are a number of surveys that have been carried out in both developed and developing countries and existing literature has identified several critical success factors in implementing an e-learning program and a number of studies that point out challenges and issues in implementing e-learning.

Whereas the impact of ICTs on the education goals is still inconclusive, there is still very little literature available on the success stories in Kenyan HEIs with regard to the implementation challenges on e-learning initiatives despite their promise and potential. The e-learning frameworks available in the literature work

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were developed in developed world environment and many aspects of the socio-economic and technological environment such as connectivity (low bandwidth) and accessibility, inadequate telecommunications infrastructure, and lack of reliable power supply are not considered and therefore they need to be addressed during technological transformation in the context of Kenya which is a developing country.

Therefore, for successful transformation there is a need to study and document the contributing factors that bring about challenges in the implementation of e-learning in the teaching and learning among HEI in Kenya, and develop a conceptual framework which shows the factors and how they are related, and therefore hopefully contribute to the successful deployment of e-learning projects in Kenya.

1.4 Research questions
The following research questions guided this study.

1. What support and training has been provided prior to and during the implementation phase of the e-learning environment?
2. What challenges do universities experience when implementing e-learning systems?
3. What percentage of the institutions budget is expended on installations and maintenance of e-learning projects?
4. Is there a policy that exists in the Universities to guide ICT integration in teaching and learning? Are there any institutional policy frameworks to support e-learning projects?

1.5 Objectives of the study
- To investigate the major challenges hindering successful implementation of e-learning in Kenyan universities.
- To develop a conceptual framework that can be used in assessing the challenges of e-learning systems in HEIs..
- Recommend best practices for successful implementation of e-learning.

1.6 Significance of the study
The study is hoped to help academic institutions understand the challenges faced in implementing e-learning projects and the findings of this study should provide the management of education institutions implementing e-learning systems a better understanding of the likely challenges they may face and put in place appropriate measures to counter them and help in mitigating the risk of implementation failures.

The study also hope to contribute to the existing growing body of literature on challenges facing e-learning in HEIs in Kenya and propose a conceptual framework that will guide IS project managers and donors in understanding the relationship among the factors necessary for the successful implementation of e-learning systems.

1.7 Basic assumptions and limitations of the study

1.7.1 Assumptions

Kenyan Universities are increasingly turning to e-learning as a tool to facilitate improved education. They also want to rope in more students through better access to facilities, hoping to reach a wider base in a cost-effective way. The efficiency accruing from e-learning is among the advantages gained by local universities that have adopted the use of technology. However, there are a number of challenges that face universities in Kenya as they seek to implement the e-learning systems and in order to determine these challenges certain assumptions were made.

- Access to e-learning would be high in institutions that had fully embraced e-learning and integrated it into the teaching and learning. The contrary was expected to be true in institutions where there was limited internet connectivity (low bandwidth) and little or none implementation of e-learning.
- It was also assumed that most of the subjects would have their content delivered through the e-learning platforms in place.
- Respondents would be cooperative and willing to assist.

1.7.2 Limitations

There were methodological limitations faced in this study. A descriptive survey research design used for this study cannot be used to discover a causal relationship between independent and dependent variables. Consequently, this type of research cannot be used to investigate core relationships between variables or generalize about such relationships (Kathuri and Pals 1993).

Another limitation expected involved the sampling of the population, such as identifying which Institutions have implemented elearning successfully and which have failed in absence of accurate data from the relevant governmental departments and accessing the required data.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

Developments in Information and Communication Technologies (ICTs) have impacted all sectors of society, including the education sector. In higher education, application of ICTs in form of E-learning is already changing teaching and learning processes. There are many pedagogical and socio-economic factors that have driven higher learning institutions to adopt E-learning. These include greater information access; greater communication via electronic facilities; synchronous learning; increased cooperation and collaboration, cost-effectiveness (e.g. by reaching different students and in greater numbers) and pedagogical improvement through simulations, virtual experiences, and graphic representations. Both trainers and learners can choose more appropriate applications which are flexible in time, in place, personalized, reusable, adapted to specific domains and more cost-efficient (Fisser, 2001; Pelliccione, 2001).

On the other hand, there are a number of challenges that face universities in developing countries as they seek to implement the e-learning systems. AAU (2001) asserts that African universities which should be in the forefront of ensuring Africa's participation in the ICT revolution, they are themselves unable and ill-prepared to play such a leadership role. This is because of the information infrastructure of African universities which is poorly developed and inequitably distributed.

2.1 History of e-learning

In 1993 William D. Graziadei officially recorded the first online lecture through the Virtual Instructional Classroom Environment in Science (Jay Cross, 2004). The specific term 'e-Learning' however was created by Jay Cross in 1998, a veteran of the software industry. Since then many have used the term differently according to the context of their environment however the general idea that e-Learning is the use of information technology adopted in the learning process can be derived from the name 'e-Learning' itself. Abel (2005) described that e-Learning can have different meanings to different people and that we can not specify a generalized definition. This factor demonstrates the dynamic nature of e-Learning. Jay Cross (2004) described the world as an e-World where technology was used in our day to day lives thus is 2010 we can predict with no hesitation that technology is even more important for the development of society. In 2004 the Web 2.0 term was created to describe how visitors interact with the internet through learning methods such as wikis, blogs, Google Docs and many other technologies. (Hannon & D'Netto, 2007)

2.2 Definitions

In 1999 Cisco stated that e-Learning was 'internet enabled learning which included content delivery, management of the learning experience and a networked community of learners, content developers and experts.' (Cross, 2004) Bhattacharya and Sharma in their research paper (2007,p.553) described that Urdan and Wegans defined e-Learning as the delivery of course content through electronic means as follows-'internet, intranets, extranets, satellite broadcast, audio/ video tape, interactive TV and CD-ROM.'

Information and Communication Technology (ICT) consists of hardware, software, networks, and media for collection, storage, processing, transmission, and presentation of information (voice, data, text, and images) according to the ICT Sector Strategy Paper of the World Bank Group (Batchelor and Nocrish, 2005). E-learning on the other hand refers to the purposeful use of electronic systems or computer in support of the learning process (Allen, 2003). Therefore, the presence of ICT infrastructure in a school is a pointer to an enabling environment for e-learning. It means that e-learning is only possible when ICT infrastructure has been put in place.

2.3 Review of previous researches and opinion

According to Omwenga, Waema and Wagacha (2004) in Africa, where we have enormous and varied challenges in accessing higher education, there is need for relevant and customized content that is specific to our needs and challenges. Most of the models that exist to address these challenges have their limitations in terms of flexibility, time and space constraints and hence the need to address the mitigating factors. A blend of different types of information and communication technologies can be used in innovative ways in order to resolve some of these limitations. However, the same technologies bring about other challenges such as the costs that are associated and change of attitude and training on the part of the e-content developers. These challenges must be addressed for successful introduction of the same in an educational setup.

In their paper, they stated that electronic learning is proposed as one of the main ways of overcoming some of the key challenges in accessing education and that electronic learning models should be sensitive to the level of availability of infrastructure, technical support, and clear policy on implementation, evaluation and curriculum re-orientation.

In the issue of ICT and open learning, Omwenga, Waema and Wagacha(2004) argue that the possibilities of almost unlimited access to information and global communication offered by ICTs give a new dimension to the concepts of open and life-long learning.

An open-learning institution is one dedicated to helping individuals overcome the barriers of entrance requirements, time constraints, financial demands, geographical distances, and social and cultural barriers, as well as those of gender. Emerging technologies provide a means of overcoming some of these traditional barriers to education, offering the individuals the opportunity to control and direct their learning and continually extend, renew and update their knowledge and skills. It is thus argued that E-learning will not replace the classroom setting, but rather enhance it, taking advantage of new content and delivery technologies to enable learning. In this study, the Roger's model was used in understanding factors that facilitate or impede implementing of e-learning. In terms of contextual specific issues, the study identified costs, poor infrastructure, teacher attitudes, conflicts with curriculum, manpower availability, lack of information, professional competence, lack of technical expertise, content development and hosting issues as challenges that vary from country to country. In their opinion, the challenge that needed attention was

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the process of content development, due to the level of competence, commitment and skills that was required to develop good content.

Gakuu , Libotton, Omwenga and Kidombo (2008), in a study that sought to identify the factors that influence University of Nairobi lecturers' participation in distance education and determine if there is a difference between the factors that influence lectures' participation in DE in other institutions and the University of Nairobi and among various disciplines, states that "although the University of Nairobi has been involved in distance education for many years, few lecturers participate in delivering their programmes through this mode of learning". In the study factor analysis was used to obtain and rank the most important factors. The findings concurred with previous studies conducted in both developed and developing countries which showed that: increased time commitment and workload; lack of extrinsic incentives or rewards and lack of technical, administrative and pedagogical support are the main factors influencing participation in distance education by lecturers. The adoption rate of distance education instructional delivery modes among University of Nairobi lecturers is low and this has hampered the spread of distance education to all disciplines in the university. The findings indicate the need for technical and administrative support to lecturers and the provision of incentives such promotion based on DE course materials, payment for development of study materials and policy on intellectual property rights.

In another research conducted by Gakuu, Libotton and Omwenga (2007) states that "there has been a very low rate to adopt distance education and the use of e-learning instructional delivery modes by university lecturers. If lecturer's readiness to adopt distance learning and e-learning is critically low it will hamper the expansion of distance education and e-learning, yet instructional delivery in higher education will predictably use the two modes in very near future". The research study examined issues that are critical in influencing the university lecturers' attitudes towards distance education and their readiness to adopt e-learning. The study results indicated that lecturers from "hard science" disciplines differ from "social science" lecturers in terms of the importance they attach to the factors that influence their readiness to adopt distance education and e-learning.

Most African countries have inefficient ICT-related infrastructure such as electricity, telecommunications, computers and trained personnel. A study carried out for the African Virtual University (AVU) found that while most of the partner institutions either have an ICT policy in place or are developing one, they lack the resources to implement it.

AVU also revealed that internet connectivity in tertiary institutions in Africa is inadequate, expensive and poorly managed (Twinomugisha, Magochi & Aluoch, 2004). Therefore, the three pillars of the ICT revolution, that is, connectivity, capacity and content, are yet to be realized in Africa. The average African university has bandwidth capacity equivalent to a broadband residential connection available in Europe, pays 50 times more for their bandwidth than their educational counterparts in the rest of the world, and fails to monitor, let alone manage, the existing bandwidth.... As a result, what little bandwidth that is available becomes even less useful for research and education purposes (Steiner, Tirivayi, Jensen & Gakio, 2005).

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The problem in Africa is generally not just the near absence of e-learning programmes but also the inability of students to gain access even to the few that do exist.

Alexander and McKenzie (1998) reported that e-learning would fail for the following reasons:
- Being overly ambitious in terms of desired outcomes for the budget and time available.
- Utilizing particular information technologies for their own sake, without sufficient regard for appropriate learning design.
- No change in the assessment of learning to suit the changed learning outcomes.
- Commencing software development without adequate planning.
- Failure to prepare students for participation in learning experiences such as working in groups.
- Failure to obtain copyright clearance.

As it is the case with other African countries, the implementation of E-learning platform in Tanzanian universities is still very low despite of the opportunities that are provided by the open source technology and the conducive environment created by the government. In the case of higher education, among ten universities, only the University of Dar es Salaam (UDSM) has managed to implement the E-learning platform in Tanzania. UDSM has implemented E-learning platform by using WEBCT and Blackboard, which are E-learning proprietary software. While, other universities such as Sokoine University of Agriculture (SUA), Mzumbe University and Open University of Tanzania (OUT) possess basic ICT infrastructure such as Local Area Network (LAN), Internet, computers, CDs and DVDs facilities that form the basis for the establishment of E-learning platform (Sife *etal*, 2007).

While technology has enabled online education in many countries, the same cannot be said for African public universities. Universities in Ghana have made some progress in building networking infrastructure and acquiring computers, but integrating technology into the teaching and learning process has been a challenge. Instructional delivery remains largely instructor-led, with limited or no electronic collaboration between students and lecturers. To meet their objective of increasing enrollment through distance education programs, universities must establish appropriate e-learning policies and get the implementation of e-learning systems right the first time, establishing a record of success to build upon (Awidi, Isaiah T., 2008)

2.4 ICT and E-learning in Kenyan Universities
The past ten years have witnessed rapid developments in ICT in Kenyan universities and accompanying explosion of ICT-related activity in the higher education sector, as higher education institutions and national systems grapple with the challenge of how best to deploy the potential of ICT to the benefit of students.

According to report of e-readiness survey of East African universities 2008 conducted by KENET (Kenya Education Network), only 28% of the East African universities reported to be using e-learning in some of their courses. Further study shows most of the universities were not tracking progress on development of e-learning materials by faculty.

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The study also found that there is limited training for technical ICT staff on professional courses and e-learning and limited faculty training on e-learning, productivity tools and other internal ICT training. Addressing this means aggressive capacity building for both technical ICT staff and faculty.

Learning Management Systems (LMS) are slowly being introduced in Kenyan Universities to improve learning and instruction as well as to gain competitive advantage (Wannemacher, 2006). Consequently, universities must face the challenge in having to get academic staff to adopt and make effective use of them in teaching and learning since technology rejection is common (Davis F. D., 1989; Davis, Bagozzi, & Warshaw, 1989; Venkatesh & Bala, 2008). Therefore there is a need for more successful mechanisms of increasing the adoption of LMS technologies by academic staff in universities since it is an ideal solution for improving access and the quality of teaching and learning (Yun & Murad, 2006).This need is even more urgent for universities in a developing nation like Kenya where large scale deployment of LMS has not taken off in the past due to internet bandwidth cost and internet limitations (Gerhan & Mutula, 2005). Now that the fibre cable is to connect Kenya with the rest of the world, a window of opportunity for Kenyan universities has opened for them to exploit these technologies to the full.

Kenya has been quite fortunate in that the local access fiber infrastructure has been constructed for all KENET member institutions using funding from government. Universities in Kenya can therefore start enjoying fiber bandwidth once it goes live in the country.

2.5 E-learning in context

E-learning refers to the use of ICTs to enhance and support teaching and learning processes. It is the instructional content or learning experiences delivered or enabled by electronic technologies and it incorporates a wide variety of learning strategies and technologies. Elearning ranges from the way students use e-mail and accessing course work online while following a course on campus to programmes offered entirely online (Commission on Technology and Adult Learning, 2001; OECD 2005). It is thus an alternative solution, which enlarges accessibility to training and becomes essential to complement the traditional way of teaching (i.e. face-to-face).

E-learning encompasses a continuum of integrated educational technologies. At one end are applications like PowerPoint, which have little impact on learning and teaching strategies or the organization. At the other end are virtual learning environments (VLEs), and managed learning environments (MLEs), which can have significant impact upon learning and teaching strategies, and upon the organization (OSU, 2003; Julian et al, 2004). Broadly, OSU (2003) views the continuum of e-learning as the educational technology from the supplemental use of technology in the classroom, through blended or hybrid uses comprising a mix of face-to-face and fully online instruction, to fully online synchronous and asynchronous distance learning environments delivered to remote learners.

In the supplemental use of ICTs to complement traditional learning experiences, the instructor teaches all sessions in the classroom but with the occasional use of technology, such as Web based activities, multimedia simulations, virtual labs, and/or online testing (Arabasz and Baker, 2003). Blended learning denotes a solution that combines several different delivery methods, such as collaboration software, web-based courses, computer communication practices with traditional with traditional face-to-face instructions (Mortera-Gutierrez 2005). On the other hand, distance learning is conducted solely online where interaction may be synchronous or asynchronous (OSU, 2007). Synchronous learning requires the teachers and students to interact at the same time though they may be dispersed geographically. On the other hand, asynchronous learning allows teachers and students to interact and participate in the educational process at different time irrespective of their locations (Chen *et al.*, 2004). Actually, the use of synchronous with asynchronous activities is determined by the available technology, cost, and maintenance and is adjusted to suit each course, instructor and audience (Graziadei *et al.*, 1997).

2.6 E-Learning Technologies

Functionally, e-learning includes a wide variety of learning strategies and ICT applications for exchanging information and gaining knowledge. Such ICT applications include television and radio; Compact Discs (CDs) and Digital Versatile Discs (DVDs); video conferencing; mobile technologies; web-based technologies; and electronic learning platforms. This section discusses what these ICTs entail and their pedagogical, technical and cost implications.

Television (TV) refers to a receiver that displays visual images of stationary or moving objects both live or pre-recorded and mostly accompanied by sound which is electronically captured, processed and re-displayed. Likewise, this applies to the term radio – both live generated sound as well as pre-recorded sound. Both TV and radio can improve teaching and learning process in different ways such as by showing processes and activities that may not otherwise be available to the learner. However, digitalization has taken over analog audio and video systems.

Compact Discs (CDs) and Digital Versatile Discs (DVDs) are based upon laser technologies for writing and reading data. They provide a way in which a large amount of multimedia training material can be stored and made available to end-users: CD-ROM can store up to 1GB while DVD can store up to 17 GB. CD-ROM and DVD-based products can be linked with online information sources. This hybrid approach provides the user with access to media-rich up-to-date information.

Video conferencing is a system where two or more participants, based in different physical locations, can see and hear each other in real time (i.e. live) using special equipment. It is a method of performing interactive video communications over a regular high-speed Internet connection. A videoconference can be either two-way (point-to-point) or multipoint, linking three or more sites with sound and video. It can also include data sharing such as an electronic whiteboard where participants can draw on, or text based real

time 'chat'. Interactive whiteboard is simply a surface onto which a computer screen can be displayed, via a projector (Department for Education and Skill, 2004).

Mobile e-Learning (sometimes called 'm-Learning') is a new way to learn using small, portable computers such as personal digital assistants (PDAs), handheld computers, two-way messaging pagers, Internet-enabled cell phones, as well as hybrid devices that combine two or more of these devices into one (Hunsinger, 2005). These technologies have enormous potential as learning tools.

World Wide Web (WWW) is set of software tools and standards that allow users to obtain and distribute information stored on a server and connected to Internet. WWW is a decentralized information system, in which anyone can add new information whenever he/she wants. Lecture notes and other teaching materials are placed on the WWW and linking useful websites to these resources for students to access. In the recent years, web and Internet technologies have matured significantly by providing a uniform access media for both asynchronous and synchronous learning. This phenomenon has significantly increased the popularity of on-line learning (Chen *et al.*, 2004). The usage of web technologies in e-learning are further enhanced with the web 2.0, which is a set of economic, social, and technology trends that facilitate a more socially connected Web where everyone is able to add to and edit the information space (Anderson, 2007). These include blogs, wikis, multimedia sharing services, content syndication, podcasting and content tagging services (Anderson, 2007).

E-learning platforms (sometimes called learning management systems (LMS)) are applications used for delivery of learning content and facilitation of learning process. They are developed for administration and teaching in tertiary education. This software enables the administrators and lecturers to treat enrolment data electronically, offer electronic access to course materials and carry out assessments (OECD, 2005). The activities managed by the LMS vary from instructor led classroom training to educational seminars to Web-based online training. In addition to managing the administrative functions of online learning, some systems helps create, reuse, locate, deliver, manage, and improve learning content. These systems are called Learning Content Management Systems (LCMS) (Rengarajan, 2001). LCMS actually provide tools to deliver instructor-led synchronous and asynchronous online training. The LCMS provides tools for authoring content as well as virtual spaces for learner interaction (such as discussion forums and live chat rooms). Rengarajan (2001) emphasizes the importance of integrating both LMS and LCMS because they share different levels of administrative interests in the same entities. Lack of smooth integration between the products results in a broken solution with administrative conflicts.

Many e-learning platforms (both LMS and LCMS) currently available are based on either proprietary e-learning software (PES) or open source e-learning software (OSS). OSS usage in implementing e-learning systems is more emphasized in developing world due to the challenges faced when implementing the PES. Coppola (2005) describes two characteristics of PES that make it ill-suited: (1) the rapidly escalating cost of proprietary software leaves too little of an institution's ICT budget available for creative exploration,

once the software has been installed and minimally supported, (2) reduced flexibility to adapt to institutional culture, teaching practices, and disciplinary uniqueness occurs when software development is driven by mass market economics.

Open source software offers the potential to reduce the cost of the software while providing the universities greater control over its destiny. Elimination or reduction of license leaves more budgets available to invest in adapting and managing the software; offers reliability, performance and security over proprietary software due to the availability of the source code, which allows vulnerabilities to be identified and resolved by third parties and it is easy to customize (Wheeler 2003; Coppola, 2005). Some of the widely used open-source e-learning software programs are the Claroline, Moodle. Joomla, WordPress and Drupal.

E-learning is a revolutionary way to empower learners with the skills and knowledge they need in a convenient time and space-independent means (CISCO, 2002). It is the online delivery of information, communication, education, and training providing a new set of tools that can add value to all the traditional learning modes – classroom experiences, textbook study, CD-ROM, and traditional computer based training. Old-world learning models don't scale to meet the new world learning challenges. E-learning can provide the tools to meet that challenge. However, E-learning will not replace the classroom setting, but rather enhance it, taking advantage of new content and delivery technologies to enable learning (Omwenga, 2003). It has been argued that retention for a learner varies, based on content type and the delivery vehicle. The better the match of content and delivery vehicle to a learner's style, the greater the retention, and therefore the greater the results, (Omwenga, Waema and Wagacha, 2004).

Table 2.1: Pedagogical, Technical And Cost Implications Of E-Learning Technologies

E-learning technologies	Pedagogical implications	Technical implications	Cost implications
TV/Radio	Effective use of TV/radio depends on three key moments in the application: before, during and after the viewing session and give instructions, explanations, questions or evaluation before and after each moment	Equipments are needed depending on the objectives and the scope of the training application, which includes audiocassette, video camera, PCs, editing software, distribution channel and receiving and displaying equipment.	Costly in terms of TV/radio production, which includes, animation and graphic designers, hardware, access to the broadcast network
CD/DVD	• Simulation for self study • Used with the presence or remote support of the trainer	Hardware that meets their specifications - graphic screens, MPEG^2 cards, CD or DVD reader and appropriate software	Costs are higher than for printed materials - replication downloading free products or buying ready-made

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			products can lower the costs.
Web-based technologies	Permanent accessibility (24 hours, all days of the week), speed, direct communication, links to related topics and up-to-date notes.	Fast computers with sound cards and reliable Internet connections are required. • The following team is needed for implementing web-based training: (a)Instructional designer familiar with computer delivered instruction; (b) A programmer or author to use the authoring tool; (c) A graphic artist; (d) A subject matter expert; (e) A webmaster for maintaining the programme on the server.	Hardware, technical expertise and Internet subscriptions costs
E-learning platforms	Adding and changing content as course is progressing. • Template for inclusion of course content. • Support Multimedia presentation of course content while others are text based. • Complex structuring of content allowing for multiple links and cross reference possibilities.	(i) Server platform hardware requirements; (ii) Client platform Hardware requirements; (iii) Operating system/cross platform; (iv) organization/ registration/ administration; and (v) The learning content should be in standard formats that can easily be stored, accessed and distributed. Such formats include HTML, PDF, RTF, GIF, JPEG and MPEG.	Hardware Cost implications • Cost for maintenance • Operational Costs (technical And administrative support) • License fee (annual fee).
videoconferencing	• New pedagogical methods required to provoke interaction • Require small groups • Both trainers and learners require some basic training	Required equipment: (i) Sound proofing and controlling the lighting conditions; (ii) Audio-visual peripherals – TV monitor or video	There are two types of costs: setting up the videoconferencing system and operational costs.

		projector, camera(s), microphone(s) and sound playback; (iii) Videoconferencing codec (Rollabout) (iv) Multimedia PC (with PCI-based as well as software based videoconferencing codec) and (v) More bandwidth is needed for higher-quality images	

2.7 Choosing an appropriate mode of e-learning

According to Omwenga, Waema and Wagacha (2004), a combination of synchronous and asynchronous modes of communication provide a more comprehensive e-learning implementation. Bulletin and message boards and other chatting techniques enable synchronous learner-learner as well as learner-instructor communication. Email is an example of asynchronous communication. All these modes of communication are possible within an intranet and Internet availability may not be mandatory. However, for external communication, one needs to have Internet connection to enable synchronous mode of access while email is used within a store-and-forward configuration.

Most university campuses in developing countries are rapidly developing Internet infrastructure and the above modes of access are increasingly becoming possible. However, in order to offer off-campus programs using elearning, a number of limitations must be overcome. Besides dwindling finances, existing infrastructure to support distance education may not be available or adequate. Electricity and telephone facilities are still lacking in most areas and where they are available, the cost can be prohibitive.

In order to overcome such barriers, there needs to be a change of attitude and resolve that with careful planning, we can formulate appropriate technologies that can be beneficial to dispersed learners. Omwenga, Waema and Wagacha (2004) in their study proposes some alternatives for solving these limitations.

2.7.1 Offline access of content on CDs with regular updates
(e.g Monthly or weekly)

This remote access option offers a practical way of solving the problem of poor infrastructure in remote parts of the county-side in developing countries. These CDs can be used in e-learning centers or in home computers, which may be shared among friends. Distance learners may also use these CDs in cyber cafés or hired computer facilities in nearby urban centers. The CDs may be regularly updated or replaced and students can follow missed online discussions and correspondences from the Instructor.

2.7.2 Offline access with dial-up

This option will enable a learner to access content through a dial-up connection and download current content together with any missed synchronous communication.

In this case the learner may send email to colleagues and instructor.

2.7.3 Online access at cyber cafés or at e-learning centers

This option has a promising future as the cost of Internet comes down. Effective policy formulations may see cyber cafés lowering costs as they respond to challenges of "education for all" initiatives. Individual universities may wish to invest in e-learning centers which may double-up as extra-mural or community learning centers.

In all of these cases e-learning can serve as an alternative mode of instruction or as a complimentary mode to other instructional methodologies for various learning options.

As much as possible we should have options that in their totality are inclusive and not exclusive. Unlike most universities in the developed world which offer distance courses wholly through electronic means including video conferencing and Internet-based tools, mixed modes in which face-to-face classroom teaching and/or printed notes accompany new didactic technologies are becoming common in developing countries.

A new technology of downloading content has been proposed by a company called Worldspace (http://www.worldspace.com/). The company's goal is to create a new form of electronic media with a vision to spread knowledge for the good of mankind. Africa, Asia, the Middle East, and Western Europe are covered using satellite technology. The company's presence within the African countries is expanding steadily although the technology's use for educational purposes has not quite picked up. One exception is in the Kenya Institute of Education where the Institute is using Worldspace infrastructure to deliver courses to both primary and secondary schools through cheap receivers. We hope that this technology will outgrow its teething shortcomings and become a viable cost-effective delivery mode.

2.8 Existing E-learning Frameworks

A number of Frameworks and models exist for implementation of e-learning in higher education. But they are not static rather they are dynamic and have evolved from classroom based teaching towards models that incorporate technology and pedagogical issues. (Elmarie 2003) noted that, "While the first e-learning models emphasized the role of the technology in providing content, delivery and electronic services, more recent models focus on pedagogical issues" Some of the existing E-Learning frameworks and models are listed below:

2.8.1 An e-learning framework: Adapted from (Khan 2001)

The Design, development, implementation and evaluation of E-learning requires thoughtful analysis and investigation of how to use the attributes and resources of the Internet and digital technologies in concert with instructional design principles and issues important to various dimensions of online learning environments (Khan, 2001).

Khan after working closely with more than 100 authors worldwide who had contributed chapters to his two books realized that e-learning represents a paradigm shift not only for learners, but also for instructors, administrators, technical and other support services staff, and indeed the institution as a whole. This led

Khan to formulate an extensive list of caveats that are organized around eight key dimensions that form a course designer's "framework for e-learning". These critical dimensions are: pedagogical, institutional, technological, interface design, evaluation, management, resource support, and ethical considerations. Each dimension has several sub-dimensions, and each sub-dimension consists of issues related to a specific aspect of an e-learning environment. These issues generate many questions that course designers can ask themselves when planning or designing an e-learning system

Khan developed the E-learning framework after reflecting on various factors important to open, flexible and distributed learning environments that is, e-learning.

Various factors discussed in the eight dimensions of the framework can provide guidance in the design, development, implementation, delivery and evaluation of E-learning system.

Khan's framework as shown in Figure1 has 8 dimensions: Institutional, Pedagogical, Technological, Interface design, Evaluation, Management, Resource support, and Ethical considerations.

Table1 briefly explains the dimensions of the framework. (Barry 2002) noted that, "Various issues within the eight dimensions of the framework were found to be useful in several studies that were conducted to review e-learning programs resources and tools".
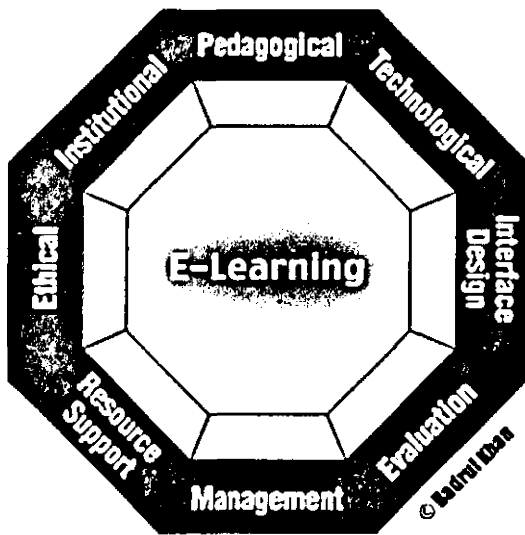
Figure 2.1: An e-learning framework: Adapted from (Khan 2001)

Table 2.2: An e-learning framework:

No.	Dimension	Explanation
1.	Institutional	Institutional readiness, Institutional matters, Collaboration, Administrative matters, Organizational, Academic, Infrastructure availability, and Planning
2.	Technological	Availability of Technology Infrastructure
3.	Pedagogical	Teaching/Learning requirements, Content Management Systems
4.	Resource Suport	Online, Offline technical support
5.	Evaluation	Assessment of learners, Instructions and programs

6.	Interface Design	Overall look and feel of E-learning programs
7	Management	Maintenance of learning environment, Distribution of information
8.	Ethical considerations	Social and Cultural diversity, Copyright and so on

1. The **pedagogical** dimension of E-learning refers to teaching and learning. This dimension addresses issues concerning *content analysis, audience analysis, goal analysis, media analysis, design approach, organization and methods and strategies* of e-learning environments.

2. The **technological** dimension of the E-Learning Framework examines issues of technology infrastructure in e-learning environments. This includes *infrastructure planning, hardware* and *software.*

3. The **interface design** refers to the overall look and feel of e-learning programs. Interface design dimension encompasses *page and site design, content design, navigation, and usability testing.*

4. The **evaluation** for e-learning includes both *assessment of learners and evaluation of the instruction* and *learning environment.*

5. The **management** of e-learning refers to the *maintenance of learning environment* and *distribution of information.*

6. The **resource support** dimension of the E-Learning Framework examines the

7. *Online support* and *resources* required to foster meaningful learning environments.

8. The **ethical** considerations of e-learning relate to *social and political influence, cultural diversity, bias, geographical diversity, learner diversity, information accessibility, etiquette,* and *the legal issues.*

9. The **institutional** dimension is concerned with issues of *administrative affairs, academic affairs* and *student services* related to e-learning.

The E-Learning framework by Khan has the potential to provide guidance in

1. Planning and designing e-learning materials,

1. organizing resources for e-learning environment,

2. designing distributed learning systems, corporate universities, virtual universities and cyber schools,

3. designing LMS, LCMS and comprehensive authoring systems (e.g., Omni),

4. Evaluating e-learning courses, and programs.

5. Evaluating e-learning authoring tools/systems, LMS and LCMS.

6. designing and evaluating blended learning environments

Khan argues that this framework can be applied to e-learning of any scope. Each dimension has further sub dimensions and each of these are inter related, e.g., after handling all matters concerning staff, students, and planning in Institutional dimension, next step is to put in place the necessary technology to support the e-learning programs, followed by e-learning teaching requirements etc. Author believes that a meaningful e-learning environment can be created for a particular group, by putting each stake holder group (such as

learner, instructor, support staff etc.) at the center of the framework and raising issues along the eight dimensions of the e- learning environment as shown in Figure1.

2.8.2 Framework for Adaptation of Online Learning

The Framework for Adaptation of Online Learning was developed by Faridha (Faridha 2005). It is a modification of Bates (Bates 1997) ACTIONS model which has elements: Access (A), Cost(C), Technologies (T), Interactivity (I), Organization (O), Novelty (N), and Speed (S). Faridha grouped online learning issues into three categories; Educational, Managerial, and Technological.

Educational: This factor addresses the issues concerning; curriculum development, instructional design, and delivery.

Managerial: All organizational matters and constraints for implementation of online learning are looked at in this factor.

Technological: This factor handles issues like: access, integration, usability, and flexibility. The LASO Model for Technological Transformation in Tertiary Education is based upon major findings of the author (Uys 2004) at his Doctoral research in New Zealand. The Model has the elements: Leadership, Academic, Student Ownership and Readiness, as shown in Figure 2.2. According to this model technological transformation occurs when leadership is integrated with academic and student ownership and readiness, whereas Leadership is achieved through mechanisms which define a clear vision for the transformation, providing incentives for the staff engaging in the change process and the creation of a strategic framework to guide the transformation. The author argues that the strategies such as; pilot projects ,extensive training, establishing workgroups in every faculty/school, teams for courseware development should be used to achieve the Ownership and Readiness for change by both students and academic staff. A ragged line shown in the figure "signifies the complexities and dilemmas with which technological transformation is often associated".

The LASO model is proposed for developed and developing environment. MacNaught et al (in uys et al 2004) state, "The LASO model for technological transformation is one where management provides for the requisite vision, direction, organization, focus and control over the resources needed and thereby empowers the staff for action and ownership of the transformation". The model also includes an inside-out dimension as it attempts to address the affective domain such as motivation of staff and students.
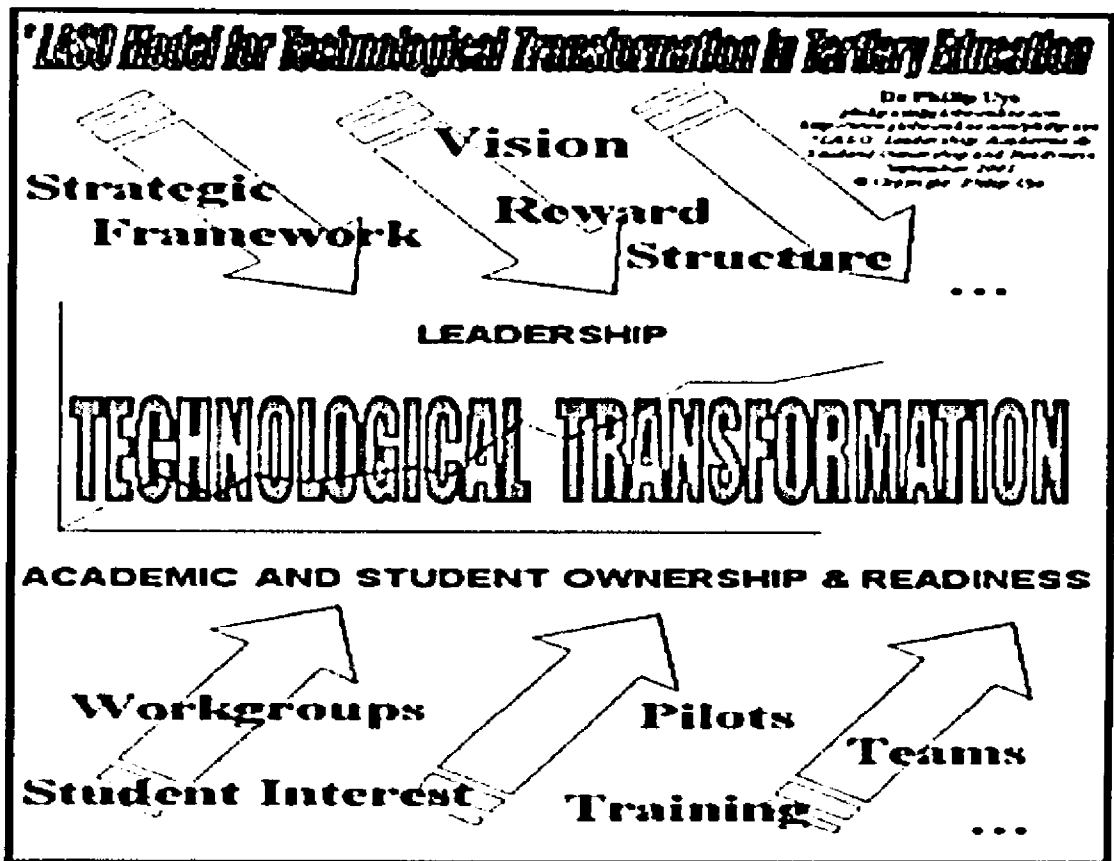
Figure 2.2: A Framework for developing and developed environment: Adapted from (uys 2001)

2.8.3 A Framework for Success

The Framework for Success was proposed by Jennifer (Jennifer 2005) and has five elements: Technology, Content, Administration and support, Communication, and Financial analysis.

Technology: There are two types of technologies; synchronous and asynchronous.

Synchronous technologies involve real-time interaction between an instructor and learner and they are like a broadcast with a time and a "channel" (web URL) for tuning in, and include webcasts, webinars, and chats, which can be recorded and replayed, and the recordings would be considered as asynchronous. The author argues that it is necessary to make IT department a partner in the technology decision making process.

Content: Content can be developed internally or can be bought from vendors. Therefore organizations should decide as what content to buy vs. build internally.

Administration and support: According to author, it is necessary for someone to be there full time for student support to receive queries, issue of identity cards, and to facilitate registration process etc.

Communication: Two factors are to be considered when communicating e-learning strategy to learners; change management and marketing communications.

Financial analysis: Much emphasis should be put on financial analysis, as this is the factor which determines sustainability of the e-learning program, and financial analysis should include all related costs including; cost of technology, authoring tools, course development, support, and administration.

2.8.4 The demand-driven learning model

The demand-driven learning model was developed in Canada by MacDonald et al (MacDonald et al 2001) as a collaborative effort between academics and experts from private and public industries. It emphasizes the three consumer (learner) demands:

High quality content, Delivery, and Service. As shown in Figure 2.3, the superior structure has its components; (learners needs, learner motivation), (learning environment, program goals), pedagogical strategies, and (learner evaluation, learner convenience). Other components of superior structure are: (content, delivery, and service), which result into superior learning outcomes (lower cost of learner and employer, personal advantage of learner), with emphasis on ongoing program evaluation and continued adaptation and improvement.

Content: Content should have qualities like; authenticity, comprehensiveness, and should be research based.

Delivery: A web-based delivery is recommended which should have user-friendly interface with communication tools to support interactivity.

Service: Service should include; the provision of resources for e-learning, administrative and technical support.
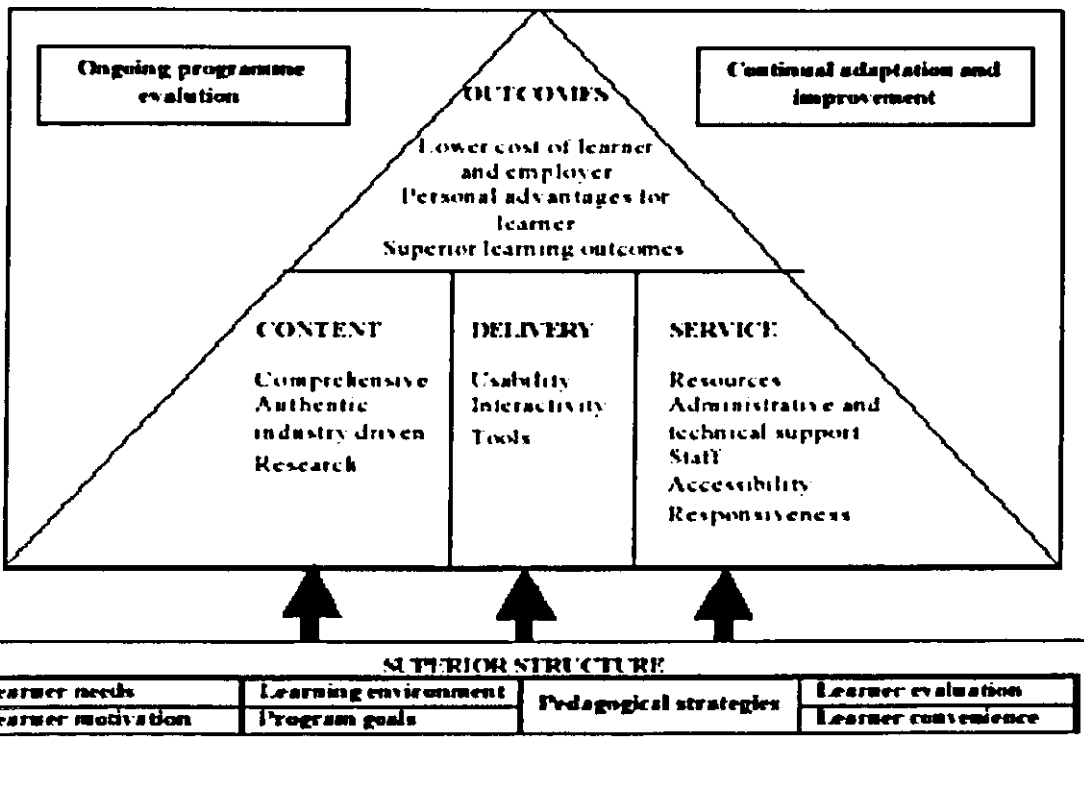
Figure 2.3: The demand – driven model: Adapted from (MacDonald et al 2001)

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2.9 Critique to Existing Frameworks

In terms of key factors important commonalities are identified between existing frameworks and models listed above; they refer to, and suggest, similar factors.

Some frameworks such as "The demand-driven learning model", (Macdonald 2001) and "Framework for Adaptation of Online Learning", (Faridha 2005) combine several elements under one factor while others like "A Framework for Success",(Jennifer 2005) and "An e-learning framework", (Khan 2001) refer to each of these areas as a key factor. The reviewed literature reveals that the core factors; accessibility and connectivity (low bandwidth), irregular or non existent power supply, inadequate telecommunication infrastructure, high cost of hardware, software, economic conditions, and cultural issues, associated with implementation of e-learning in developing countries, which need solution are not considered. Therefore, there is a need for a conceptual framework which assesses the implementation of e-learning systems within higher education in Kenyan environment which addresses the above issues.

2.10 Conceptual e-learning Framework

The conceptual framework for guiding this study will be adapted from the one developed by (Khan 2001) Blended e-learning Framework having dimensions; Institutional, Pedagogical, Technological, Interface design, Resource support, Evaluation, Management and Ethical. (Harvey 2003) argues, "Organizations exploring strategies for effective learning and performance have to consider a variety of issues to ensure effective delivery of learning and thus a high return on investment, while Khan's framework has capacity to serves as a guide to plan, develop, deliver, manage, and evaluate blended learning programs".

On the other hand, in this frame work, many aspects of the socio-economic and technological environment such as connectivity (low bandwidth) and accessibility, inadequate telecommunications infrastructure, and lack of reliable power supply are not considered and therefore they need to be addressed during technological transformation in the context of developing countries. Many frameworks adopted in developing countries ignore some important constituents hence affecting the entire e-learning process.

In terms of factors, the conceptual e-learning framework which can be adaptable by the Higher Education Institutions in Kenyan environment as shown in Figure 2.4 is a modified form of Khan's Blended learning framework. The conceptual framework considers those issues and shows that constraints like; scarcity of resources and inadequate infrastructure, including insufficient bandwidth can be the barriers towards the process of e-learning implementation (IICCIT 2006).

The conceptual framework has the following dimensions; *Institutional; Infrastructure; Bandwidth; good connectivity; access; Cultural; acceptance to technological change; Content Development and e- learning Tools; Management and Student Support; technical experience and skills; reliable power supply and Financial support and Analysis*. All the dimensions are inter-related. When these constituents are interlinked together they are able to effectively deliver an effective e-learning process. According to the framework, first step is to handle Institutional matters and putting in place the necessary Infrastructure, addressing low bandwidth and cultural issues and overcoming other constraints., which is followed by Content Development & e-learning Tools, technical experience and skills and Management of blended

learning programme & Student support dimensions. Next, the developed courses are put online and are communicated, which are accessed by on campus and off campus students. The last dimension of the framework is Financial Analysis- the sustainability criteria of the technology transformation. The outcome of the implementation of the framework is increased enrolment with no extra lecture rooms for HE institutions and Flexible, Quality Higher Education at affordable cost for students.
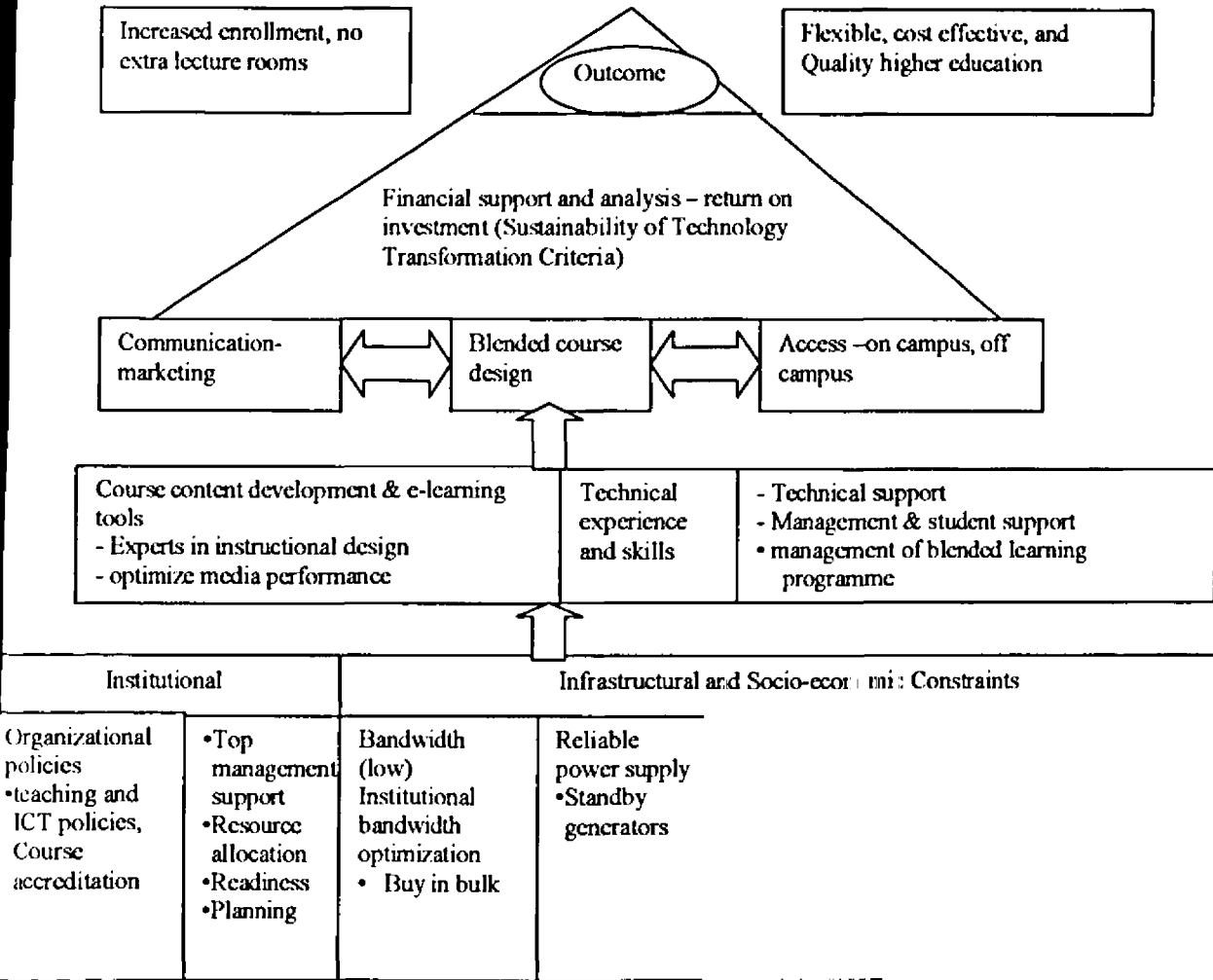
Figure 2.4: Conceptual E-learning Framework

(a) **Institutional:** The Institutional dimension addresses issues concerning; organizational readiness, a vision for e-learning at the institution & development of technology development plan, top management support, formation of steering committee, human and financial resource allocation, staff and student affairs (khan 2001). Recruitment, library services, collaboration with other institutions, maintenance of infrastructure, and general administration, student ownership, copy right and learners needs, offering each trainee the learning delivery mode independently, organizational policy as well as in a blended program, are also part of the Institutional dimension.

Organizational policy: This refers to a set of guidelines set up by the organization to guide in administering of the organization. These guidelines stipulate what should be done, how it can be done and the end result. The policies that affect e-learning implementation include course accreditation, teaching and ICT policies. When the faculty decides to offer an online course, the University has to agree on the accreditation of the course based on the existing policy for accreditation, the delivery methods, appropriateness of the courseware and target group of learners. The University's policy on teaching using ICT encourages the faculty in implementing e-learning. Therefore these policies have a direct impact how e-learning is implemented within an organization. The policies also outline clearly how the monitoring and tracking of the e-learning implementation is carried out within the organization.

(b) Infrastructure: After the institutional vision for implementation of e-learning in their program offerings, readiness, and resource allocation, and handling other administrative matters, the next step is to put in place the necessary Technology Infrastructure. The basic requirement for implementation of e-learning is the availability of regular power supply, computers, telecommunication infrastructure, reliable Internet connection, and bandwidth. The necessary Technology Infrastructure also includes; high-speed access to the university network and the Web, including access from off campus, provision of appropriate classroom technologies, and student computing abilities.

(c) Bandwidth: Bandwidth is part of necessary infrastructure for implementation of e-learning. But in developing countries the insufficient bandwidth that supports the educational needs of students and university, adversely affect delivery and teaching using e-Learning technologies that rely entirely on a high-speed campus backbone (Claudia 2002). In the implementation of e-learning process bandwidth is required by the institution for the development of e-learning course materials (content development), and by the learners who access those materials. Institutional bandwidth can be conserved through Bandwidth optimization. From the perspective of bandwidth, all media are not created equal. Asynchronous e-learning uses web based learning modules but does not support real time interaction between the instructor and the students.

Synchronous e-learning consists of on-line real-time lectures, which typically have to be joined by students at the time of their delivery. Additional asynchronous functions typically support the learning environment. Most demanding in terms of bandwidth are forms of collaborative e-learning in which students have to interact continuously to solve problems or engage in other learning activities.

Table3 below illustrates that only certain forms of e-learning require broadband support.

Table 2.3: Broad band requirement for e-learning: Adapted from (Bauer et al 2002)

	Application	Network demand	**Complementary Functions and Tools**
Asynchronous	Computer Based Training,	POTS ISDN	E-mail Automatic upload of

	Multimedia Database Support System		Educational materials
Synchronous	Remote Lecture Room, Interactive Home Learning	Up to 6 ISDN channels, ATM, Internet protocol stack	Bulletin board, videoconference systems, e-mail, chat room, file exchange tool
Collaborative	Remote Interactive Seminars	Up to 6 ISDN channels, ATM, Internet protocol stack	Bulletin board, videoconference systems, e-mail, chat room, file exchange tool

Text and simple graphics can be downloaded quickly even in low bandwidth environment, whereas complex media require more bandwidth (Bruce 2001), which can be acquired through bandwidth optimization; exploring and controlling bandwidth hungry applications, filtering undesirable traffic from reaching backbone. Other possible solutions according to (ATICS 2004) are; formation of bandwidth consortium-which could cost half the cost of bandwidth, management of centralized network and technical capacity, improved regulatory policies regarding educational bandwidth. Although, bringing Internet access into the remote rural village in a least developed country is still a challenge different than optimizing it at a university, in its library, labs, and offices, or on the desktops of government or business officials in a capital city (David 2004).

(d) Cultural: Implementation of e-learning changes the perception of teaching and learning, by providing entirely new educational culture (Karen 2006). It reconstitutes the roles for faculty members such that ; faculty members become e- Learning content developers, instructors, content experts, instructional designers, graphic artists, media producers, and programmers. Some incentives should be put in place to reward them.

Cultural change is a complex and one of the biggest challenging subjects in any medium and most particularly in the context of developing countries. People fear from the technology. Cultural awareness extends to appropriate design that takes into account the different learning styles. For example design that presents characters, thoughts, and speech in both audio and text format can address: accessibility to technology, different learning styles, and consideration of language needs for non native speakers of the language being used, and for native speakers with unfamiliar accent. Another important factor to be considered in any training product design is learner motivation.

(e) Content Development and e-learning Tools: Once the technology infrastructure is in place, the faculties interested in offering their programs in blended learning, are to develop and design the courses

according to learners needs, offering each trainee the learning delivery mode independently as well as in a blended program (Harvey 2003).

E-learning content development is a team work (John 2004). It includes: Instructional designers, Subject matter experts, Software developers, Graphic designers, Project managers, Database specialists, and Translators. Multimedia specialists, Distance learning specialists, professors, and instructors are also part of the content development team. Other team members are: Information security and privacy experts and Legal advisers.

Developed courses are to be put on line which can be accessed both by on campus and off campus students. Other requirements, according to (John 2004) include: Virtual

Learning Environment (VLE), use of research facilities and resources, video and audio streaming, web conferencing, Computer Assisted Assessment (CAA). Learning

Management System (LMS) and Learning Content Management System (LCMS) are also part of the e-learning tools. LMS is a program that manages the administration of training, typically includes functionality for course catalogues, launching courses, registering students, tracking student progress and assessments, and (LCMS) is a web based administration program that facilitates the creation, storage and delivery of unique learning objects, as well the management of students, rosters, and assessment.

2.11 Optimizing Media performance

There are two main ways to improve the course's performance: media optimization and streaming. The content that is presented in a continuous stream as the file downloads is referred as Streaming media. The streamed file starts playing before it has entirely downloaded. It is an effective way to deliver bandwidth-intensive content without making the user waiting. The streaming technologies can be used to reduce the bandwidth, but the rule of authoring is to make the courses small, which is called optimization. To optimize various media types effectively, techniques used, according to (Bruce 2001) are the following:

Text: Text files are small and perform well at low bandwidth, users can search for specific words, and content can be updated easily. Using anti-aliased text avoids having to create display text as a graphics file, which can make the course size much larger.

Graphics: Graphics are optimized by modifying file attributes, such as decreasing the resolution, size, and number of colours. Web graphics should have a bitmap resolution of 72 pixels per inch. Using graphics saved at a higher resolution will make the file unnecessarily large. The size of imported graphics should not be changed directly in an authoring tool and large graphics can be resized in an image editing application.

Animation: The animation file size is dependent on the size and file type of the graphics being animated. Techniques for optimizing animations are similar to those for optimizing graphics.

Audio: Large audio files can be optimized for efficient playback. Audio can be optimized by balancing sound quality and file size while musical audios by use of a short file that loops rather than one long audio track. Several files can be looped to play throughout your piece. Because Mono audio files are significantly smaller than stereo audio files, therefore files should be saved as mono unless it is necessary to use stereo audio.

Video: High bandwidth is required to download a video. Three standard digital video formats are: QuickTime, Video for Windows, and MPEG. Streaming video format, such as Real Video, requires a special server. Video files tend to be large and are not appropriate for delivery on modem connections- low bandwidth. Users can turn on bandwidth detection to automatically receive video at the highest quality their bandwidth supports. Video is captured, edited, and optimized in video editors such as Adobe Premiere. If video is too bandwidth intensive, it can be substituted with still graphics and audio, which will considerably decrease the size of your course. As Flash files are considerably smaller, substituting animation can also make downloading more efficient. A careful decision should be made by the users when viewing various types of media, as text and simple graphics can be downloaded even at any available bandwidth.

Authoring guidelines

Following are some of the techniques to deliver low-bandwidth courses.

Interface design: It should be noted that a clean and simple interface design can make courses more compact. By using the authoring program's drawing tools, create large blocks of colour rather than importing bitmaps. The graphics without gradients compress better than heavily shaded graphics. Moreover, only those graphics should be used that are necessary for learner comprehension. For self paced training, CD-ROM and DVD are usually created on 800 x 600 pixel screen resolution but online courses require a smaller screen resolution that will download quickly.

Status indicators: Status indicators should be added to inform users when they are waiting for files to download. Progress bars will show how quickly a file is downloading. Loader movies presented in a very small window, present a short introduction or entertaining animation that can hold the user's attention while files are downloading. The Loader movie can be a lightweight main menu that loads other portions of the course.

(f) Management and student support: The Management dimension deals with issues related to the management of a blended learning program, such as infrastructure and logistics to manage multiple delivery types. Harvey (Harvey2003) argues that delivering a blended learning program is more work than delivering the entire course in one delivery type. The management dimension also addresses issues like registration and notification, and scheduling of the different elements of the blend.

(g) Communication: After putting the courses online. There are some factors to consider in communicating e-learning strategy to your learners which include:

Real time communication, change management and marketing communications (Jennifer 2005). Due to reduced bandwidth, which is the information carrying capacity of a communication channel, real-time communication is a bit problematic issue for developing countries. However, universities can collaborate, form partnership among them and buy high bandwidth in order to achieve this benefit which is very important. Universities should use both print and electronic media to publicize their on line courses. Some resistance in the beginning is expected.

(h) Access: In order to implement e-learning in the universities, students are required to have access to computers and Internet, whereas access to computer technology is a major issue, particularly in developing countries. Access involves offering stakeholders the appropriate avenues through which they can interact with the information offered in the e-learning process. The access that is required by the tutors may be different from what is required by the students. Is e-learning offered at a 24 hour basis or the e-learning process occurs at only designated times of the day? Can students access the e-learning environment ubiquitously or restricted to the university circumference? Some tutors prefer to avail the online assessment at specific periods for the sake of monitoring.

In developing countries many students cannot afford to purchase computers and network access. Several strategies can be used to provide support for student access to computers, like providing computer labs on campus for students. Although, "It is a useful start-up strategy, but it becomes unsustainable in the long run as the primary source of student support but relying on computer labs for access has some drawbacks. For example, as the need to use computers for learning increases, either capital investment costs get out of control, or students' lining up for access reaches unacceptable levels. Secondly, with the technological change, computers in labs can get outdated (Bates 1997).Other strategies to increase the accessibility of computers and networks for learners are the development of government-funded educational networks, equipped with advanced technologies including generators to help learners who stay in remote areas with non existent or irregular power supply.

More important, the main advantage of e-learning technology is flexibility- a learner can choose as where, when and how to learn but students to access learning from a specific place, often at a specific time, if they have to book, thus removing one of the main advantages of using technology- its flexibility. However, in the long run the most flexible and most cost-effective approach is to encourage students to provide their own computers and Internet access. Governments should provide loans to the students.

(h) Financial Analysis: The return-on-investment is the most important factor, which determines whether e-learning program receives the investment it needs to succeed and grow. The financial analysis should include: Costs for technology, authoring tools, course development, support, and administration (Jennifer 2005).

This refers to both the money spent (expenses) on the implementation of e-learning and the one generated from the revenues (training fees, tuition, etc...). Money can be spent on several items such tutor recruitment, human capacity development, rent for e-learning platform, purchase of hardware and software. The funding directly and indirectly influences the type of e-learning that will be provided based on initial input (expenditure). The funding will determine what stakeholders to be recruited (staff) for teaching and content creation. It also influences the quality of infrastructure to be installed for delivering the e-learning process. Funding also determines the type and quality of services that can be offered. The fees paid by the students should be well articulated to indicate the reasons why they are paying a specific amount as compared to another. Full time students will end up paying more fees than part time students.

CHAPTER THREE: METHODOLOGY

3.0 Introduction

This study concerns the challenges of implementation of e-learning systems in Higher Education Institutions in Kenya. This chapter presents the research methodology by describing the research design, location of the study, target and accessible population, sampling procedures and the sample size, instrumentation, data collection and analysis procedures.

3.1 Research Design.

The research design used was descriptive research survey. This study design involves describing the characteristics of a particular individual or of a group of variables (Kothari, 2007). It is used to determine how people feel about a particular issue by enabling them to describe their experiences (Mc Burney & White, 2004). Descriptive survey design lays a greater emphasis on sample selection because the major concern is to obtain a broad picture of the social problem prevailing in the defined universe and make recommendations to bring about the desired change (Majumdar, 2005). It is ideal because surveys are suitable for sampling a relatively large population. Ndirangu (2000) argues that surveys are very good vehicles for collecting original data for the purposes of studying attitudes and orientations of a very large population.

3.2 Location of the study

The study was carried out in Nairobi metropolitan. This region has the highest number of both public and private universities. The respondents have similar demographic characteristics with those across all Kenyan universities based on age, social-economic status, gender distribution, ethnic, racial, religious and income characteristics. Thus, the respondents of this study constitute a representative sample of a typical Kenyan university. Also the institutions are within Nairobi area and therefore convenient in terms of time and cost of the researcher.

The study took account of two public and two private universities. The target was students, lecturers, ICT support staff and administrative staff in the selected universities.

3.3 Target Population

The target population comprises of all individuals, objects or things that the researcher can reasonably generalize his/her findings to (Cooper & Schindler, 2006; Mugenda, 2008). The target population for this study was all the students, lecturers, ICT support staff and administrative staff in all the public and private universities in Kenya with those situated in Nairobi city and its environs selected as a representative group for the study. Therefore, the coverage research included two public universities out of seven(7) and two private universities out of fifteen (15) in Kenya by year 2010. The study area was selected due to the reason that the universities are within Nairobi area and therefore convenient in terms of time and cost of the researcher. University administrators, lecturers, students and ICT support staff were identified as potential participants. For student population the researcher only targeted full time students due to the reason that they are easily accessible. For the purpose of this study, the target population is as shown in Table 3.1

Table 3.1: Target Population: Student enrolment in public and private universities, 2009/2010

Public Universities	Students	Lecturers
University of Nairobi	22,327	1,411
Kenyatta University	21,010	720
JKUAT	4,831	503
Total	48,168	2,634

Private universities student enrolment, 2008/2009

Private Accredited	Students	Lecturers
Strathmore University	1,910	130
Daystar University	4,103	220
Catholic University of East Africa	3,420	200
Baraton University	2,849	190
United States International University	3,579	210
Scott Theological College	257	50
Aga Khan University	596	65
Nazarene University	1,543	150
Methodist University	2,309	180
Kiriri Women University of Science and Technology	806	40
KCA University	2,300	70
Total	23672	1505

Source: Respective University's Websites and Kenya Statistical Abstract 2010.

3.4 Sample and sampling procedure

Purposive sampling was used to select the universities from which the sample will be drawn. Purposive sampling, (Flick, 2002) was used to obtain desired information from specific target group. The main objective in this type of sampling is to pick cases that are typical of the population being studied. The researcher's judgment is used to select the respondents who best meet the purposes of the study. The two public universities were sampled because they are the first universities to be established in Kenya and they have their main campuses within Nairobi Metropolitan. The two private universities were sampled because one of them is among the most established private universities and the other is an upcoming private

university.

The selected universities from which the sample was drawn are:

- University of Nairobi

- Kenyatta University

- Strathmore University

- KCA University

Stratified random sampling was used to select the four categories of respondents namely; students, lecturers, ICT support staff and administrative staff from the target population. Students were sampled because they are the people for whom the ICT policies are expected to facilitate their learning, communication and management. Lecturers were sampled because they are the people who use the e-learning for teaching and communication. They also interact with the students on a daily basis. ICT support staff were sampled because they implement and maintain the e-learning systems; Administrative staff were sampled because they are considered as the ones who influence policy decisions. They also use ICT for communication and students' record management.

3.5 Sampling frame

Where time and resources allow, a research should take as big a sample as possible, since this would ensure reliability of the results (Mugenda & Mugenda 2003). Indeed it is desirable to use the entire population whenever possible. In most cases however, researchers have to work with a sample that is as representative as possible to ensure similar results would be obtained even when the entire population is used. The discrepancy between the sample characteristics and the population characteristics is known as sampling error. The smaller the sample, the bigger the sampling error (Mugenda & Mugenda 2003). It is therefore very important to identify the minimum sample size which will give results within acceptable sampling error margin. Both Mugenda & Mugenda (2003) and Kothari (2004) suggest a statistical formula for arriving at a sample size to be;

$$n = \frac{Z^2 pq}{d^2}$$

Where:

      n= the desired sample size if the target population is greater than 10,000

      Z= the standard normal deviate at the required confidence level, set at 1.96

      p = the proportion in the target population estimated to have characteristics being measured. Use 0.5 if unknown.

      q =1-p

      d= the level of significance set.

If the target population is less than 10,000 then the minimum sample size is obtained using the formula:

$$n_s = \frac{n}{1} + \frac{n}{N} n = \frac{n}{1} + \frac{n}{N} \qquad\qquad n_s = \frac{n}{1 + \dfrac{n}{N}} \qquad\qquad \text{Where:}$$

n_s= the desired sample if the target sample size is less than 10,000

n = the desired sample size if the target population is greater than 10,000

N = the estimate of the population size.

Kothari (2004) goes on to argue that the formula is suitable in case of infinite population in the universe. In case of finite population, the formula may be changed to;

$$n = \frac{z^2 * p * q * N}{e^2 * (N-1) + z^2 * p * q}$$

Whereby:

* n is the estimate of our sample size
* z is the area under the normal curve as per the table of normal curve. Given the confidence level of 95.5%, z is 2.005.
* N is the estimated population of the target respondents about.
* p the proportion in the target population estimated to have characteristics being measured or based on past experience and q = 1 – p. in our case, p was assumed to be 0.02 hence giving q as 0.98.
* e is acceptable error, in our case, the estimate should be given within 2%(0.02) of the true value.

To arrive at the value of N, the estimated population of the target respondents, we were guided by the estimates from respective University's Website and Kenya Statistical Abstract 2010.

The sample size for students was therefore given by;

$$n = \frac{(2.005)^2 * 0.02 * 0.98 * 47547}{(0.02)^2 * (47546) + (2.005)^2 * 0.02 * 0.98}$$

3872.887/(19.661+0.07879) = 3872.887/19.7398 = 196.2

The minimum acceptable number of respondents was taken to be 200

The sample size for lecturers was given by;

$$n = \frac{(2.005)^2 * 0.02 * 0.98 * 2321}{(0.02)^2 * (2320) + (2.005)^2 * 0.02 * 0.98}$$

182.88/(0.928+0.07879) = 182.88/1.007 = 181.61

The minimum acceptable number of lecturers' respondents was taken to be 180

Once the required sample size was determined, proportionate allocation was used to obtain the number of students, lecturers ICT staff and administrative staff to be included in the sample from each of the selected

universities. The researcher considered the size of the university in coming up with the number of respondents in each university.

The table below shows the distribution sample size calculated using the formulas above.

Table 3.2: Sample size

Universities	Students	Lecturers	Admin staff	ICT staff
University of Nairobi	70	70	20	15
Kenyatta University	70	60	20	10
Strathmore University	30	25	10	5
KCA University	30	25	10	5
Total	**200**	**180**	**60**	**35**

However, most of the other part of the research was qualitative. Purposeful and snowball sampling methods were used to draw samples from target population.

Purposeful – the researcher selected samples from population that has the information required as per the objectives of the study and also due to nature of confidentiality of data. The purposeful sample included university administrators, Technical personnel and faculty directors.

Through Snowball sampling the few identified subjects would help in obtaining the required information.

3.6 Instrumentation

To accomplish the objectives of the study, the survey instrument was developed to gain as much information as possible regarding the challenges of implementing e-learning systems in HEI's in Kenya.

Questionnaire

The questionnaire was designed to be as straightforward as possible so as to allow respondents answer questions correctly. The major considerations and which was employed in our study in formulating questions are content, structure, format and sequence (Nachmias,2005). Our survey questions were concerned with facts, perceptions, attitudes and opinions about e-learning implementation in Kenya. The questions in our questionnaires were unambiguous and easy for respondents to complete. A 5-point likert type questions was adopted. Likert type questions are used to assess perceptions and they have the advantage of yielding continuous data that lends itself to many statistical analyses. Likert-type scale is considered more reliable because under it respondents answer each statement included in the instrument, it takes much less time and its easy to construct (Kothari, 2004).

The questionnaires were composed of closed-ended questions and a few open-ended questions.

To formulate the questions, the questionnaire was designed to collect all required data based on the objectives of study, the research questions and the conceptual e-learning framework (figure 2.4) consisting of 12 dimensions was used as a guide.

Four questionnaires were used to collect data, one for each of the categories of respondents that is students, lecturers, ICT support staff and university administrators. They are the students' questionnaire (QS), Lecturers questionnaire (QL), ICT technical staff questionnaire (QIS) and the administrator's questionnaire (QA). They were constructed by the researcher.

3.6.1 Student Questionnaire (QS)

The student's questionnaire collected information from the students. This questionnaire was used to identify the ICT facilities available in the university for students to support use of e-learning systems, perceived use of e-learning by students, ease of access to ICT by students for learning and the perceived challenges of e-learning systems use by students. A Likert scale item was used. Information obtained was coded using actual numbers as follows: Strongly agree will be number 1, Agree will be 2 Neutral will be 3, Disagree as number 4 and strongly disagree as 5.

3.6.2 Lecturer's questionnaire (QL)

The lecturer's questionnaire collected information from the lecturers. The questionnaire was expected to capture the following: ICT facilities available in the university for lecturers, perceived use of e-learning systems by lecturers for teaching and learning, ease of access of ICT by lecturers for teaching, learning and research and the perceived challenges of e-learning systems use by lecturers. A Likert scale item was used. Information obtained was coded using actual numbers as follows: Strongly disagree will be number 1, disgree will be 2 Neutral will be 3, agree as number 4 and strongly agree as 5.

3.6.3 Administrator's questionnaire (QA)

The Administrator's questionnaire collected information from the university administrators. The questionnaire was expected to capture the following: ICT facilities available in the University Students and lecturers and the e-learning tools implemented, University support of e-learning systems use, nature of ICT policy in the University and implementation and the perceived challenges of e-learning adoption and implementation as well as government support on ICT use in education. A Likert scale items were used. Information obtained was coded using actual numbers as follows: Strongly agree will be number 1, Agree will be 2 Neutral will be 3, Disagree as number 4 and strongly disagree as 5.

3.6.4 ICT Technical Staff Questionnaire (QIS)

The ICT support staff's questionnaire collected information from the ICT Technical Staff. The questionnaire was expected to capture the following: University ICT Infrastructure and connectivity, ICT facilities available in the University Students and lecturers, Existing online learning and open learning facilities and the e-learning tools implemented, implementation and the perceived challenges of e-learning implementation and maintenance. A Likert scale items was used. Information obtained was coded using actual numbers as follows: Strongly agree will be number 1, Agree will be 2 Neutral will be 3, Disagree as

number 4 and strongly disagree as 5.

3.7 Pre-testing the Questionnaires.

Once the questionnaire was finalized, it was tried out in the field. In a pilot study, the researcher analyzes few questionnaires to see if the methods of analysis are appropriate, the questionnaire should be pre-tested to a selected sample which is similar to the actual sample which the researcher plans to use in the study; subjects in the actual sample should not be used in the pretest (Mugend & Mugenda, 2003). Procedures used in pre-testing the questionnaire were identical to those used during the actual data collection. This allowed the researcher to make meaningful observations. The subjects were asked to make comments and suggestions concerning instructions, clarity of questions and relevance.

3.8 Validity and Reliability of Research Instruments

3.8.1 Validity

This is the degree to which correct inferences can be made based on results from an instrument (Fraenkel & Wallen, 2003; Christensen & Johnson, 2000). Validity is concerned with whether the findings are really about what they appear to be about (Kothari, 2006). Validity is defined as the extent to which the data collection method or methods accurately measures what they were intended to measure. There are two forms; external and internal. The external validity of research findings refers to the data's ability to be generalized across persons, settings and times. Internal validity is the ability of a research instrument to measure what is purposed to measure.

The following are measures that were taken to ensure validity:

- Survey questions were designed based on literature review and proposed framework to ensure the validity of the results.

- Data was collected from reliable sources, from reputable public and private universities.

- Pilot testing was then done and the reliability analysis was conducted in order to ensure the internal validity and consistency of the items used for each variables.

Pilot testing was done so that any weak items could be reviewed and any missing information included. A pilot study is a small-scale study administered before conducting an actual study. Its purpose is to reveal defects in the research plan. Piloting was done at UON and KCAU. Twelve students, twelve lecturers, twelve ICT technical staff and twelve administrative staff were sampled for the pilot. These numbers are supported by Julious (2005), who argues that when there is no prior information to base a sample size on, the recommended sample size for a pilot study is twelve (12) subjects per group. Data obtained from the pilot study was used to calculate reliability.

3.8.2 Reliability

Reliability refers to the consistency or stability of the scores we get from our tests and assessment procedures (Christensen & Johnson, 2000). It demonstrates to which extent the operations of a study, such as data collection procedures can be repeated with similar results. If a test or assessment procedure is

reliable, it will produce similar scores or responses on every occasion. A measure is said to be reliable if a person's score on the same test given twice is similar.

The reliability analysis was conducted in order to ensure the internal validity and consistency of the items used for each variables. Cronbach Alpha is the most appropriate and preferable method for use when the test consists of items assigned a wide range of scores. (Christensen & Johnson, 2000). An alpha of more than 0.7 would indicate that the items are homogeneous and measuring the same constant.

For this study, reliability was measured using Cronbach alpha coefficient established through a pilot study. Four questionnaires were used to collect data, one for each of the categories of respondents that is students, lecturers, ICT support staff and university administrators. In all questionnaires, all returned a Cronbach Alpha coefficient higher than the minimum recommended of 0.7. Therefore the results demonstrated that the questionnaires were reliable measurement tool. The following tables show results of the reliability analysis of the four categories of the questionnaires of the study, their Cronbach Alpha values are way above the recommended value of 0.7

Reliability Analysis for Students Questionnaire

****** Method 1 (space saver) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S - S C A L E   (A L P H A)

RELIABILITY

   /SCALE('ALL VARIABLES') ALL

/MODEL=ALPHA

/STATISTICS=DESCRIPTIVE SCALE

/SUMMARY=TOTAL MEANS VARIANCE CORR.

Table 3.3: Reliability Analysis for Students Questionnaire

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.898	.883	88

The cronbach alpha is a statistical test used to measure the reliability of the scale.

The coefficient ranges from $0<x<1$ and the strength of reliability becomes strong as the value tends to 1.

In our case the Cronbach alpha=0.898 which tends to 1 indicating the scale produces consistent results.

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.307	1.111	4.889	3.778	4.400	.990	88
Item Variances	1.303	.111	3.611	3.500	32.500	.725	88
Inter-Item Correlations	.079	-.944	1.000	1.944	-1.059	.153	88

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Reliability Analysis for Lecturer's Questionnaire

****** Method 1 (space saver) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

Table 3.4: Reliability Analysis for Lecturer's Questionnaire

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.897	.906	106

The Cronbach alpha=0.897 which tends to 1 indicating that the scale produces consistent results.

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.229	1.125	4.750	3.625	4.222	1.270	106
Item Variances	1.047	.125	3.268	3.143	26.143	.584	106
Inter-Item Correlations	.083	-1.000	1.000	2.000	-1.000	.162	106

Reliability Analysis for Administrators Questionnaire

****** Method 1 (space saver) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

Table 3.5: Reliability Analysis for Administrators Questionnaire

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.953	.918	74

The Cronbach alpha=0.953 which tends to 1 indicating that the scale produces consistent results.

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.108	1.333	6.333	5.000	4.750	.932	74
Inter-Item Correlations	.131	-1.000	1.000	2.000	-1.000	.983	74

Reliability Analysis for ICT Technical Personnel

****** Method 1 (space saver) will be used for this analysis ******

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

Table 3.6: Reliability Analysis for ICT Technical Personnel

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.793	.890	64

The Cronbach alpha=0.793 which tends to 1 indicating that the scale produces consistent results.

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	89.127	1.067	1332.933	1331.867	1249.625	92670.888	64
Item Variances	194487.828	.067	3611634.171	3611634.105	5.417E7	6.083E11	64
Inter-Item Correlations	.112	-1.000	1.000	2.000	-1.000	.189	64

3.9 Data collection procedures

A letter of introduction was obtained from the School of Computing and Informatics, University of Nairobi. Administrators, lecturers, ICT technical staff and students of the selected universities in the study were informed of the intended study. Appointments were then booked when the researcher visited the universities to deliver the questionnaires. The researcher and two research assistants delivered the questionnaires in person to the respondents in order to increase the response rates. The respondents were given two weeks to fill them and thereafter the researcher collected them for analysis.

3.10 Data analysis

Immediately the questionnaires were received, they were checked for accuracy. This was done by checking whether the responses were legible, complete and whether all the contextual information was included (Kombo & Tromp, 2006). A coding system was used to find a quick and easy way to organize the data so that it could be analysed. Codes are used to identify particular responses (Robson, 1993). Once the data was coded, it was entered into the computer for analysis. The Statistical Package for Social Sciences (SPSS) was used for data analyses. Descriptive statistics such as frequencies, percentages, means, chi-square test and correlation analysis were used to convey the essential characteristics of the data so that it could be interpreted. The information was interpreted and then presented using tables, pie charts and graphs.

CHAPTER FOUR: DATA ANALYSIS AND INTERPRETATION OF FINDINGS

4.1 Introduction

Much literature has suggested e-learning has the potential benefits to increase institutional reputations and improve the quality of teaching and learning. The purpose of going out to collect data was to investigate the major challenges hindering the implementation of e-learning in Kenyan universities. In this chapter, the research findings are presented following interpretation of data collected from the students, lecturers, administrators and ICT technical staff. The researcher conducted a survey research and questionnaires were administered to four universities. Of the universities sampled two were public and two private universities. The researcher hopes that the findings from the respondents on challenges hindering the implementation of e-learning systems in Kenyan universities represent a microcosm of challenges encountered by other HEIs across the country. The data collected was analyzed using descriptive statistics such as frequencies, percentages, means, Chi-square test and correlation analysis. The information was interpreted and then presented using tables, pie charts and graphs.

4.2 Characteristics of Respondents
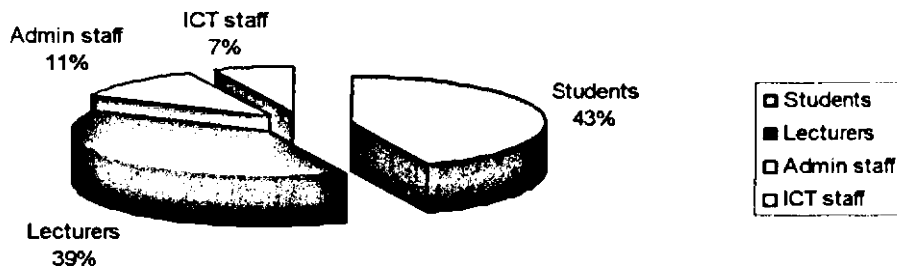
Figure 4.1: Overall distribution sample size response rates

Table 4.1: Overall distribution and response rates.

Categories	Target	Respondents	Response rate
Students	200	178	89%
Lecturers	180	160	88.8%
Admin staff	60	46	76.6%
ICT staff	35	28	80%
Total	475	412	86.7%

160 lecturers out of 200, 178 students out of 200, 46 administrators out of 60 and 28 ICT technical personnel staff out of 35 targeted responded.
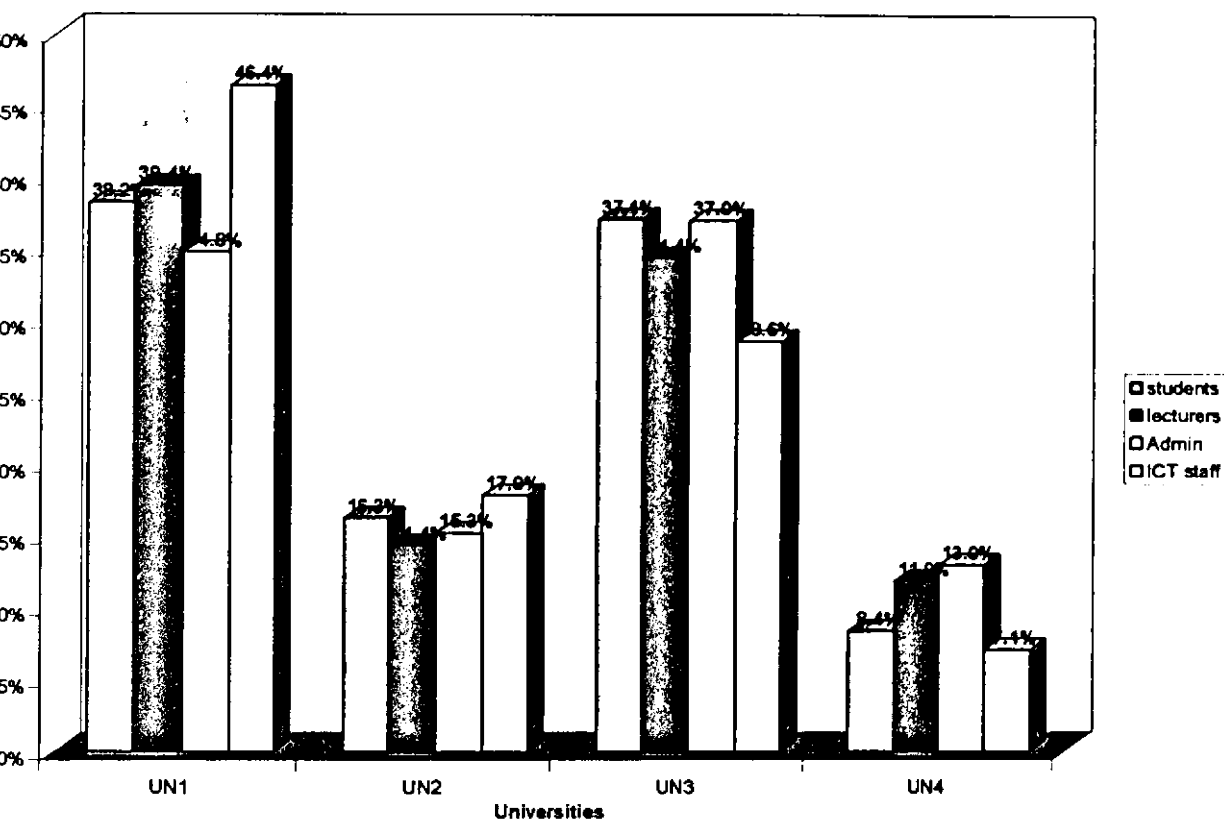
Figure 4.2: Distribution of respondents across four universities

The researcher targeted 180 lecturers, 200 students, 60 Administrators and 35 ICT technical personnel all totaling to 475 respondents among the four targeted Universities. The response rate was found to be 86.7% indicating that 412 out of 475 targeted responded. According to Babbie (2002) any response of 50% and above is adequate for analysis, thus 86.7% is even a better response. Respondents of the survey were from four universities with UON (36.8%), KU (33.7%), Strathmore (14.7%) and KCAU (14.7%).

Four categories of questionnaires were used to collect data, one for each of the categories of respondents that is students, lecturers, ICT support staff and university administrators

The figure above represents the overall distribution rates across the four universities.

4.3 FINDINGS

From this study the following factors were identified as the key challenges affecting the successful implementation of e-learning in HEIs in Kenya:

- Inadequate ICT and e-learning infrastructure
- Attitude towards e-learning
- Financial constraints
- Top management support
- Technical support
- Lack good connectivity and adequate Internet bandwidth
- Lack of technical skills on e-content development and inadequate ICT literacy skills
- Operationalization of the e-learning and ICT policies

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- Fear and resistance of new technology by staff
- Lack of modern lecture halls and labs equipped with ICT and e-learning facilities.
- Lack of motivation of lecturers through incentives to use e-learning in teaching and develop e-content.

A detailed presentation of the results is made next.

Q1. What challenges do universities experience when implementing e-learning systems?

Perceived challenges hindering successful implementation of e-learning systems.

After the data was collected and analyzed the dominant factors which the researcher had included in the conceptual framework as the key factors hindering the successful implementation of e-learning were subjected to Chi-Square Test to test their significance and the following table display the results;

Table 4.2: Perceived challenges hindering successful implementation of e-learning systems.

A. Student attitude (N=404)

	Administration	Student	Lecturer	ICT staff	X^2	df	signf
	N(%)	N(%)	N(%)	N (%)			
Strongly disagree		7(3.9)	3(1.9)	3(12.0)			
disagree	3(6.5)	1(.6)	8(5.2)	1(4.0)			
neutral	1(2.2)	10(5.6)	14(9.0)	2(8.0)			
agree	24(52.2)	67(37.6)	42(27.1)	18(72.0)			
strongly agree	18(39.1)	93(52.2)	88(56.8)	1(4.0)	47.404	12	0.000

B.Technical support (N=404)

strongly disagree		5(2.8)		2(8.0)			
disagree	1(2.2)		7(4.5)	1(4.0)			
neutral	3(3.3)	23(12.9)	22(14.2)	1(4.0)			
agree	15(32.6)	63(35.4)	38(24.5)	2(8.0)			
strongly agree	27(58.7)	87(48.9)	88(56.8)	19(76.0)	32.456	12	0.001

C.Experts in instructional design (N=404)

strongly disagree		8(4.5)		3(12.0)			
disagree		6(3.4)	11(7.1)				
neutral	2(4.3)	15(8.4)	17(11.0)	5(20.0)			
agree	19(41.3)	53(29.3)	49(31.6)	11(44.0)			
strongly agree	25(54.3)	93(52.2)	78(50.3)	6(24.0)	36.541	15	0.001

D.Top Management support (N=401)

strongly disagree		3(1.7)		2(8.0)			
disagree		7(3.9)	7(4.6)	1(4.0)			
neutral	4(8.7)	26(14.6)	27(17.8)	5(20.0)			
agree	18(39.1)	73(41.0)	35(23.0)	8(32.0)			
strongly agree	24(52.2)	69(38.8)	83(54.6)	9(36.0)	30.061	12	0.003

E.Technical experience and skills (N=402)

strongly disagree		2(1.3)	1(4.0)				

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	Administration	Student	Lecturer	ICT staff	X^2	df	signf
disagree		4(2.2)	9(5.9)	2(8.0)			
neutral	3(6.5)	32(18.0)	18(11.8)	3(12.0)			
agree	21(45.7)	59(33.1)	48(31.4)	6(24.0)			
strongly agree	22(47.8)	82(46.1)	76(49.7)	13(52.0)	20.732	15	0.146

F.Good Connectivity   (N=404)

strongly disagree	2(4.3)	9(5.1)	8(5.2)	1(4.0)			
disagree	1(2.2)	28(15.7)	13(8.4)	1(4.0)			
neutral	18(39.1)	53(29.8)	36(23.2)	1(4.0)			
agree	25(54.3)	88(49.4)	97(62.6)	19(76.0)			
strongly agree	22(47.8)	82(46.1)	76(49.7)	13(52.0)	55.411	12	0.000

G.High bandwidth (N=402)

strongly disagree			5(3.3)	1(4.0)			
disagree		4(2.2)	1(0.7)	1(4.0)			
neutral	3(6.5)	20(11.2)	13(8.5)	2(8.0)			
agree	11(23.9)	61(34.3)	32(20.9)				
strongly agree	32(69.3)	93(52.2)	102(66.7)	21(84.0)	30.497	12	0.002

H. Adequate telecommunications infrastructure (N=397)

strongly disagree			2(1.3)				
disagree		11(6.4)	6(3.9)	2(8.0)			
neutral	2(4.3)	17(9.8)	13(8.5)	1(4.0)			
agree	14(30.4)	66(38.2)	37(24.2)	13(52.0)			
strongly agree	30(65.2)	79(45.7)	95(62.1)	9(36.0)	23.531	12	0.023

Reliable Power supply(N=398)

strongly disagree			1(4.0)				
disagree	10(5.6)	8(5.3)	1(4.0)	2(8.0)			
neutral	4(8.9)	12(6.7)	16(10.7)				
agree	10(22.2)	51(28.7)	44(29.3)	3(12.0)			
strongly agree	31(68.9)	105(59.0)	82(54.7)	20(80.0)	27.111	12	0.007

J.Acceptance to technology change(N=319)

	Administration	Student	Lecturer	ICT staff	X^2	df	signf
	N(%)	N(%)	N(%)	N (%)			
strongly disagree		1(0.6)	4(2.6)				
disagree	2(4.4)	8(4.5)	5(3.3)	1(4.0)			
neutral	2(4.4)	12(6.7)	27(17.9)	3(12.0)			
agree	10(22.2)	64(36.0)	46(30.5)	11(44.0)			
strongly agree	31(68.9)	93(52.2)	69(47.7)	10(40.0)	22.992	12	0.020

K.Financial resources (N=402)

	Administration	Student	Lecturer	ICT staff	X^2	df	signf
	N (%)	N (%)	N (%)	N (%)			
strongly disagree		1(0.6)	40(25.8)	1(4.2)			
disagree		8(4.5)	3(1.9)	1(4.2)			
neutral	4(8.9)	12(6.7)	22(14.2)	12(50.0)			
agree	16(35.6)	64(36.0)	59(38.1)	4(16.7)			
strongly agree	25(55.6)	93(52.2)	31(20.0)	6(25.0)	123.05	12	0.000

From all the respondents across the four universities the following were the responses regarding the major challenges hindering successful e-learning implementation;

Student attitude

On the factor of students attitude 56.8% of lecturers, 39.1% students, 52.2% Admin staff all strongly agreed to this while 72.0% ICT staff agreed to this.

Technical support

On the aspect of technical support it elicited very positive responses with 76.0% of ICT staff, 58.7% of admin staff, 56.8% of lecturers and 48.9% of students strongly agreeing to this.

Top management support

Another key factor was the top management support in which 54.6% or lecturers, 52.2% admin staff, 38.8% students and 36.0% ICT staff strongly agreed.

Quality of connectivity and bandwidth

Good connectivity and high bandwidth also plays a major role in successful implementation of e-learning according to the findings with 76.0% ICT staff, 62.6% lecturers, 54.3% admin staff and 49.4% students all agreeing that good connectivity is a key challenge while 84.0% of ICT staff, 69.3% admin staff, 66.7% lecturers and 52.2% students strongly agreed that high bandwidth is a key factor towards successful implementation of e-learning projects.

Financial support

Funding remains a prominent attribute of successful e-learning development in the university context and according to the findings 55.6% of admin staff, 52.2% students, 38.1% lecturers and 25.0% ICT staff supported this. Therefore prior to implementation, universities must consider the ongoing cost of providing flexible pedagogy and personalized materials to students.

In summary, ICT staff who are responsible with the implementation and maintenance of the e-learning systems and available infrastructures strongly felt that good connectivity and high bandwidth as well as technical support and financial resources are very significant factors as illustrated from the findings. Other dominant key factors which are key challenges to successful implementation of e-learning systems according to findings in the table above are adequate infrastructure, reliable power supply, technical experience and skills and acceptance to technology change.

Chi –square test to check the significance of the factors in the conceptual framework

When all the key challenges were subjected to chi-square test (see table 4.2) it was found out that apart from Technical experience and skills which generated a p value = 0.146 which is greater than 0.05 showing some significant difference, all the other challenges all had a p value <0.05 indicating no significance

difference among the factors and therefore the relationship among the factors is truly significant and hence the model fit. Chi-Squared test is used to determine if there is a statistically significant difference in the proportions for different groups. To accomplish this, it breaks all outcomes into groups.

Greater differences between expected and actual data produce a larger Chi-square value. The larger the Chi-square value, the greater the probability that there really is a significant difference.

The convention used in mass communication research is that results must be equal or less than 5% due to chance. That is, p must be smaller than or equals to 0.05 in order to claim the relationship is truly significant. The lower the significance level, the more the data is said to be significant.

Correlation analysis to test the relationship among the factors in the conceptual framework

Most variable on the key challenges that hinder e-learning implementation were positively correlated (see appendix 1) except for the factor Finance which was negatively correlated to technical support and top management. Considering the p values derived from the interrelationships which exist between these variables, there are quite a number of factors which showed significance in this correlation which had a significance level below 0.05 i.e. ($p<0.05$).Though finance being the most expected factor to have contributed to existence of other factors did not show any significance of correlation to students attitude, Technical support, Top management, Technical experience and skills; Good connectivity, high bandwidths and adequate telecommunications i.e. $p>0.05$ but was significantly correlated to reliable power supply; acceptance to technological change and Finance. Although most factors had a positive correlation to each other, it was deduced that none was highly correlated i.e. $r>0.7$

In summary most of the key challenges tested using the Chi-square test had a $P<0.05$ indicating no significance difference among the factors and therefore the relationship among the factors is truly significant and hence the model fit. When the same key challenges were tested using correlation analysis, most factors had a positive correlation to each other and had significance levels below 0.05 i.e. ($p<0.05$) indicating a good research framework as shown in table 4.2 and appendix 1.

4.3: Key challenges that your institution faces in supporting students in their uses of technology

	not a very significant challenge	not a significant challenge	neutral	significant challenge	very significant challenge
Maintaining current technical infrastructure	2(4.3%)	11(23.9%)	2(4.3%)	20(43.5%)	11(23.9%)
Securing adequate funding to handle demand	1(2.2%)	1(2.2%)	7(15.2%)	19(41.3%)	18(39.1%)
Maintaining a standard network/user platform	1(2.2%)	1(2.2%)	7(15.2%)	23(50.0%)	14(30.4%)
Upgrading classrooms to enable technology use	1(2.2%)	3(6.5%)	11(23.9%)	16(34.8%)	16(34.8%)
Faculty's lack of confidence to use technology in teaching environment	3(6.5%)	4(8.7%)	9(19.6%)	15(32.6%)	14(30.4%)

Unreliable technology: Network/software crashes during teaching session	1 (2.2%)	6 (13.0%)	8 (17.4%)	11 (23.9%)	19 (41.3%)
Providing 24 x 7 support	1 (2.2%)	3 (6.5%)	3 (6.5%)	21 (45.7%)	18 (39.1%)
Inconsistent technology: platforms, tools, software vary	4 (8.7%)	2 (4.3%)	11 (23.9%)	15 (32.6%)	14 (30.4%)
Instructors' lack of knowledge about how to design courses utilizing technology to promote learning	2 (4.3%)	1 (2.2%)	8 (17.4%)	17 (37.0%)	18 (39.1%)

The study also wanted to establish the key challenges that institutions faced in supporting students in their uses of technology from the institution administrators and the findings were as follows;

43.5% of the respondents felt that maintaining the current technical infrastructure is a significant challenge whereas interestingly 23.9% felt it's a very significant challenge while on the other hand 23.9% felt that its not a significant challenge and only 4.3% said its not a very significant challenge and 4.3% were neutral

Faculty's lack of confidence to use technology in teaching environment was considered to be a significant challenge by 32.6% of the respondents and 30.4% said that this is a very significant challenge while 8.7% said that it is not a significant challenge and 6.5% argued that it is not a very significant challenge.

On the issue of securing adequate funding to handle demand 39.1% said this is a very significant challenge while 41.3% felt that it is a significant challenge. 2.2% said it is not a challenge while 2.2% felt that it is not a very significant challenge. Thus funding remains a prominent attribute of successful e-learning development in the university context. CERI (2005) suggests although e-learning is educationally advantageous to learning institutions, a clear sustainable business model is critical to the implementation process. Sustainability is an important issue that can be affected by funding implications. Prior to implementation, universities must consider the ongoing cost of providing flexible pedagogy and personalized materials to students.

Another key challenge was lack of modern lecture halls and labs equipped with ICT and e-learning facilities and on the issue of upgrading classrooms to enable technology use, majority of the respondents 34.8% felt that this is a very significant challenge while also 34.8% felt that it is a significant challenge. Of all the targeted administrators about 23.9% remained neutral.

41.3% respondents said that unreliable technology is a very significant challenge compared to 2.2% who felt that its not a very significant challenge, while 23.9% respondents said it is significant challenge compare to 13.0% who said that its not a significant challenge.

On providing 24 x 7 support, 45.7% respondents said that it's a significant challenge while 39.1% said it's a very significant challenge and 6.5% said that its not a significant challenge while only 2.2% said its not a very significant challenge.

Inconsistent technology was another key challenge with 32.6% respondents who said it's a significant challenge compared to 4.3% who said it's not a significant challenge while 30.4% said that this is a very significant challenge compared to 8.7% respondents who said its not a very significant challenge

39.1% of the respondents said that Instructors lack of knowledge about how to design courses utilizing technology to promote learning is a very significant challenge while,37.0% said this is significant challenge and 4.3% said its not a very significant challenge while 2.2% said its not a significant challenge.
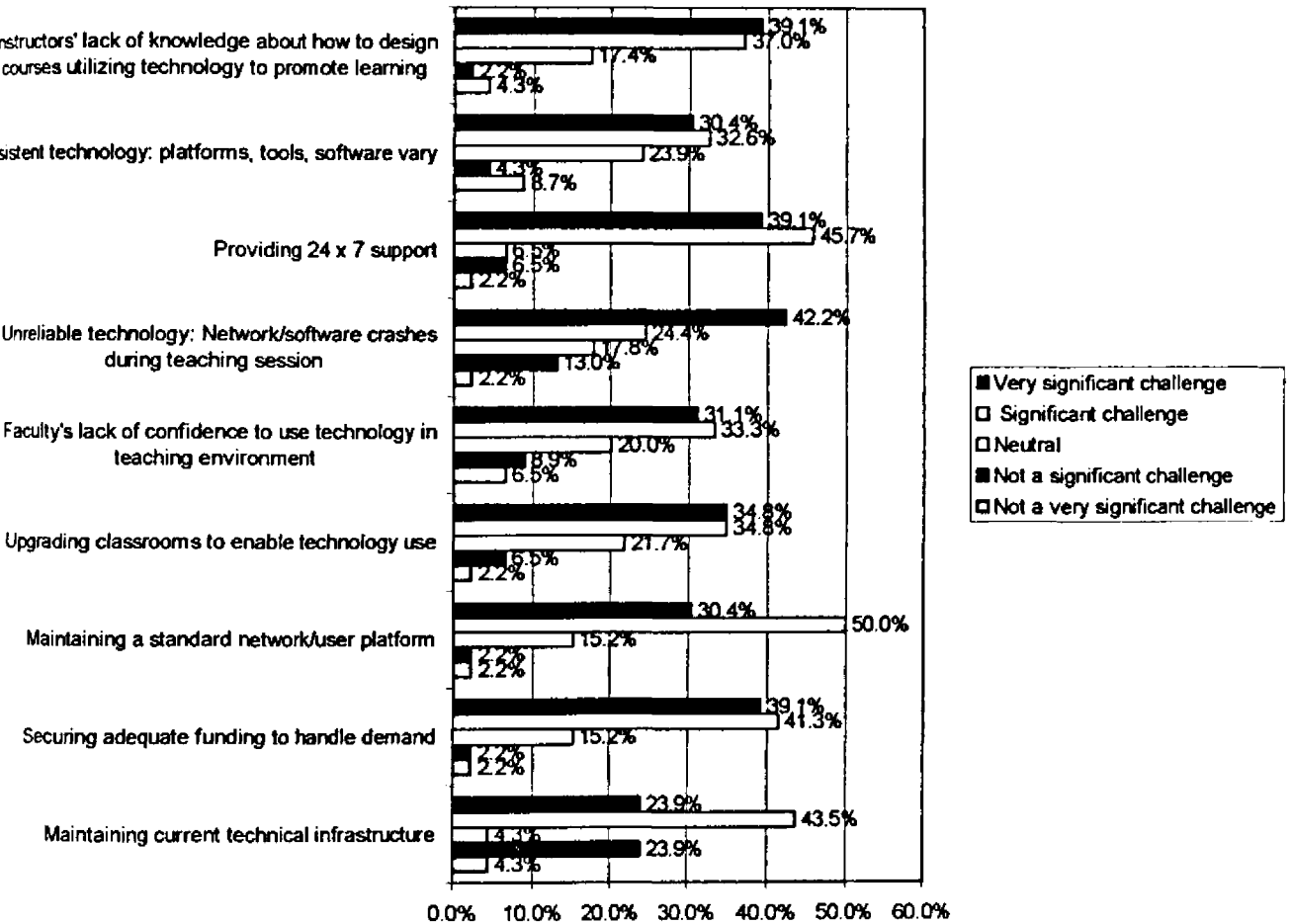
Figure 4.3: Key challenges that institutions face in supporting students in their uses of technology

Internet connectivity

Table 4.4: Rate yourself with the internet connection at your university

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very satisfied	28	15.7	15.7	15.7
	satisfied	65	36.5	36.5	52.2
	unsatisfied	58	32.6	32.6	84.8
	Very unsatisfied	22	12.4	12.4	97.2
	I don't know	5	2.8	2.8	100.0
	Total	178	100.0	100.0	

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On the issue of internet connectivity about 36.5% of the respondents said that they were satisfied with the current internet connection at their universities as compared to 32.6% who were unsatisfied. On the other hand 15.7% said they were very satisfied compared to 12.4% who said they were very unsatisfied. This shows that internet connection and accessibility is still a major problem in some of the HEIs.

The researcher also sought to establish if KENET provision of internet connection bandwidth to the universities was adequate and 45.7% respondents disagreed compared to 39.1% who agreed that it is adequate while 2.2% strongly disagreed and 2.2% strongly agreed.
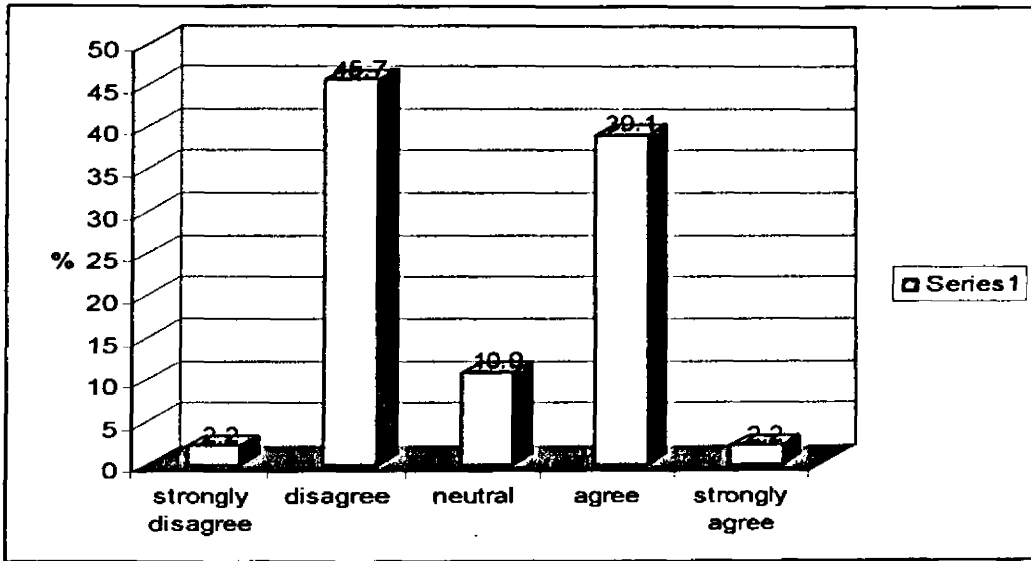
Figure 4.4 KENET provision of internet connection bandwidth to the university is adequate

Table 4.5: Reasons discouraging downloading of education materials from the internet.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Internet access is slow	33	18.5	18.5	18.5
	Bandwidth is limited therefore I can't download huge files	83	46.6	46.6	65.2
	Accessibility to computers is a problem	26	14.6	14.6	79.8
	I can get what I need from the e-learning portal at the university	31	17.4	17.4	97.2
		5	2.8	2.8	100.0
	Total	178	100.0	100.0	

According to the findings, 46.6% respondents were of the view that the bandwidth is limited thus not adequate for downloading huge files, 18.5% respondents said that the internet access is slow while 14.6% respondents said that there are no enough computers for all the students therefore, access to computers is a problem.

The study also sought to establish if there is any bandwidth management solutions in place within the institutions and according to responses presented in the figure 4.6 below 78.6% respondents said No while only 14.3% said yes.

yes
15%

no
85%

☐ yes
■ no
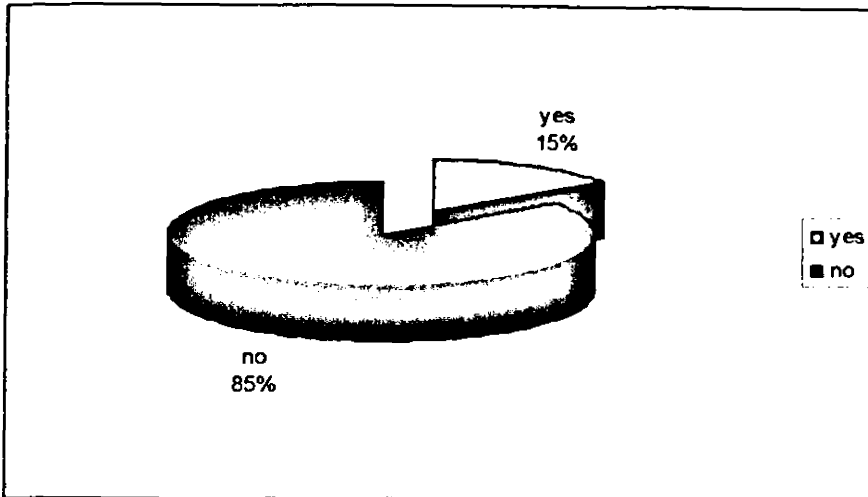
Figure 4.5: Do you have any bandwidth management solutions in place?

Table 4.6 below shows the findings on what the students thought as the limitations of e-learning as a learning tool in their respective universities where majority were of the view that access to computers (51.1%) and Internet connection/bandwidth (28.1% were major limitations of e-learning implementation, while 10.1% said it's the relevance and quality of e-learning materials.

Table 4.6: What do you foresee as a limitation of e-learning as a learning tool in your university?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Internet connection (bandwidth)	50	28.1	28.1	28.1
	Access to computers	91	51.1	51.1	79.2
	Relevance and quality of e-learning materials	18	10.1	10.1	89.3
	Total	178	100.0	100.0	

On the issue of bandwidth it was clear from the research findings presented above that the available bandwidth is limited among the sampled universities as most respondents said that they are unable to download huge files or run bandwidth hungry applications because the available bandwidth is less. figure 4.5 above shows that the institutions have also failed to monitor let alone manage the existing bandwidth. As a result of this the little bandwidth that is available becomes even less useful for research and education purposes.

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Table 4.7: Attended any training in e-learning

Name of University	lecturers	
	Yes N (%)	No N (%)
UN1	43(79.6)	9(16.7)
UN2	21(100)	0(0.0)
UN3	45(88.2)	6(11.8)
UN4	12(63.2)	7(36.8)
mean	82.73	16.33

The e-learning is essential especially in facilitating learning in institutions. The e-learning makes work easier both in application and delivery of content. According to Salmon (2004) focusing training on the technological features of the e-learning system is the first step to success; the real challenge is training for changes to pedagogy. Inadequately trained lecturers using e-learning in educational environments can become an obstacle in a finely balanced learning process and can lead to problems in application use and in the perception of students (Volery 2000:8).

As shown in table 4.7 above and figure 4.6 shown below 82.7% of lecturers who were sampled have at least attended training on e-learning thus indicating that only 16.3% of sampled lecturers had not attended any training and this would lead to lack of confidence to use the technology and their interaction with students. It therefore becomes necessary to continuously equip them with more knowledge through training and refresher courses as a way of creating confidence in them
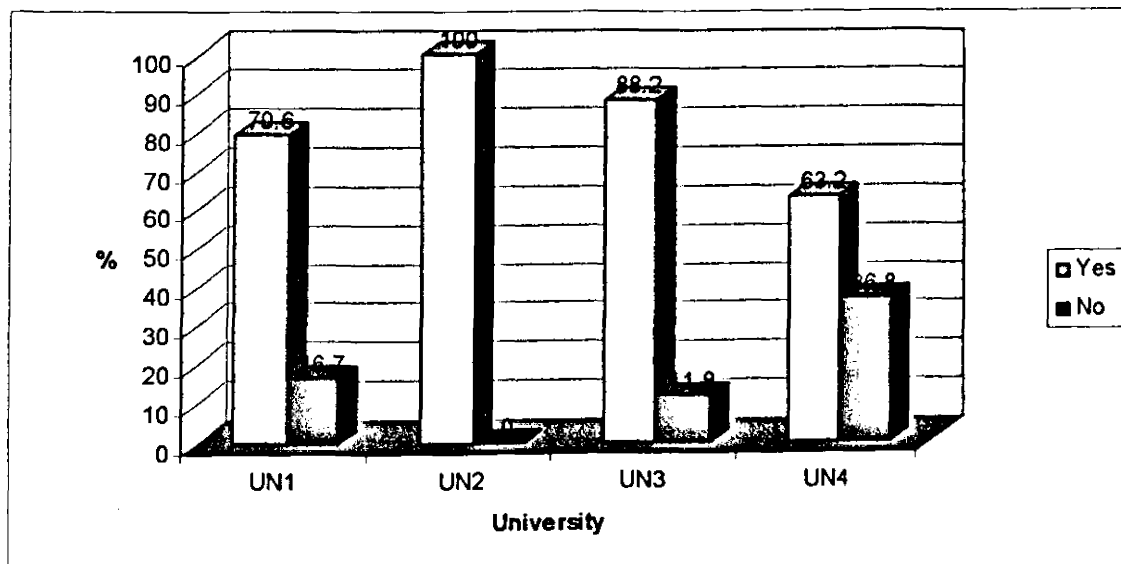
Figure 4.6: attended any training in e-learning

Table 4.8 below shows that on average 93.5% of lecturers have attended a professional training in e learning almost same to the percentage of administrators expressed by 92.8 % with some slight differences according to the institutions. The motivation and perception of applying e-learning is derived from Management passed to students. This can be possible only if the top management are well informed in this sector and realizes the benefits of implementing e-learning projects.

Table 4.8: Professional development and training in e-learning

Name of university	administrators		Lecturers	
	Yes N (%)	No N (%)	Yes N (%)	No N (%)
UN1	15(93.8)	1(6.3)	54(91.5)	5(8.5)
UN2	7(100.0)	0(0.0)	22(94.1)	1(4.3)
UN3	16(94.1)	1(5.9)	48(94.1)	3(5.9)
UN4	5(83.3)	1(16.7)	16(94.1)	1(5.9)
Mean	92.8	7.2	93.5	6.15

Support and encouragement

Table 4.9: How does your institution encourage instructors to integrate technologies into instruction?

		UN1 N (%)	UN2 N (%)	UN3 N (%)	UN4 N (%)	mean
lease time	yes	2(12.5)	19(14.3)	2(11.8)	1(16.7)	13.83
	no	14(87.5)	6(85.7)	15(88.2)	5(83.3)	86.18
tpends	yes	4(25.0)		5(29.4)		27.2
	no	12(12.7)	7(100.0)	12(70.6)	6(100.0)	70.83
ecial consideration for omotions or tenure	yes	5(31.3)	3(42.9)	9(52.9)	1(16.7)	35.95
	no	11(68.8)	4(57.1)	8(47.1)	5(83.3)	64.1
andatory with no special nsiderations	yes	5(31.3)	1(14.3)	1(5.9)	5(83.3)	33.7
	no	11(68.8)	6(85.7)	16(94.1)	1(16.7)	91.33
institution practices	yes	2(12.5)	2(28.6)		5(83.3)	41.47
	no	14(87.5)	5(71.4)	17(100.0)	1(16.7)	68.9

From the above table 4.9 its clear that in supporting and encouraging the instructors to integrate technologies into instruction within the institutions there are no institutional practices as majority of admin respondents across the four universities answered No with a mean of 86.1 and only a mean of 13.8 answered yes to release time, on stipends a mean of 70.8 answered No while a mean of 27.2 answered yes, on special consideration for promotions or tenure a mean of 64.1 answered No while a mean of 35.9

answered Yes, and on mandatory with no special considerations a mean of 91.3 answered No while 33.7 answered Yes.

Use of e -learning
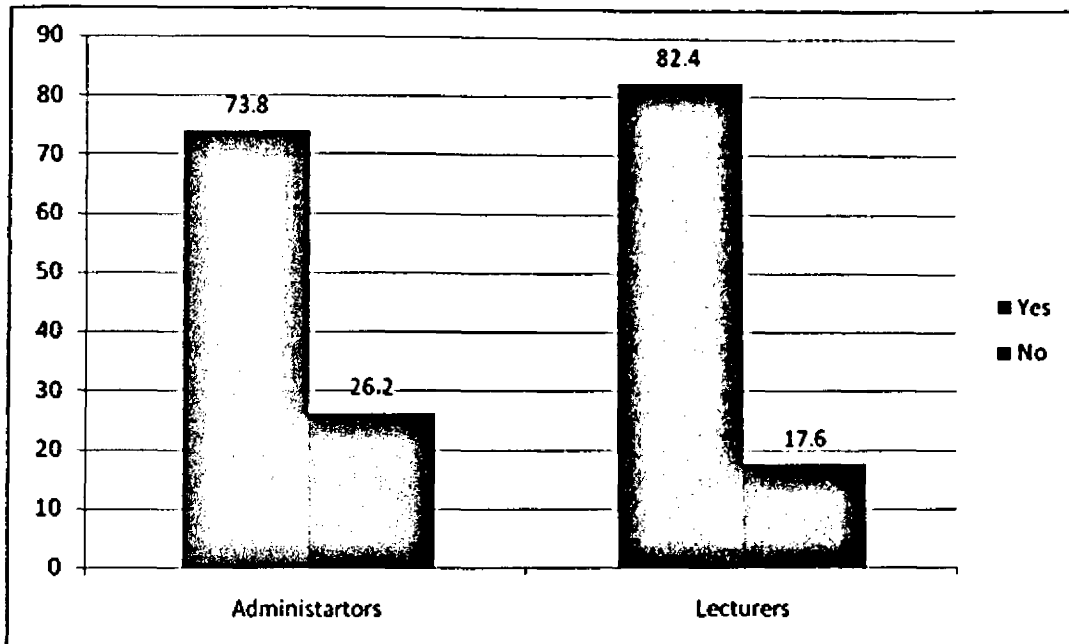
Figure 4.7: Use of e- learning in institutions

Respondents were asked whether they do use e-learning in the institutions, Figure 4.7 above shows that 73.8% of administrators agreed to using e-learning compared to 26.2% who said no while 82.4% of lecturers also concurs that they use e- learning in their institutions compared to 17.6% who said no to use of e-learning. According to the findings awareness and use of e-learning among the Universities is very high.

Lecturers experiences with e-learning

The readiness of staff members/Instructor level

The lecturers have the important role of transferring the knowledge to students via e-learning. The study found that most of the lecturers were satisfied with teaching via e-learning. The reasons being that they were able to produce the content for the electronic medium by themselves.

From the table 4.10 below, the lecturers were asked about their experiences with e-learning, and a majority indicated that they were using it for teaching and learning with 39.4% respondents, interestingly another 20% claimed to have had no experience at all with e-learning; 18% have seen colleagues using e-learning for teaching and learning; 15% have attended course on e-learning while 3.1% have heard it from colleagues from another university.

Table 4.10: What kind of experiences have you had with e-learning

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	none	32	20.0	20.8	20.8
	I have seen colleagues using it	30	18.8	18.8	39.6
	I attended a course on e-learning	24	15.0	15.6	55.2
	I am using it for teaching and learning	63	39.4	39.4	96.8
	I heard it from colleagues from another university	5	3.1	3.2	100.0

Q3. What percentage of the institutions budget is expended on installations and maintenance of e-learning projects?

Table 4.11: Estimated percentage of total cost (administrators)

	UN1	UN2	UN3	UN4	Mean
	N (%)	N (%)	N (%)	N (%)	N (%)
less 5 %	1(6.3)	1(20.0)	2(12.5)		13.3
5-9%	2(12.5)	1(20.0)			10.8
10-19%	9(56.3)	3(60.0)	10(62.5)	4(66.7)	32.3
20-29%	4(25.0)		3(18.8)	2(33.3)	19.23
more than 30			1(6.3)		1.56

On the question about institutions budget allocations on installation and maintenance of e-learning projects the findings are presented on table 4.11 indicates that on average about 32.3% respondents across the four sampled universities said that the estimated percentage of total cost was between 10-19%, while 19.23% said that the total cost was between 20-29% and 10.8% said that the cost was between 5-9% while about 13.3% said that the total cost was less than 5%.

There are always funds allocated for the implementation of e-learning in teaching and learning
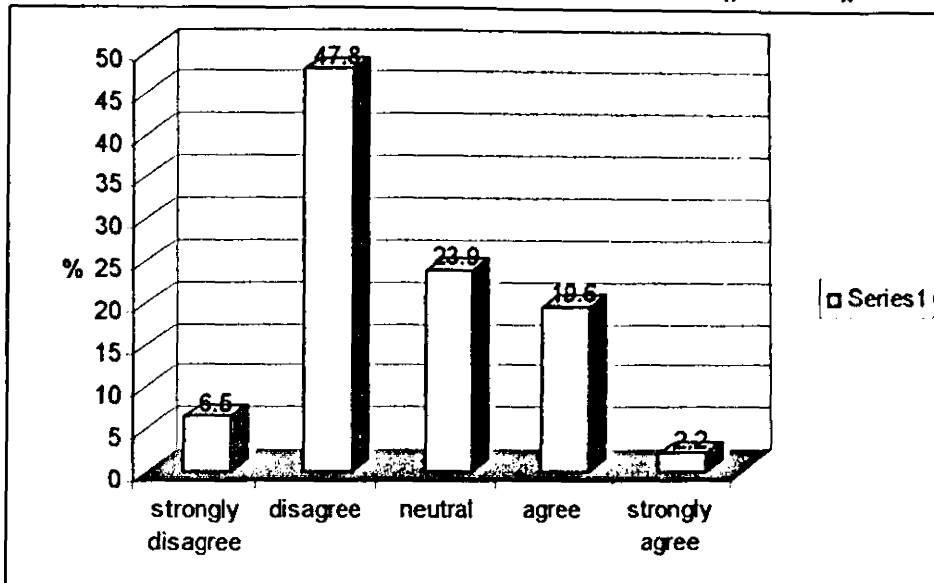
Figure 4.8: Responses on funds allocated for implementation of e-learning in teaching and learning

According to figure 4.8 above 47.8% of the respondents disagreed that there are enough funds allocation for the implementation of e-learning in teaching and learning within their institutions while about 19.6% agreed to this and 23.9% remained neutral while 6.5% strongly disagreed.
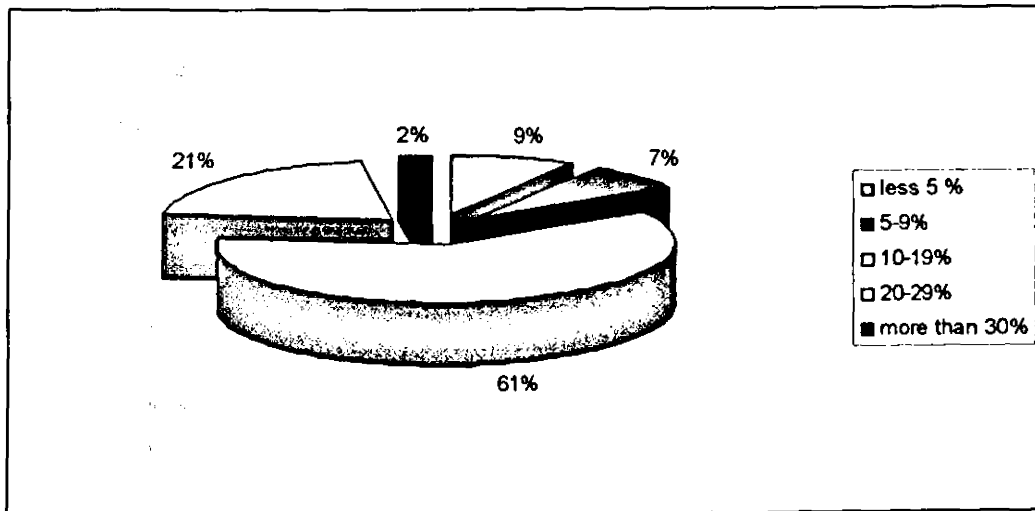
Figure 4.9: Total cost of internet access as a percentage of the total expenditure to your institution per year?

According to figure 4.9 above , internet access costs as a proportion of the institutional annual expenditure had a majority of the institutions surveyed spending between 10-19% according to 61% of the respondents. About 21% said that their institutions' spending is between 20-29% and about 7% said that their spending is between 5-9% while 9% said their spending is less that 5%.

From the above findings this means that institutions have not yet invested enough in the e-learning technologies or they are yet to do that.

Funding remains a prominent attribute of successful e-learning development in the university context. CERI (2005) suggests although e-learning is educationally advantageous to learning institutions, a clear sustainable business model is critical to the implementation process. Sustainability is an important issue that can be affected by funding implications. Prior to implementation, universities must consider the ongoing cost of providing flexible pedagogy and personalized materials to students.

Q4. What is the nature of policy that exists in the Universities to guide ICT integration in teaching and learning? Are there any institutional policy frameworks to support e-learning projects?

Table 4.12: Nature of Policy that exist in the university

	strongly agree	agree	neutral	disagree	strongly disagree
The university has an ICT policy in place that guides the use of ICTs in teaching and learning		22(47.8%)	6(13%)	13(28.3%)	5(10.9%)
There is a clear university policy on the evaluation of teaching effectiveness using e-learning	1(2.2%)	15(32.6%)	10(21.7%)	17(37.0%)	3(6.5%)
The University has institutional policy frameworks to support e-learning projects	1(2.2%)	21(45.7%)	6(13.0%)	17(37.0%)	1(2.2%)
There are difficulties in implementing the university's ICT policy	2(4.3%)	18(39.1%)	8(17.4%)	16(34.8)	2(4.3%)

On the issue relating to the nature of policy that exist in the university to guide in e-learning integration in teaching and learning its clear from the findings that most of universities have an ICT policy in place as this was supported by 47.8% of the respondents who agreed to this compared to 28.3% who disagreed, and 10.9% strongly disagreed while 13% remained neutral.

There is a clear university policy on the evaluation of teaching effectiveness using e-learning
The researcher also wanted to establish if there is a policy among the institutions on the evaluation of teaching effectiveness using e-learning (figure 4.10) below and 36.0% disagreed compared to 30% who agreed, while 7% strongly disagreed compared to only 2% who strongly agreed and 22% respondents remained neutral This clearly shows that this policy exists only in some universities while in others it doesn't exist according to the findings.
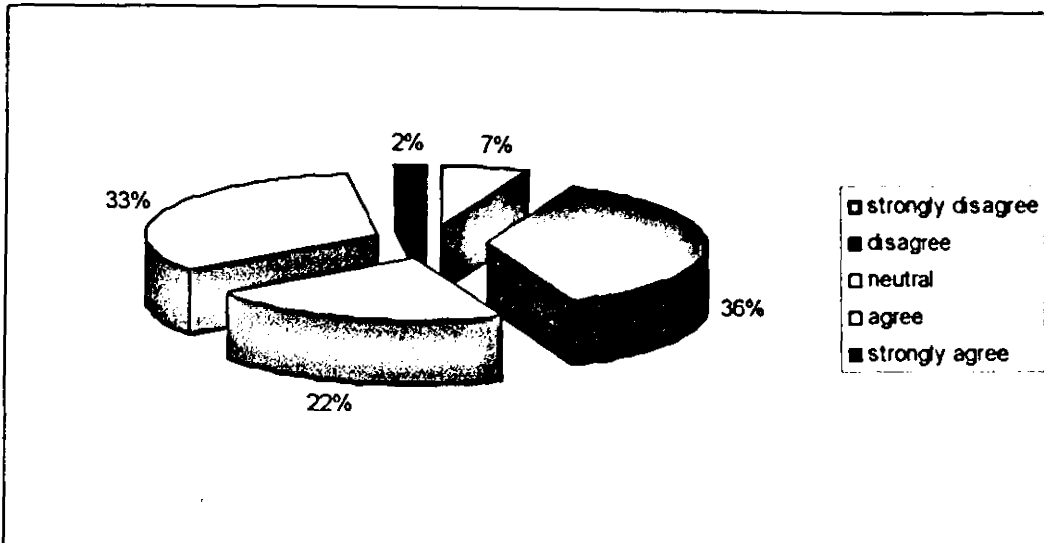
Figure 4.10: There is a clear university policy on the evaluation of teaching effectiveness using e-learning

There are difficulties in implementing the university's ICT policy
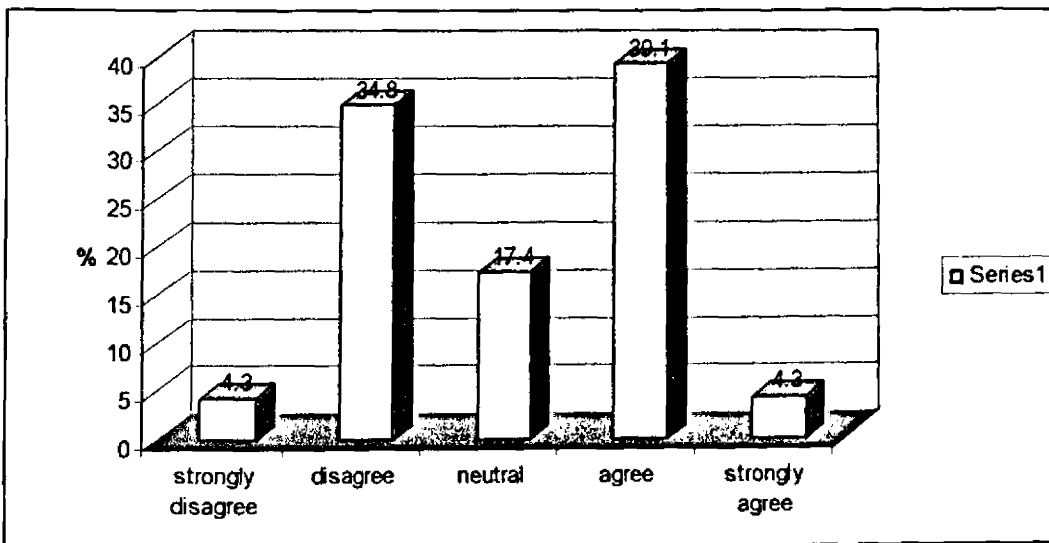
Figure 4.11: There are difficulties in implementing the university's ICT policy

According to the findings 39.1% respondents agreed that there are difficulties in implementing the university's ICT policy as compared to 34.8% who disagreed, while 4.3% strongly disagreed compared to 4.3% who strongly agreed to this.

The study also sought to establish if there exist institutional policy frameworks to support e-learning projects and 45.7% of respondents agreed that this policy exist compared to 37.0% who disagreed to this, while 2.2% strongly disagreed compared to 2.2% who strongly agreed.

Table 4.13: Perceived Administrators opinion on availability of e-learning resources in the university

	UN1 N(%)	UN2 N(%)	UN3 N(%)	UN4 N(%)	Mean	One way Analysis of variance			
The university has been able to acquire enough ICT resources for teaching and learning (PC's Printers, Projectors, photocopiers, internet email, Learning management system etc)									
Disagree	3(18.8)		1(5.9)	5(83.3)	36.0				
Neutral	29((12.5)	1(14.3)	2(11.8)	1(16.7)	13.82				
Agree	11(68.8)	6(85.7)	11(64.7)		73.0				
Strongly agree			3(17.6)		17.6	F(3,42) = 10.030,P=0.000			
CT resources in the university are enough for all the students and lecturers to use in teaching and learning									
Strongly disagree	1(1.6)	0(0.0)	0(0.0)	0(0.0)	1.6				
Disagree	3(18.8)	1(14.3)	7(41.2)	4(66.7)	26.9				
Neutral	1(6.3)	2(28.6)	3(17.6)		17.05				
Agree	11(68.8)	4(57.1)	7(41.2)	2(33.3)	50.1	F(3,42) = 4.516,P=0.008			
CT resources in the university are accessible to all the students and lecturers for teaching and learning									
Strongly disagree	1(6.3)		1(5.9)	1(16.7)	20.73				
Disagree	3(18.8)		6(35.3)		27.05				
Neutral	1(1.6)	1(14.3)	1(5.9)	3(50.0)	17.95				
Agree	10(62.5)	6(85.7)	9(52.9)	2(33.3)	58.6				
Strongly agree	1(6.3)				1.5	F(3,42) = 1.281,P=0.293			
Guidance and training is available to lecturers and students to use ICT resources in the university.									
Strongly disagree				1(16.7)	4.18				
Disagree	3(18.2)		6(35.0)		26.9				
Neutral	1(6.3)		3(17.6)	3(50.0)	32.79	F(3,42) = 02.529,P=0.070			
Agree	11(68.8)	6(85.7)	7(41.2)	2(33.3)	57.25				
A special person (group) is available for assistance with the ICTs use in teaching, learning and research									
Strongly agree	1(6.3)	1(14.3)	1(5.9)		8.83				
Disagree	4(25.0)		7(41.2)		27.75				
Neutral	1(6.3)			4(66.7)	55.67				
Agree	10(62.5)	6(85.7)	7(41.2)	2(33.3)	55.67				
Strongly agree	1(6.3)	1(14.3)	3(17.6)		36.5	F(3,42) = 1.135,P=0.0325			

When the perceived opinion of administrators was asked on availability of e-learning resources/facilities Most of the administrators agreed that their university has been able to acquire ICT resources for teaching and learning such as the printers, photocopiers etc represented by 73.0 % respondents who agreed. This statement was significant when it was subjected to ANOVA test where F(3,42)=1.281,p=0.00. However, the resources in these institutions are not enough for all students and lecturers to use in teaching and learning nor readily accessible. There was no significance to show that they are enough or accessible to students and lecturers (see on table 4.13) above for significance test. This was true also to the factors that Guidance and training isn't available to lecturers and students and No special groups set aside for assisting

with ICTs in teaching and research despite most of the respondents agreeing on these statements. These factors showed no significance for when subjected to Anova (see table above)

Table 4.14: How do you rate the level of availability of resources in general at your university for effective e-leaning implementation?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very inadequate	6	3.4	3.4	3.4
	inadequate	66	37.1	37.1	40.5
	neutral	29	16.3	16.3	56.7
	adequate	57	32.0	32.6	90.3
	very adequate	17	9.6	9.7	100.0
	Total	175	98.3	100.0	
Missing	System	3	1.7		
Total		178	100.0		

The students were also asked about their perception of availability of resources for effective e-learning implementation at their institutions, and interestingly, 37.1% said resources were inadequate compared to 32% who argued that the resources were adequate as shown in table. About 9.6% said that the resources are very adequate compared to 3.4% who said the resources were very inadequate. This implies that amongst the institutions surveyed, students were of the opinion that their universities had inadequate resources for their e-learning needs.

Table 4.15: Available resources of e-learning in the university according to students

	Never	Very rarely	Occasionary	Frequently	Very frequently	Analysis of Variance
Personal computers		10(5.8)	99(55.6)	64(36.0)	5(2.8)	F(3,174)=5.136,P=0.002
printers	4(2.2)	27(15.2)	86(48.3)	38(21.3)	23(12.9)	F(3,174)=12.697,P=0.000
Projectors	13(7.3)	63(35.4)	46(25.80	45(25.3)	11(6.2)	F(3,174)=0.766,P=0.009
The internet	14(7.9)	14(7.9)	80(44.9)	51(28.7)	19(10.7)	F(3,174)=2.121,P=0.099
e- learning management system	3(1.7)	15(8.4)	78(43.3)	52(20.2)	17(9.6)	F(3,174)=1.278,P=0.283
Automated library services	87(49.2)	8(4.5)	40(22.6)	37(20.9)	5(2.8)	F(3,174)=6.690,P=0.000

According to students interviewed on the available resources for e-learning in the university 55.6 % respondents said personal computers are occasionary available compared to 36.0% who said personal computers are frequently available, while 5.8% said they are very rarely available compared to only 2.8% of students who use personal computers very frequently though it was significant that personal computers are used (F(3,174)=50136, p<0.05).

According to the findings, from the above table most of the resources are occasionary available though they are significant to e-learning use with personal computers 55.6%, printers 48.3%, internet 44.9% and e-learning management systems 43.3%.

35.4% respondents said that projectors are very rarely available while 49.2% respondents said that automated library services are never available.

Internet and e-learning management system are not readily available for e-learning use as their significance level is p>0.05 indicating a statistically significant difference.

Table 4.16: The University has been able to acquire enough ICT resources for teaching and learning.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	63	39.4	40.4	40.4
	disagree	27	16.9	17.3	57.7
	neutral	13	8.1	8.3	66.0
	agree	41	25.6	26.3	92.3
	strongly agree	12	7.5	7.7	100.0
	Total	156	97.5	100.0	
Missing	System	4	2.5		
Total		160	100.0		

On the availability of ICT resources for teaching and learning, there was a mixed reactions with 39.4% of lecturer respondents strongly disagreed that the university has been able to acquire enough ICT resources for teaching and learning compared to 25.6% who agreed to this, while 16.9% disagreed compared to 7.5% who disagreed.

Lecturers repeatedly emphasized that the time and capability needed to prepare course materials which often meant that the inconvenience involved in using the university e-learning facilities would become a challenge for them.
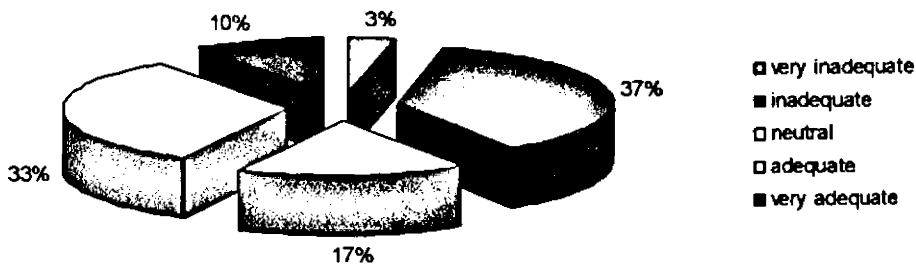
Figure 4.12 How do you rate the level of availability of resources in general at your university for effective e-leaning implementation?

On the level of availability of resources in general at the universities for effective e-learning implementation 37% respondents said that the resources are inadequate compared to 33% who felt that the resources are adequate, while 10% said they are very inadequate compared to only 3% who said that they are very adequate and a 17% respondents remained neutral on the issue. From the findings it clearly shows that across the universities there are no adequate resources required for effective e-learning implementation

thus adequate infrastructure in a major challenge hindering successful implementation of e-learning projects.

One critical finding was that many students did not believe their institutes could support & motivate them towards e-Learning. On the other hand many believed that they could depend on the institute's infrastructure to support their learning needs.

From the findings it can be assumed that if a factor can impact a student's use of technology then it also affects their perceptions of implementation

According to Jacobsen (2005), the technological infrastructure of the learning institutions is fundamental to the integration of the e-learning environment. For teachers and students alike, the ability to gain reliable access to computers and the e-learning environment is a key issue.

4.17: Power supply

	strongly agree	agree	neutral	disagree	strongly disagree
There is frequent loss of power	23(12.9%)	62(34.8%)	51(28.7%)	31(17.4%)	10(5.6%)
When the power goes off there is a standby generator	50(28.1%)	68(38.2%)	26(14.6%)	33(18.5%)	
When power goes off the generator automatically switches on	20(11.2%)	62(34.8%)	37(20.8%)	30(16.9%)	26(14.6%)

From the findings shown above 34.8% respondents agreed that there is frequent loss of power compared to 17.4% who disagreed, while 12.9% strongly agreed compared to 5.6% respondents who strongly disagreed. 38.2% respondents said that when the power goes off there is a standby generator with 28.1% strongly agreeing to this compared with 18.5% who disagreed to this.

The study also sought to establish if when power went off the generator automatically switched on and 34.8% respondents agreed compared to 16.9% who disagreed while 14.6% strongly disagreed compared to 11.2% who strongly agreed.

From the findings its clear that the problem of reliable power supply exist but most of institutions had mitigated this by having a standby generator in place. Interestingly in some institutions, when the power went off the generator automatically switched on while in others it didn't switch on automatically and therefore the problem of reliable power supply still exists.

4.4 Investigation of the relationships among the variables in the conceptual framework

The purpose of the study was to find the challenges hindering successful implementation of elearning systems in HEIs in Kenya and after analyzing, synthesizing and making a comparative study of the existing frameworks and models, the study proposed a conceptual framework for implementation of e-learning in Higher Education Institutions in Kenya.

The researcher intended to develop an e-learning conceptual framework suitable to the Kenyan environment and therefore proposed a conceptual framework consisting of twelve dimensions namely;

Institutional; Infrastructure; Bandwidth; good connectivity; access; Cultural; acceptance to technological change; Content Development and e- learning Tools; Management and Student Support; technical experience and skills; reliable power supply and Financial support and Analysis which are illustrated in figure 2.4. in chapter two. The conceptual framework shows these factors and how they are inter-related This was with the hope of contributing to the successful deployment of e-learning projects in Kenyan context.

4.5 Validating Framework

The proposed framework was tested so as to assess whether it can be used by universities in Kenya. This was done by developing a questionnaire based on the framework dimensions. The questionnaire contained a perception test item for each of the dimensions of the framework. The questionnaire was varied to suit the four types of respondents namely students, lecturers, admin staff and ICT staff.

The researcher conducted a survey research and the questionnaires were administered in four universities. Of the universities sampled two were public and two private universities. A total of 475 questionnaires were distributed to students, lecturers, admin staff and ICT staff and the response rate was found to be 86.7% indicating that 412 out of 475 targeted responded

The key dominant factors perceived to be significant in the implementation of e-learning were subjected to chi-square test to check their significance (see table 4.2) and correlation analysis to determine their relationships (see appendix 1)

4.6 Chi-square test

When all the key challenges were subjected to chi-square test (see table 4.2), it was found out that apart from Technical experience and skills, all the other factors indicated no significant difference and therefore the relationship among the factors is truly significant and hence, the model was confirmed to fit. Technical experience and skills had a p value = 0.146 which is greater than 0.05, while the rest had a p value= <0.05.

4.7 Correlation analysis test

Most variables on the key challenges that hinder e-learning implementation were positively correlated (see appendix 1) except for the factor Finance which was negatively correlated to technical support and top management. Considering the p values derived from the interrelationships which exist between these variables, there are quite a number of factors that showed significance in this correlation which had a significance level below 0.05 i.e. (p<0.05).

4.8 Revised Conceptual Framework

The findings validated the conceptual framework that was proposed in chapter two section 2.10. Since only technical experience and skills did not portray any association with other variable nor any interrelationship the framework was then refined by removing technical experience and skills component that gave an indication that its relationship among the other factors is not significant.

In Conclusion Since most of factors had a significant value $P<0.05$ we accept that the success of e-learning depends on implementation of the key challenges facing e-learning

| Increased enrollment, no extra lecture rooms | | Flexible, cost effective, and Quality higher education |

Outcome

Financial support and analysis – return on investment (Sustainability of Technology Transformation Criteria)

| Communication-marketing | Blended course design | Access –on campus, off campus |

Course content development & e-learning tools
- Experts in instructional design
- optimize media performance

- Technical support
- Management & student support
• management of blended learning programme

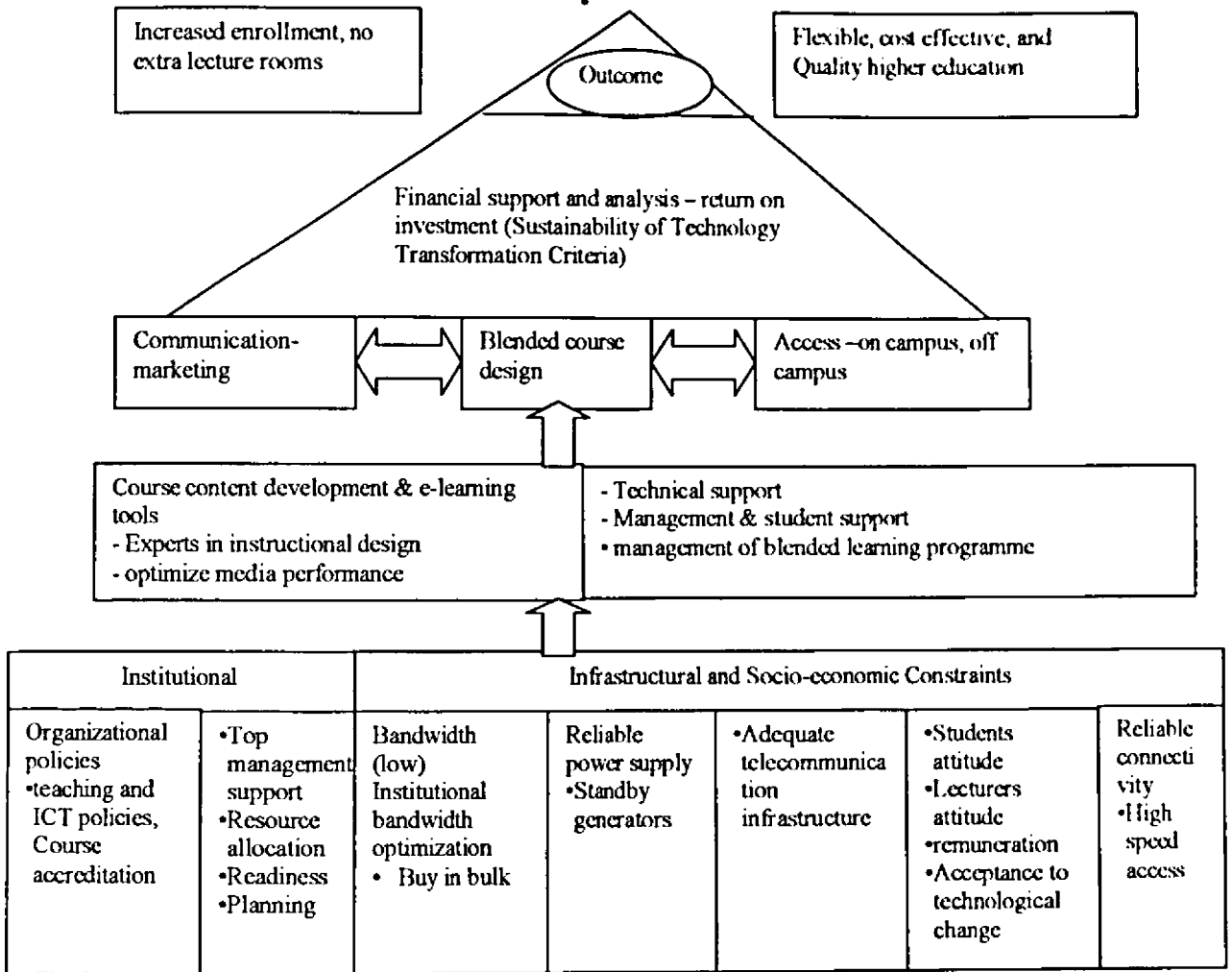	Institutional	Infrastructural and Socio-economic Constraints				
Organizational policies •teaching and ICT policies, Course accreditation	•Top management support •Resource allocation •Readiness •Planning	Bandwidth (low) Institutional bandwidth optimization • Buy in bulk	Reliable power supply •Standby generators	•Adequate telecommunica tion infrastructure	•Students attitude •Lecturers attitude •remuneration •Acceptance to technological change	Reliable connecti vity •High speed access

Figure 4.13: Revised conceptual framework.

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CHAPTER FIVE: DISCUSSIONS, RECOMMENDATIONS AND CONCLUSIONS

5.0 Introduction

This chapter presents the key findings, discussions, recommendations made there-to and conclusion drawn from the findings highlighted.

Higher education institutions have encountered many challenges that they should overcome if their attempts at implementing e-learning is to bear any fruit. Some of the problems have emanated from the students' lack of confidence to use technology and their interaction with lecturers. Students need to be prepared to adapt to advances in technology, especially for learning and communication purposes. The purpose of this study was to ascertain which factors affected successful implementation of e-learning systems in HEIs in Kenya.

Survey research method was adopted for the study, and questionnaire was the only instrument used for the data collection. The response rate was 86.7% indicating that 412 out of 475 targeted responded and according to Babbie (2002) any response of 50% and above is adequate for analysis, thus 86.7% is even a better response. According to the findings awareness of e-learning among the Universities is very high but investment and commitment to support e-learning implementation is very poor and below expectation according to the study. Most of the staff and students in the universities only use Internet related e- learning site just for the sake of finding related information for their research.

While this study does not include a detailed account of all of the data, several key factors have been chosen that are important in the implementation of an e-learning environment. These key factors emerged as recurring themes within the data. Learning in an electronic environment is great challenge in Kenyan institutions because of so many factors. Part of these negative factors included difficulties with computers and Internet access, connectivity and bandwidth, unreliable power supply, inadequate infrastructure, in adequate skills; e.t.c.

Connectivity and bandwidth

Some lecturers and students participants said about bad quality of Internet connection, low bandwidth and difficulties accessing a computer/printer or projectors. Except lack of sufficient computer and Internet skills, insufficient experience with Internet -based teaching, lack of adequate organizational/management support from their universities, lecturers also mentioned a new learning style so different from the traditional learning.

The finding of the study showed that implementation of e-learning has not been given much priority in Kenyan universities. The study also showed that Kenyan universities are making much progress though attitude of academic staff should be improved and the staff receive more training so that their personal capability in using e-learning improves. The university administration also needs to improve the existing infrastructure and technology related to e-learning.

On average the studied universities had scheme (s) to provide teaching/ admin staff and or students with personal PCs or laptops, while others accessed the e-learning environment through computer laboratories All lecturers who participated in the study expressed differing opinions regarding the reliability of access to computers for their classroom teaching practices. The research findings indicate that the accessibility of computers can impact on a lecturer's purpose for using the technology.

One critical finding was that many students did not believe their institutes could support & motivate them towards e-Learning. On the other hand many believed that they could depend on the institute's infrastructure to support their learning needs. While others claimed that they had personal computers/laptops. It has been assumed that if a factor can impact a student's use of technology then it also affects their perceptions of implementation

Financial support

Funding remains a prominent attribute of successful e-learning development in the university context. CERI (2005) suggests although e-learning is educationally advantageous to learning institutions, a clear sustainable business model is critical to the implementation process. Sustainability is an important issue that can be affected by funding implications. Prior to implementation, universities must consider the ongoing cost of providing flexible pedagogy and personalized materials to students. Practical issues such as hardware (accessibility to computers), connectivity and networking (access to the Internet) will often influence a lecturer's decision to use ICT resources in their teaching and learning practices.

E-learning implementations are costly and require significant and sustainable funding to ensure that adequate infrastructure is deployed at the start-up of the initiative and that on-going funding is available to support further development and growth. Implementations, if not properly managed, will be plagued by cost overruns. University administration should be able to link the vast investments in infrastructure and the use of that infrastructure in delivering educational benefits.
The government's role should involve funding of research and developments of ICT infrastructures. Any single educational institution will only be concerned about its own autonomy and survival. The commitment from the government can foster greater commitment among academic leadership and staff. They can assist with funding and get the necessary support for the initiative in place. They can provide nation-wide infrastructure.

Technology

Technological challenges are broadly defined as challenges surrounding issues of familiarity with new technology and technical problems encountered by instructors, for example, network bandwidth, computer facilities and storage and technology operation. A personal lack of easy access to these technologies as well as a lack of skills necessary to use available computer and communication technology has hindered instructor use of e-learning. Even when instructors did have access to computers themselves, there could be issues to do with the quality of this access, for example other technologies (e.g., high quality of audio-video

facilities or network) related to e-learning practice were sometimes also required Three categories of technological challenges exist: easy access to necessary computer equipment, technical skills to access computer technology and the e-learning system, and the quality of e-learning computer facilities and technology.

Easy access to necessary computer equipment: On the availability of ICT resources for teaching and learning, there was a mixed reaction with 39.4% of lecturer respondents strongly disagreed that the university has been able to acquire enough ICT resources for teaching and learning while 25 6% agreed compared to 16.9% who disagreed to this while 7.5% strongly disagreed. They repeatedly emphasized that the time and capability needed to prepare course materials which often meant that the inconvenience involved in using the university e-learning facilities would become a challenge for them On the level of availability of resources in general at the universities for effective e-learning implementation 37% respondents said that the resources are inadequate compared to 33% who felt that the resources are adequate, while 10% said they are very inadequate compared to only 3% who said that they are very adequate and a17% respondents remained neutral on the issue. From the findings it clearly shows that across the universities there are no adequate resources required for effective e-learning implementation thus adequate infrastructure in a major challenge hindering successful implementation of e-learning projects.

Technical skills to access computer technology and the e-learning system: although most of lecturers had attended training on e-content development and how to use e-learning in teaching, some felt they needed not only to be familiar with new technologies but also able to deal with technical problems encountered, for example, network bandwidths, computer facilities and storage and technology operations. Similarly, some instructors reported their colleagues had difficulties using e-learning systems due to a lack of technical skills. Typically, they reported overcoming these problems by asking their colleagues or technical support staff for help.

The quality of e-learning computer facilities and technology: Some respondents indicated that the available technology was slow and lacked the high quality network bandwidth and facilities required to download huge files. On the issue of bandwidth it was clear from the research findings presented in above table 4.4, table 4.5 and table 4.6 that the available bandwidth is limited among the sampled universities as most respondents said that they are unable to download huge files or run bandwidth hungry applications because the available bandwidth is less. Figure 4.4 shows that the institutions have also failed to monitor let alone manage the existing bandwidth. As a result of this the little bandwidth that is available becomes even less useful for research and education purposes. These respondents noted they needed more adequate and higher quality e-learning related computer technology, peripherals and other multimedia accessories.

A majority of instructors involved in the study pointed out that e-learning not only relies on multiple ICT technologies but also that technology innovation is ongoing and so instructors are continuously faced with pedagogical, personal, and technological challenges. The assertion from a majority of instructors was e-

learning was significantly different from face-to-face instruction and so they need to adopt different pedagogical approaches. However, respondent instructors indicated that actually most instructors have had little or no formal training in the effective use of technological resources in e-learning. The general perception was that they would benefit from training in this, either from the university and or external professionals.

On a more practical note, a majority of instructors noted the time needed to prepare e-learning lessons and interact with students was a challenge to their use of e-learning. The time and effort needed for instructional design with new media to produce e-content and in online interaction was reported to have decreased instructors' motivation to use e-learning as has been reported by Adams (2002) and Beggs (2000).

Support and Training Initiatives

A range of methods should be utilized to support the initial and ongoing use of e-learning environments for both staff and students. This should be done through the development of a policy or procedural document that outlines the standard practices for activity on the system. Of the sampled universities who responded to the statement that "The University has an ICT policy in place that guides the use of ICTs in teaching and learning", 47.8% of the respondents agreed to this compared to 28.3% respondents who disagreed while 10.9% strongly disagreed. However, 39.1% respondents agreed that there are difficulties in implementing the university's ICT policy as compared to 34.8% who disagreed, while 4.3% strongly disagreed compared to 4.3% who strongly agreed to this.

Given the pivotal role that lecturing staff play in the adoption and execution of e-pedagogy, it becomes necessary to continuously equip them with more knowledge through training and refresher courses as a way of creating confidence in them. It has been observed from the findings that most lecturers are not resistant to learning new skills. Many are more than prepared and receptive to new ideas. However, given the different experiences and ideologies among the lecturers, it is acknowledged that some academics working in higher education are reluctant in accepting aspects of technology in their teaching and learning because of lack of understanding and confidence in the new technological innovations.

Inadequately trained lecturers using e-learning in educational environments can become an obstacle in a finely balanced learning process and can lead to problems in application use and in the perception of students (Volery 2000:8). Lecturers in HEIs work in a unique educational environment given that they are expected to implement technological changes within their respective working environments. It therefore becomes incumbent upon the lecturing fraternity to be receptive to changes in technology and to be prepared to embrace and impact the same skills to students Lecturers in higher educational institutions must accept and embrace technological advancements offered by e-learning.

According to Salmon (2004) focusing training on the technological features of the e-learning system is only the first step to success; the real challenge is training for changes to pedagogy. Lecturers from the study were generally satisfied with the level of support and training they had received prior to and during the implementation phase of the e-learning environment, however access to time to implement pedagogical change and develop their e-learning environments was a key issue. The research findings from the sampled universities reinforced this key issue.

Motivation

Motivation of the instructors should be of paramount importance. The teaching staff are a vital component of HEIs and form a policy-implementation arm of any HEI through acceptable pedagogic dispatches to students. Educational material should be transmitted to students through the teaching staff who are tasked with the dissemination of educational material to students. Debates on the pivotal role of lecturers have ensued with the bottom-line indicating the indispensable nature of the teaching staff in education. Volery (2000:57) maintains that technical expertise on its own is not of great value unless lecturers conceive effective ways to utilize it.

Attitude towards technology

Lecturers will always play a key role in the effective delivery of e-learning initiatives, as it is the lecturer not the technology that facilitates the students learning experience. Wilson (2001:8) suggests that three characteristics of the lecturer will control the degree of learning; attitude towards technology, teaching style and the control of technology. The availability of lecturers alone does not suffice in successful adoption and implementation of e-learning within HEIs. Attitudinal aspects should be considered as well. Commitment and a positive attitude towards e-learning by lecturers help to create a conducive environment for the successful implementation of e-pedagogy which would subsequently yield positive results for students as well. In support of this view Holley (2002:117) concludes that students will experience a more positive learning experience if guided by a lecturer who retains a positive attitude towards traditional learning whilst promoting e-learning methods.

Internet accessibility and connectivity

In an attempt to improve the accessibility of internet facilities within HEIs, many institutions have introduced the wireless network facility which enables students and lecturers alike to access the internet without having to have internet accessories like internet cables and portals. While these developments have been hailed by many HEIs as a positive development, but they have been accompanied by challenges. There are a number of challenges that need to be addressed including authentication, security, bandwidth, student support, and mobility management. Efficient mobility management, and especially handover management, is considered one of the major factors toward a seamless connectivity across networks of different technologies.

Problems associated with the internet connectivity and wireless network within these institutions need to be addressed with the assistance of experts who ensure that the system does not let down students and lecturers, although in some cases, the reception is very low and cannot enable users to access internet Efforts should also be made to increase the number of locations (access points) where one can access the wireless facility. Currently these are few and sparsely populated.

Planning

Careful planning should be at the forefront of any e-learning initiative. Failure to realize value from technology investments can be attributed to the lack of an effective strategy for planning, implementing, evaluating and institutionalizing the payoffs from investments. Governments should have a clearly articulated strategy for the use and implementation of e-learning in order to realize its benefits

The competitive nature of utilizing ICTs has put many HEIs at a very precarious position, especially given that many HEIs will find themselves grappling with the threat of being 'left behind' by their competitors Proponents of the adoption of e-learning in HEIs stress the dangers of 'jumping on the bandwagon' too soon or without due diligence, given the influx of students and this justifies many HEIs' desire to extend their brand. The extension of an institution's brand is not without risk. Increasing the number of students who claim to have studied there can damage a university's reputation if those students do not receive the level of teaching that the university's name was built on" (O'Donoghue, et al 2004:318). Thus, need to consider the implications for everyone involved before implementing any new e-learning strategies.
The implications are clearly multi-faceted. The institution will itself necessitate change physical, cultural and managerial.
Students will require support in adapting to a potentially unfamiliar learning context. Finally the implications are huge for staff who are under pressure to introduce and develop often totally different approaches to their teaching and delivery.

The obligation eventually rests with universities which must transform to accommodate demand and in response to new competition from global, giant corporate and virtual universities, however the problems associated with the change must be fully understood and taken into account prior to the transition taking place. Despite the fact that the benefits of e-learning may be highly prophesised, the many implications of implementing an e-learning programme require careful consideration, and getting it 'right' the first time will ensure long term success in a highly competitive market (O'Neill, Singh and Donoghue, 2004:313).

In addition to the viability of e-learning programmes in the face of high students' turn-over, there are other underlying challenges that universities need to contend with. Many of these implementations are costly and yet superficial, in terms of learner engagement and activity (O'Neill, Singh and Donoghue, 2004:313). They provide a content repository and in many cases limited active learner participation. For many students this result in endless reading of screen based text. Pessimists of e-learning are also of the view that given the myriad of challenges that confront lecturers, such as lack of adequate skills to execute e-learning

confidently and in some cases, lack of appropriate resources and infrastructure, "staff are 'forced' down the e-learning route as a consequence of management directives and mission statements The creation of sound pedagogic practice is often flawed or missing completely (O'Neill, Singh and Donoghue, 2004 313) This has left staff in a quagmire on the prospects of successfully implementing and achieving their teaching and learning objective.

In addition among other issues to be addressed within the universities should include the following

- Awareness, sensitization and training of stakeholders on e-learning and e-content development
- Formulation and operationalization of appropriate ICT and e-learning policies
- Adequate financial allocation for e-learning development
- Development of ICT and e learning infrastructure to facilitate access to e-learning
- Collaborations and partnerships in e-learning
- Provision of learner support to students
- Introduction of compulsory ICT and e-learning courses for students
- Top Management Support
- Adoption of simpler open source learning management systems

What needs to be addressed in implementing e-learning?
As argued by Susan D'Antoni (2002), potential e-learning providers should ask four questions about the usefulness of e-learning before implementation.

- **Accessibility:** for e-learning to have any impact, it must be accessible to the learner *(the first priority is to provide ready Internet connectivity & access to a computer).*
- **Appropriateness:** the content should fit the learners' needs.
- *Accreditation:* accreditation in the country of origin is one indicator of quality and provides some consumer protection.
- *Affordability:* opportunities offered by e-learning should be affordable in local contexts.

5.1 Projection for e-learning in HEIs
E-learning in education HEIs is experiencing unprecedented usage and development. Despite challenges faced by HEIs, e-learning has successfully managed to bring education to the doorstep of all those who seek it. The need to create more conducive environment for learners has proved to be a requirement for the attainment of good results. Lecturers, to be able to conduct themselves confidently, should receive continuously training and upgrading of their pedagogical skills in accordance with the dynamic nature of technology. Students, being the central focal point for HEIs, should have access to internet and e-learning facilities if they are to prove themselves and attain their goals. Institutional leaders should continuously adapt themselves to changing technological environments and inculcate a positive attitude to adoption and implementation of e-learning within their institutions. Attitudinal aspects have been cited as determining the success or failure of implementing e-learning in institutions. The prospects for e-learning in HEIs

remain bright, especially given the receptive nature that numerous HEIs and institutional leadership have and the optimism that students and lecturers hold of the future of e-learning in educations. This has been compounded by the preparedness of lecturers to meet challenges posed by the continuous technological innovations and their preparedness to learn new skills.

5.2 Conclusion

Despite the various debates on the adoption and implementation of e-learning as well as the accompanying challenges, e-learning remains an indispensable pedagogical phenomenon in the 21st century and beyond. Its ability to cater for a myriad of students seeking educational opportunities have made it the best medium through which lecturers can interact with students anytime anywhere. The utilization of e-learning has also cut distances which students in conventional learning institutions would have covered to access lecturers and learning materials.

Incentives should therefore be accorded to HEIs to enhance e-learning facilities within their institutions. More financial resources should be devoted to the acquisition of resources and infrastructure for the promotion of e-learning facilities and infrastructure in HEIs. Attitudinal change should also be inculcated in institutional leaders to keep abreast of technological innovations for their respective institutions for the advancement of both their lecturers and students.

Given that the challenges encountered by HEIs and the barriers that inhibit the implementation of e-learning within institutions are common across the educational institutions, the obligation rests with institutional leadership whose thrust should be focused on providing the necessary resources and infrastructure with which to implement their respective institutional e-learning strategies.

Governments should also take it upon themselves to commit more funding for HEIs to be able to undertake training programmes for academic staff, procure more computers and provide for bigger bandwidth for different HEIs. This should be reinforced by a reliable internet and network system that does not further provide further challenges like crashing or getting offline at a time when students and staff need it most.

The large influx of students seeking tertiary education has also presented a challenge as HEIs have to contend with these students, some taking part time classes. Through availing adequate tutors and facilitators would help improve the situation. At the Universities the E-Learning Department should have facilitators on stand by to provide help to any e-learning-related problems throughout the year. The Department should also deploy its trained staff to visit different departments in the institution to help resolve any issues pertaining to the disbursement of e-learning.

The problems associated with the wireless network should be addressed with the assistance of experts who ensure that the system does not let down students and lecturers, and efforts to be made to increase the number of access points where one can access the wireless facility.

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The research department within the institutions should undertake researches on challenges that those who utilize the e-learning facilities within the institution encounter and bring these problems to the attention of appropriate personnel for resolution.

Given the similarity of challenges within and among HEIs, the solutions to e-learning related challenges at the studied universities can be applied to other HEIs in Kenya and in other developing countries

5.3 Limitations and suggestions for future research.

Some limitations or challenges were encountered in undertaking this research project. Lack of funds hindered the research to the extent that the study only concentrated in universities within Nairobi metropolitan in which students, lecturers, administrators and ICT support staff were involved leaving out the public who include students from other institutions, academicians and the general public who are also the target users of e-learning contents. This could have brought about some biasness to the findings of the research especially on some of construct of research such as internet access, awareness and relevance of contents from the university. For instance, internet access level was high which only involved respondents in the selected Nairobi area but this would be different if all targeted users of e-learning were involved.

Further research should be carried out to include other higher learning institutions in Kenya. Moreover, further research should be carried out to investigate whether e-learning investments contribute to the realization of value.

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APPENDICES

Appendix 1

Correlation on key challenges hindering successful e-learning implementation.
-

- - - **P A R T I A L   C O R R E L A T I O N   C O E F F I C I E N T S** - - -

Controlling for..   RESPODENT

	CH_2	CH_3	CH_4	CH_5	CH_6	CH_7
CH_2	1.0000	.5277	.1675	.4728	.1118	.4395
	(0)	(377)	(377)	(377)	(377)	(377)
	P= .	P= .000	P= .001	P= .000	P= .015	P= .000
CH_3	.5277	1.0000	.1607	.4605	.1301	.3684
	(377)	(0)	(377)	(377)	(377)	(377)
	P= .000	P= .	P= .001	P= .000	P= .006	P= .000
CH_4	.1675	.1607	1.0000	.0158	-.0360	.0309
	(377)	(377)	(0)	(377)	(377)	(377)
	P= .001	P= .001	P= .	P= .380	P= .242	P= .275
CH_5	.4728	.4605	.0158	1.0000	.1772	.4849
	(377)	(377)	(377)	(0)	(377)	(377)
	P= .000	P= .000	P= .380	P= .	P= .000	P= .000
CH_6	.1118	.1301	-.0360	.1772	1.0000	.1628
	(377)	(377)	(377)	(377)	(0)	(377)
	P= .015	P= .006	P= .242	P= .000	P= .	P= .001
CH_7	.4395	.3684	.0309	.4849	.1628	1.0000
	(377)	(377)	(377)	(377)	(377)	(0)
	P= .000	P= .000	P= .275	P= .000	P= .001	P= .
CH_8	.3441	.2779	-.1009	.3600	.2122	.6020
	(377)	(377)	(377)	(377)	(377)	(377)
	P= .000	P= .000	P= .025	P= .000	P= .000	P= .000
CH_9	.1768	.1022	.0029	.3149	.0837	.4087
	(377)	(377)	(377)	(377)	(377)	(377)
	P= .000	P= .023	P= .478	P= .000	P= .052	P= .000
CH_10	.2593	.3088	.1115	.3256	.1350	.3046
	(377)	(377)	(377)	(377)	(377)	(377)
	P= .000	P= .000	P= .015	P= .000	P= .004	P= .000
CH_11	.2754	.2443	.0151	.3236	.1267	.2214
	(377)	(377)	(377)	(377)	(377)	(377)
	P= .000	P= .000	P= .385	P= .000	P= .007	P= .000
CH_12	.0444	-.0505	-.0173	.0415	.0020	.0107
	(377)	(377)	(377)	(377)	(377)	(377)

* - Signif. LE .05

	CH_8	CH_9	CH_10	CH_11	CH_12
CH_2	.3441 (377) P= .000	.1768 (377) P= .000	.2593 (377) P= .000	.2754 (377) P= .000	.0444 (377) P= .194
CH_3	.2779 (377) P= .000	.1022 (377) P= .023	.3088 (377) P= .000	.2443 (377) P= .000	-.0505 (377) P= .163
CH_4	-.1009 (377) P= .025	.0029 (377) P= .478	.1115 (377) P= .015	.0151 (377) P= .385	-.0173 (377) P= .369
CH_5	.3600 (377) P= .000	.3149 (377) P= .000	.3256 (377) P= .000	.3236 (377) P= .000	.0415 (377) P= .210
CH_6	.2122 (377) P= .000	.0837 (377) P= .052	.1350 (377) P= .004	.1267 (377) P= .007	.0020 (377) P= .484
CH_7	.6020 (377) P= .000	.4087 (377) P= .000	.3046 (377) P= .000	.2214 (377) P= .000	.0107 (377) P= .417
CH_8	1.0000 (0) P= .	.5478 (377) P= .000	.5044 (377) P= .000	.2743 (377) P= .000	.0815 (377) P= .057
CH_9	.5478 (377) P= .000	1.0000 (0) P= .	.5857 (377) P= .000	.4685 (377) P= .000	.1689 (377) P= .000
CH_10	.5044 (377) P= .000	.5857 (377) P= .000	1.0000 (0) P= .	.5295 (377) P= .000	.1702 (377) P= .000
CH_11	.2743 (377) P= .000	.4685 (377) P= .000	.5295 (377) P= .000	1.0000 (0) P= .	.3340 (377) P= .000
CH_12	.0815 (377) P= .057	.1689 (377) P= .000	.1702 (377) P= .000	.3340 (377) P= .000	1.0000 (0) P= .

* - Signif. LE .05

CH_2-Student attitude; CH_3-Technical support; CH_4-Top management support; CH_5-Technical experience and skills; CH_6-good connectivity; CH_7-High bandwidth; CH_8-Adequate telecommunication; CH_9-Reliable power supply; CH_10-Acceptance to technological change, CH_11-Finances

Appendix 2

PART1: E-learning survey questionnaire for university students

Section A: personal Details

1. Name of the University_____

2. Your faculty or department_____

3. gender:

   Male ☐   female ☐

4. Select your level of study

   Diploma ☐   Undergraduate ☐   Postgraduate ☐

5. Which course are you taking at the university_____

6. Indicate the year/stage of study_____

Section B(i): ICT facilities available in the University for students

1. In general how do you describe the availability of computers at your university?

Very Inadequate ☐   inadequate ☐   neutral ☐   Adequate ☐   very adequate ☐

2. What is the ratio of computer to number of students? ☐

1:1 ☐   1:2 ☐   1:3 ☐   1:4 ☐   1:5 One per more than five students ☐

3. How many hours in the average per week of the normal college hours are you able to use computers and related ICTs to your studies?

Less than 5 hours ☐   6-10 hours ☐   11-15 hours ☐   16-20 hours ☐

   more than 20 hours ☐

4. Which of the following resources are available for e-learning at your University?

Rating system:

1- Never   2- Very rarely   3- Occasionary   4-Frequently   5- Very frequently

		1	2	3	4	5
i.	Personal Computers	☐	☐	☐	☐	☐
ii.	Printers	☐	☐	☐	☐	☐
iii.	Projectors (LCD)	☐	☐	☐	☐	☐
iv.	The internet	☐	☐	☐	☐	☐
v.	Email	☐	☐	☐	☐	☐
vi.	Learning management system	☐	☐	☐	☐	☐
vii.	Automated library services (E-Journals)	☐	☐	☐	☐	☐

Others (Please specify). _____

Section B(ii): E-learning technology

6. Do you know what e-learning is?

   Yes ☐   No ☐

7. Have you ever attempted to use any e-learning technology services?

   Yes ☐   No ☐

8. What do you think of the value of e-learning for teaching and learning need at the university?

Highly invaluable ☐   invaluable ☐   neutral ☐   valuable ☐   very valuable

9. Indicate the degree to which you agree with each statement relating to availability of resources for e-learning at your university by using the following rating system.

Rating system:

1-Strongly Disagree   2-Disagree   3- Neutral   4-Agree   5-Strongly agree

Perception of availability of resources for e-learning

	1 Strongly disagree	2	3	4	5 Strongly Agree
There are resources available for me to use on e-learning for learning					
It is (would be) easy to gain knowledge in the use of e-learning for my learning					
If I needed help on an issue with e-learning, I know who to contact.					
I received training on how to use e-learning after joining the university.					

10. How do you rate the level of availability of resources in general at your university for effective e-leaning implementation?

Very Inadequate ☐   inadequate ☐   neutral ☐   Adequate ☐   very adequate ☐

11. How do you indicate the availability of electricity supply at your university in order to support e-learning implementation?

Very irregular ☐   irregular ☐   neutral ☐   Regular ☐   regular ☐

Section B(iii): Use of ICT by Students for e-learning

12. To what extent do you use the ICT resources for e-learning?
Rating system:

1- Never   2- Very rarely   3- Occasionally   4-Frequently   5- Very frequently

		1	2	3	4	5
i.	To provide additional learning material on concepts Learnt in class?	☐	☐	☐	☐	☐
ii.	To download notes from E-learning platform?	☐	☐	☐	☐	☐
iii.	To upload assignments to your lecturers on the E-learning platform?	☐	☐	☐	☐	☐

13. Indicate the degree to which you agree with each statement relating to the usage of e-learning at your university by using the following rating system.

Rating system:

1-Strongly Disagree   2-Disagree   3- Neutral   4-Agree   5-Strongly agree

Students' perception on usage of E-learning

	1 Strongly disagree	2	3	4	5 Strongly Agree
Without e-learning I would be unable to study					

…earning is an important element of my course					
…earning is one of a number of important components of my course					
…nd using learning management systems difficult					
…earning makes studying easier for me					
…y university is credible in the way it has …plemented e-learning system					

Section C: Internet Access and use in education

1. What is the availability of internet connectivity at your university?

Very Inadequate ☐   Inadequate ☐   Neutral ☐   Adequate ☐   Very adequate ☐

2. How often do you use internet for learning purposes.

Daily ☐   3-4 days a week ☐   1-2 days a week ☐   Less than 7 days a month ☐   Never ☐

3. Rate yourself with the internet connection at your university

Very satisfied ☐   Satisfied ☐   Unsatisfied ☐   Very unsatisfied ☐   I don't know ☐

4. How many times have you researched using free contents available on internet and downloaded educational materials per semester.

None ☐   once ☐   2-5times ☐   6-10 times ☐   uncountable times ☐

5. Please state the reasons which discourage you from downloading educational materials such as books Pdf documents and also online softwares. (tick all that apply)

☐ Internet access is slow

☐ Bandwidth is limited therefore I can't download huge files

☐ Accessibility to computers is a problem

☐ I can get what I need from the e-learning portal at the universities web site

6. How do you agree or disagree with the following statement.

My university provides online materials and useful links for research through web

Strongly agree ☐   Agree ☐   Neutral ☐   Disagree ☐   Strongly disagree ☐

7. How do you agree or disagree with the following statement

The internet connection/usage fees that we are paying are too high

Strongly agree ☐   Agree ☐   Neutral ☐   Disagree ☐   Strongly disagree ☐

Section D: Challenges of E-learning

1. In a scale of 1 to 5, indicate your degree of agreement to the following statements relating to challenges of e-learning use. Strongly disagree (1) to strongly agree (5).

Perceived challenges of e-learning use by students

	1 Strongly disagree	2	3	4	5 Strongly Agree
Some one showed me how to do it first					
I had the built in help facility for assistance					
My use of e-learning is voluntary					

Although it might be helpful, Using e-learning is not compulsory in my faculty				
The usage of e-learning is pertinent to my various learning related tasks				
I access WEBCT/Blackboard/Moodle/ other learning management systems inside the university for my learning and research work				
There is frequent loss of power				
When the power goes off there is a standby generator				
When power goes off the generator automatically switches on.				

2. What do you foresee as a limitation of e-learning as a learning tool in your university(tick all that appl

- [ ] Internet connection (bandwidth)

- [ ] Access to computers

- [ ] Relevance and quality of e-learning materials

- [ ] others (specify)_____

3. To what extent, do you agree that the following are the challenges hindering successful implementatior of e-learning at your institution?(1=Strongly disagree 5= Strongly agree)

	1	2	3	4	5
Instructor's attitude	☐	☐	☐	☐	☐
Student's altitude	☐	☐	☐	☐	☐
Technical support	☐	☐	☐	☐	☐
Experts in instructional Design	☐	☐	☐	☐	☐
Top management support	☐	☐	☐	☐	☐
Technical experience and skills	☐	☐	☐	☐	☐
Good connectivity	☐	☐	☐	☐	☐
High bandwidth	☐	☐	☐	☐	☐
Adequate telecommunications infrastructure	☐	☐	☐	☐	☐
Reliable power supply	☐	☐	☐	☐	☐
Acceptance to technological change	☐	☐	☐	☐	☐
Financial support	☐	☐	☐	☐	☐

Thank you kindly for your time and effort in participating in this research, in case of any enquiries contact the researcher as follows:
James M. Wamae
Email: muwamy@yahoo.com; Mobile No. 0722-482394

PART2: Questionnaire for lecturers

E-learning survey questionnaire for University lecturers

Section A: personal details

1. Name of the university: _____

2. Gender:

   Male ☐   Female ☐

3. Your faculty and department _____

4. What is your academic rank?

   Professor ☐   Ass. Professor ☐   Senior Lecturer ☐   Lecturer ☐   Ass. Lecturer ☐

   Graduate Assistant ☐   Others (specify)_____

Section B: Preparedness in terms of E-contents development and use

1. Do you currently use e-learning as part of your programme delivery

   Yes ☐   No ☐

2. Please indicate the percentage of your teaching material that is in following forms?

   %

   a. hand written form _____

   b. electronic form _____

3. For the materials that are in electronic form, in which format are they?

   Word document ☐   Pdf format ☐   PowerPoint slide ☐

   others (specify)_____

4. Have you attended any training on e-content development? Yes ☐ No ☐

5. Rate your willingness to contribute your own original academic work (e.g. lecture materials, paper or project) to students and to other lecturers

   Very willing ☐   Willing ☐   Neutral ☐   Unwilling ☐   Very unwilling ☐

6. Are there opportunities for professional development and training in e-learning? (Technology/skills and pedagogy/learning theory)

   Yes ☐   No ☐

7. Does your institution offer incentives for professional development and training in e-learning?

   Yes ☐   No ☐

8. Are there any ICT support mechanisms to assist with e-learning activities at your institution?

   Yes ☐   No ☐

9. To what extent do you use e-learning:

   Rating system 1- very often   2- often   3- never 4- rarely 5- very rarely

	1	2	3	4	5
i. To give students assignments, notes etc?	☐	☐	☐	☐	☐
ii. To present difficult ideas clearly?	☐	☐	☐	☐	☐
iii. To make a well organized presentation in class?	☐	☐	☐	☐	☐
iv. To mark students work electronically?	☐	☐	☐	☐	☐

v.   To cover more material in the syllabus?   ☐ ☐ ☐ ☐

10. What do you feel are the greatest benefits from introducing e-learning? (Please tick the 3 benefits)

  i. Ability for students to learn at their own pace ☐

  ii. Communication ☐

  iii. Encouraging a deeper knowledge of the subject ☐

  iv. Helps build on specific skills ☐

  v. Ability to access from anywhere / anytime ☐

  vii. Helps to organize and manage programmes ☐

  viii. Providing support for distance learning ☐

  ix. Other (please specify) _____

11. How have your students responded to the use of e-learning?

Rating system: 1-Strongly Disagree 2-Disagree 3- Neutral 4-Agree 5-Strongly agree

	1	2	3	4	5
i. Very well	☐	☐	☐	☐	☐
ii. Ok	☐	☐	☐	☐	☐
iii. Some problems	☐	☐	☐	☐	☐
iv. Poorly	☐	☐	☐	☐	☐

12. What kind of experiences have you had with e-learning (choose as many as apply)

☐ None

☐ I have seen colleagues using it

☐ I attended a course on e-learning training

☐ I am using it for teaching and learning

☐ I heard it from colleagues from another university.

   Others (specify) _____

13. In a scale of 1 to 5, indicate your degree of agreement to the following statements relating to u learning for teaching. Strongly disagree (1) to strongly agree (5).

	1	2	3	4
i. Content presentation is made much easier	☐	☐	☐	☐
ii. I am able to present material in a way that helps students learn.	☐	☐	☐	☐
iii. I am able to make the material more interesting	☐	☐	☐	☐
iv. I am able to stimulate the students to think	☐	☐	☐	☐
v. I am able to present material in a more organized way	☐	☐	☐	☐

vi. I am able to develop the course content well ☐ ☐ ☐ ☐ ☐

vii. I am able to upload the course outline and lecture notes
to my students ☐ ☐ ☐ ☐ ☐

14. Please indicate whether you agree with the following statements on the importance and use of

E-learning: **Rating system:**

1-Strongly Disagree   2-Disagree   3- Neutral   4-Agree   5-Strongly agree

	1 Strongly disagree	2	3	4	5 Strongly Agree
I am very satisfied with the e-learning when teaching.					
I feel that e-learning contributes to the improvement of teaching and learning, and is flexible to these needs.					
I feel that e-learning encourages students to participate more in class.					
I feel e-learning fits in well in the curriculum needs of the subjects taught by me					
I feel that the content of the application used for e-learning is well presented and well organized					
I am very much willing to post my teaching materials to the e-learning portal.					
I don't feel comfortable in posting all my teaching materials to the e-learning portal incase another lecturer accesses them.					

Section (C) E-learning facilities available in the university for lecturers.

1. Which facilities of e-learning do you currently incorporate in your programmes? Please tick all that applies in the first column, and upto 3 of the most useful in the second column.

For accessing programme content	currently use	most useful (3)
(i) Providing general programme information (e.g. module study guide)	☐	☐
(ii) Providing programme study materials (e.g. lecture notes, ppt slides, interactive learning materisls)	☐	☐
(iii) Providing links to web resources	☐	☐

For communication and giving tutor support

(i) Taking part in programme online discussions/groupwork	☐	☐
(ii) Contacting other programme participants by email On study matters	☐	☐
(iii) Assignment handling	☐	☐
(iv) Assignment feedback	☐	☐
(v) Online tutor-support	☐	☐

To use other e-learning facilities

(i) Providing online tests quizzes ☐

(ii) Encouraging students to use the e-portfolio feature ☐

(iv) Others (specify) _____

2. In a scale of 1 to 5, indicate your degree of agreement to the following statements relating to availability of e-learning resources in the University. Strongly disagree (1) to strongly agree (5).

Perceived Lecturers' opinion on availability of e-learning resources in the Univers

	1 Strongly disagree	2	3	4	5 St Ag
The university has been able to acquire enough e-learning technologies for teaching and learning (TV/Radio, CD DVD. Web based technologies, e-learning platforms etc)					
E-learning resources in the university are enough for all the students and lecturers to use in teaching and learning and are available when needed.					
My department head and faculty/school dean are very supportive of using e-learning for teaching, learning and research					
Guidance is available to me on how to use e-learning resources in the university					
A special person (group) is available for assistance with the e-learning use in teaching, learning and research					
Management of the university think that I should be using the e-learning resources in the university for teaching, learning and research					

Section D (i) Challenges of E-learning

1. In a scale of 1 to 5, indicate your degree of agreement to the following statements relating to cha of e-learning use. Strongly disagree (1) to strongly agree (5).

Perceived challenges of e-learning use by Lecturers

	1 Strongly disagree	2	3	4	5 Strong Agree
I find using the e-learning to be easy					
The actual process of using e-learning is pleasant because it makes my work easier					
My use of e-learning is voluntary					
The Dean/HOD does not require me to use e-learning in my teaching					
Although it might be helpful, Using e-learning is not compulsory in my faculty					
In my teaching and learning, Usage of e-learning is important					
In my teaching and learning, Usage of e-learning is					

relevant			
The usage of e-learning is pertinent to my various teaching and learning related tasks			
I access WEBCT Blackboard Moodle other learning management systems inside the university for my teaching, learning and research work			
I use e-learning system to upload on-line syllabuses, lecture notes, tutorials, tests, quizzes and course material			

2. What – if any – do you think are the greatest barriers to your successful delivery of e-learning? Tick the four that you see as the most important to overcome.

Greatest Barriers

Lack of technical training ☐

Lack of awareness of e-learning benefits ☐

Reliability of the technology ☐

Lack of tutor support / contact ☐

Ease of use of the on-line learning system ☐

Time to prepare materials ☐

Additional resources required for development ☐

Management encouragement ☐

Student attitudes ☐

Other (please specify)_____

3. How significant a challenge is it for IT to support students' online distance courses with technology activities, in the following areas? [rate each on a scale of 1 – 5, where

1 = not a challenge, 5 = very significant challenge.]

	1 Not a challenge	2	3	4	5 Very significant challenge
Student lack of knowledge about technology					
Network access/ usage problems					
Utilizing online course technology					
Utilizing online course applications/tools					
Keeping up with students' demand to implement emerging/cutting-edge technology in the classes					
Internet connectivity and low bandwidth					

4. To what extent, do you agree that the following are the challenges hindering successful impleme of e-learning at your institution?(1=Strongly disagree 5 = Strongly agree)

	1	2	3	4	5
Instructor's attitude	☐	☐	☐	☐	☐
Student's attitude	☐	☐	☐	☐	☐
Technical support	☐	☐	☐	☐	☐
Top management support	☐	☐	☐	☐	☐
Technical experience and skills	☐	☐	☐	☐	☐
Good connectivity	☐	☐	☐	☐	☐
High bandwidth	☐	☐	☐	☐	☐
Adequate telecommunications infrastructure	☐	☐	☐	☐	☐
Reliable power supply	☐	☐	☐	☐	☐
Acceptance to technological change	☐	☐	☐	☐	☐
Remuneration	☐	☐	☐	☐	☐

5. Do you have any comments that you would like to make about any general issues concerning e-le implementation in Kenya? _____

_____

_____

Thank you kindly for your time and effort in participating in this research, in case of any enqu contact the researcher as follows:

James M. Wamae

Email: muwamy@yahoo.com

Mobile No. 0722-482394

E-learning survey questionnaire for University Administrators

Section A: personal details

1. Name of university: _____

2. Gender:

Male ☐   Female ☐

3. Highest academic qualification attained

First degree ☐   Masters ☐   PHD ☐

Others (specify) _____

Section B: General information about the university

1. Does your university offer online learning?   Yes ☐   No ☐

2. What year did your institution begin to offer e-learning courses?

Pre – 2006 ☐   2006 ☐   2007 ☐   2008 ☐   2009 ☐   2010 ☐

Not yet ☐

3. What is the total cost of your internet access as a percentage of the total expenditure to your institution per year?

Less than 5% ☐   5 – 9% ☐   10-19% ☐   20-29% ☐   More than 30% ☐

4. What is the estimated percentage of total courses offered by your institution during the 2009-2010 academic years that were online distance learning?

Less than 5% ☐   5-9% ☐   10-19% ☐   20-29% ☐   Greater than 30% ☐

Don't know ☐

5. What is the estimated percentage of faculty members who taught courses using e-learning in the 2009-2010 academic year

Less than 10% ☐   11-20% ☐   21-30% ☐   31-40% ☐   41-50% ☐

More than 50% ☐   Don't know ☐

6. Identify the academic fields that require the most e-learning support for the subjects offered in any given academic period

Sciences ☐   Art based subjects ☐   Mathematics ☐   Business studies ☐   Law ☐

All Subjects ☐

7. Are there opportunities for professional development and training in e-learning (Technological/skills and pedagogy/learning theory)

Yes ☐   No ☐

8. Does your institution offer incentives for professional development and training in e-learning? (Time off and training in e-learning)

Yes ☐   No. ☐

9. Are there any ICT support mechanisms to assist with e-learning activities at your institution?

Yes ☐   No. ☐

10. Which of the following statements best describes how the central IT staff is organized to provide technical support to students for e-learning today?

Support is provided by staffers who spend part of their time on this task	
Support is provided by some staffers dedicated to this task	
There are groups or departments that support students	

11. To what degree do you agree with this statement: My institution encourages instructors to incorpo[rate]

technology into instruction?

Strongly Disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly agree ☐

12. How does your institution encourage instructors to integrate technologies into instruction? [Chec[k]

that apply]

☐ Release time

☐ Stipends

☐ Special consideration for promotions or tenure

☐ Mandatory with no special considerations

☐ No institution practices

☐ Other policies (please specify) _____

13. To what extent do you agree with the following statement about institutional spending for suppor[t]

instructors' IT and instructional needs for e-learning courses?

Our spending in support of online distance courses is adequate

Strongly Disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly agree ☐

Section C(i): ICT facilities available in the university for supporting e-learning.

1. In a scale of 1 to 5, indicate your degree of agreement to the following statements relating to availab[ility]
of ICT facilities in the University. Strongly disagree (1) to strongly agree (5).

	1 Strongly disagree	2	3	4	5 Strongly
The university has been able to acquire enough ICT resources for teaching and learning (PC's, Printers, Projectors, photocopiers, internet, Learning management system etc)					
ICT resources in the university are enough for all the students and lecturers to use in teaching and learning					
ICT resources in the university are available to lecturers and students when they need to use them					
Guidance and training is available to lecturers and students to use e-learning resources in the university.					
A special person (group) is available for assistance with the ICTs use in teaching, learning and research					

Section C(ii): University Support

2. In a scale of 1 to 5, indicate your degree of agreement to the following statements relating to support
provided towards e-learning for teaching. Strongly disagree (1) to strongly agree (5).

	1 Strongly disagree	2	3	4	5 Strongly Agree
Administrators that influence policy decisions consider e-learning as important for teaching and learning in the university					
The administration supports and allocate resources for the adoption and implementation of e-learning in teaching, learning and research					
The administration is very supportive of using e-learning for teaching, learning and research					
The Vice chancellor influences e-learning development and use in our university					
Our university VC has a clear ICT visionary leadership that influences e-learning development					

Section C(iii): University Readiness

3. In a scale of 1 to 5, indicate your degree of agreement to the following statements relating to University's readiness towards e-learning for teaching. Strongly disagree (1) to strongly agree (5).

	1 Strongly disagree	2	3	4	5 Strongly Agree
The university generally supports and actively promotes strong leadership, invests in training and experiment with the e-learning					
The university generally provides adequate funding associated with e-learning services and equipments.					
The university has an ICT policy in place that guides the use of ICTs in teaching and learning					
The University has institutional policy frameworks to support e-learning projects?					
The university is generally aware of the concept and benefit of e-learning and willing to allocate new responsibilities (practitioners, technical and administrative personnel etc)					

Section D(i) Perceived Challenges of ICT Adoption and Implementation of E-Learning by Administrators

1. In a scale of 1 to 5, indicate your degree of agreement to the following statements relating to challenges of e-learning implementation. Strongly disagree (1) to strongly agree (5).

	1 Strongly disagree	2	3	4	5 Strongly Agree
There are always funds allocated for the implementation of e-learning in teaching and learning					
There is a clear university policy on the evaluation of teaching effectiveness using e-learning					

There are difficulties in implementing the university's ICT policy					
KENET provision of internet connection bandwidth to the university is adequate					
The government is active in setting up the infrastructure to increase e-learning use in education					
The government zero tax tariffs on ICTs and this aids ICTs adoption and e-learning implementation in teaching and learning in the university					

2. Please rate the following key challenges that your institution faces in supporting students in their uses technology: [rate each on a scale of 1 – 5, where

1 = not a significant challenge. 5 = very significant challenge.]

	1 Not a significant challenge	2	3	4	5 Very significant challe...
Responding to increasing technical support demands from students					
Responding to increasing pedagogical support demands from students					
Maintaining current technical infrastructure					
Securing adequate funding to handle demand					
Maintaining a standard network/user platform					
Providing 24 x 7 support					
Upgrading classrooms to enable technology use					

3. How significant a challenge is to support instructors' e-learning use in the following areas? [Rate each on a scale of 1 – 5, where 1 = not a challenge, 5 = very significant challenge.]

	1 Not a challenge	2	3	4	5 Very significant challenge
Faculty's lack of confidence to use technology in teaching environment					
Inconsistent technology: platforms, tools, software vary					
Keeping up with instructors' demand to learn emerging/cutting edge technology					
Unreliable technology: low bandwidth, Internet/ Network disconnection during teaching session.					
Instructors' lack of knowledge about how to design courses utilizing technology to promote learning.					

4. Please rate the following key challenges that your institution faces in supporting instructors in their uses of technology [rate each on a scale of 1 – 5, where

1 = not a challenge,   5 = very significant challenge.]

	1 Not a challenge	2	3	4	5 Very significant challenge
Responding to increasing technical support demands from instructors					
Maintaining current technical infrastructure					
Securing adequate funding to handle demand					
Maintaining a standard network/user platform					
Creating/offering easy-to-use tools to decrease support requirements					
Providing 24 x 7 support					
Upgrading classrooms to enable technology use					

5. To what extent, do you agree that the following are the challenges hindering successful implementation of e-learning at your institution?(1 =Strongly disagree 5= Strongly agree)

	1	2	3	4	5
Instructor's attitude	☐	☐	☐	☐	☐
Student's altitude	☐	☐	☐	☐	☐
Technical support	☐	☐	☐	☐	☐
Experts in instructional Design	☐	☐	☐	☐	☐
Top management support	☐	☐	☐	☐	☐
Technical experience and skills	☐	☐	☐	☐	☐
Good connectivity	☐	☐	☐	☐	☐
High bandwidth	☐	☐	☐	☐	☐
Adequate telecommunications infrastructure	☐	☐	☐	☐	☐
Reliable power supply	☐	☐	☐	☐	☐
Acceptance to technological change	☐	☐	☐	☐	☐
Remuneration	☐	☐	☐	☐	☐

Thank you kindly for your time and effort in participating in this research, in case of any enquiries contact the researcher as follows:

James M. Wamae

Email: muwamy@yahoo.com

Mobile No. 0722-482394.

Appendix PART4: Questionnaire for ICT Technical Personnel

This part is to be answered by University ICT Technical Personnel.

Section A: personal details

1. Name of the university _____

2. Designation of respondent _____

3. Please indicate your professional qualification in ICT

Certificate ☐   Diploma ☐   Degree ☐   Masters ☐   PHD ☐

Section B(i): University ICT infrastructure and Connectivity

1 Please complete the table below regarding PCs at your institution.

How many PC do you have at your institution?	Number
Total number of PCs	
Total number of networked PCs	
Total number of PCs with internet connection	
Total number of PCs dedicated to students	
Total number of PCs dedicated to lecturers/ researchers	
Total number of PCs dedicated to administration	

2. Does your institution have a scheme(s) to provide teaching/ research staff with personal PCs or laptops

(e.g. loan or lease scheme, negotiated contract with private provider, etc.)?

Yes ☐   No ☐

If yes, please briefly describe the scheme(s): _____

3. Does your institution have a scheme(s) to provide students with personal PCs or laptops?

Yes ☐   No ☐

If yes, please briefly describe the scheme(s): _____

4. How many servers does your institution have in TOTAL? _____

5. Does your university have at least one data server dedicated as education digital content repository?

Yes ☐   No ☐

If yes, please state the average storage space available on the servers_____

6. Does your university have a dedicated server room(s)?

Yes ☐   No ☐

If yes, please complete the table below.

	Yes	No
a. Does the server room(s) have air conditioning?		
b. Does the server room(s) have electrical backup?		
If yes, what type(s) of electrical backup does the server room have? (Please tick all types that apply)		
i. Generator		
ii. UPS		
iii. Solar		
iv. Other, please specify		

Does your institution have a campus internet back One [ ] No [ ]

If yes, please complete the table below regarding the type(s) and the capacity bandwidth of each connection at your institution

Type of Backbone Connection	Capacity/ Bandwidth
Fiber optic	
Copper (10base t or 100base T)	
Wireless	

8. Does your university enterprise network sufficiently connect all campus premises including a offices and buildings?

Strongly agree [ ]   Agree [ ]   Neutral [ ]   Disagree [ ]   Strongly disagr

9. What is the average speed bandwidth of universities internet connection? _____

10. Do all office and teaching/ research buildings at your institution have Local Area

Networks (LANs)?   Yes [ ]   No [ ]

If NO, what percentage of buildings DO have LANs? % _____

11. If some buildings have LANs, what type of LAN connections is used? Please tick all that app

Type of LAN

[ ]   Fiber optic

[ ]   Copper (10base t or 100base T)

[ ]   Wireless

12. Please complete the table below regarding internet connectivity.

In the second column, please tick the type(s) of physical connection to the internet that your insti
Please tick all the types that apply. In the last two columns, please indicate the uplink and downli
of each type of connection that your institutions has.

Type of physical connection		Uplink speed	Downlink speed
Leased Line (fiber)			
Leased Line (wire)			
Leased line (wireless)			
VSAT			
Dial up			
Other, please specify			

13. In the table below, please indicate the MONTHLY bandwidth COST and CAPACITY for each
of physical connection to the internet that your institution has.

Type of physical connection	Monthly bandwidth CAPACITY	Monthly bandwidth CO
Leased Line (fiber)		
Leased Line (wire)		
Leased line (wireless)		
VSAT		
Dial up		
Other, please specify		

14. In the table below, please indicate the ways your institution uses its internet connection.

Ways that your institution uses its internet connection:
General internet browsing
Video conferencing
Voice over internet protocol (VOIP)
Electronic mail (email)
Research
E-learning
If you ticked the e-learning box, please briefly describe how the internet is used for e-learning at your institution:
Other, please specify:

Section B(ii): ICT Management

1. Do you have a dedicated/ centralized ICT unit?   Yes ☐   No ☐

2. Do you have a dedicated/ centralized E-learning unit?   Yes ☐   No ☐

If yes, is the E-learning unit separate from or part of the ICT unit?

Part of the ICT unit ☐   Separate ☐

3. Are there any donors who pay for, or have paid for, any ICT systems and services?

Yes ☐   No ☐

If yes, please name the donor and describe the services paid for.

Name of Donor_____

Services paid for_____

4. Does your institution have any of the following policies/ plans?

Policy/plan	Yes	No
ICT Policy		
E-learning policy		
ICT Strategic Plan		
Acceptable Use Policy (AUP) for all users		
Privacy Policy		
ICT Security Policy		
Bandwidth Management Policy		
Open Source Policy		

6. Bandwidth management monitoring

    a. Do you monitor your internet bandwidth?   Yes ☐   No ☐

    If yes, what tools/ systems do you use to do this? _____

    b. Do you have any bandwidth management solutions in place?   Yes ☐   No ☐

    c. Do you monitor your campus network backbone?   Yes ☐   No ☐

    If yes, what tools/ systems do you use to do this? _____

7. Procurement of ICT equipments

a. Do you have ICT standards for all hardware and software? Yes ☐   No ☐

8. What are the top 5 challenges facing the ICT department at your institution?

    i.

    ii.

    iii.

    iv.

    v.

Section C(i). E-learning Training and support offered

1. Does your institution have any e-learning initiatives underway or planned?

    Yes ☐   No ☐

If yes, please briefly describe the e-learning initiatives that are underway or planned at your institution:

_____

3. Do you have any curriculum for training university lecturers in e-content developments?

    Yes ☐   No ☐

If yes, what does the course entail? _____

4. Does your institution provide teaching staff with professional development courses on how to use E-learning? Yes ☐   No ☐

5. Does your institution provide basic IT training for teaching staff?

Yes ☐   No ☐

6. Does your institution provide basic IT training for ALL students?   Yes ☐   No ☐

7. Does your institution provide basic IT training only for students in SOME departments/ faculties?

    Yes ☐   No ☐

If yes, please indicate which departments/ faculties provide basic IT training for their students:

_____

8. Of the instructors who deliver online distance learning, what is the estimated percentage of instructors who request IT support for those activities?

None ☐   Less than 10% ☐   10 - 24% ☐   25 - 49% ☐   50 – 74% ☐

75 – 99% ☐   100% ☐   don't know ☐   don't offer online distance courses ☐

Section C(ii): Existing online learning and open learning facilities

1. Does your university offer online learning?   Yes ☐   No ☐

2. When was online learning started at your university?

Less than a year ago ☐   1 to 3 years ago ☐   more than 3 years ago ☐

3. How many courses there I at the university are available for online learning?

4. What is the name of E-Learning Content Management System which is implemented by your university (i.e. BlackBoard, Moodle, WebCT, Joomla)?

5. In which category is your e-learning management system?

Proprietary software ☐

Open source software ☐

Others (specify) _____

6. Which, if any, of the following types of Information Management Systems (IMS) does your institution currently have installed?

Type of IMS	Installed		If Yes, Please name the system and version
	Yes	No	
Student management			
Student registration			
Financial			
ERP			
Learning management			
Human resources			
Library			
Other, please specify:			

7. Rate the existing e-learning system in your university in terms of the following design issues (tick appropriately)

	Very high	High	Medium	Low	Very low
Scalability (score high if it accommodate a lot of contents					
Flexibility (score high if it is easy to update)					
Usability(score high if users can easily accomplish tasks e.g. searching contents)					
Reliability (score high if error rate is low)					
Interoperability (score high if support many different tools e.g. authoring)					
Security (score high if the system is secure)					
Accessibility					
Ease of use					

8. Which of the following describes your university's online learning management system (tick all that apply)

☐ Course authors produce the materials for online learning using templates in specific format

☐ Online technical team assists in collecting and preparation of contents for uploading to online system

☐ Course authors can directly access and update their course contents any time using course authoring tools available on learning management system

☐ Online technical team manages the online learning contents

9. In which format is your university online contents (tick all that apply)

Textual ☐   Audio ☐   Video ☐

Others (specify) _____

10. Have you included any site access tracking mechanism to check on how much your online site is visited by students   Yes ☐   No ☐

If yes, please briefly describe the mechanism _____

_____

11. What do you think is the weakness of your online learning infrastructure?

_____

_____

12. To what extent, do you agree that the following are the challenges hindering successful implementation of e-learning at your institution? (1=Strongly disagree 5= Strongly agree)

	1	2	3	4	5
Instructor's attitude	☐	☐	☐	☐	☐
Student's attitude	☐	☐	☐	☐	☐
Technical support	☐	☐	☐	☐	☐
Experts in instructional Design	☐	☐	☐	☐	☐
Top management support	☐	☐	☐	☐	☐
Technical experience and skills	☐	☐	☐	☐	☐
Good connectivity	☐	☐	☐	☐	☐
High bandwidth	☐	☐	☐	☐	☐
Adequate telecommunications infrastructure	☐	☐	☐	☐	☐
Reliable power supply	☐	☐	☐	☐	☐
Acceptance to technological change	☐	☐	☐	☐	☐
Financial support	☐	☐	☐	☐	☐

13. State some of the challenges you anticipate in e-learning if implemented on your university's available infrastructure. _____

_____

14. How do we address some of the challenges that you have stated.

_____

_____

Thank you kindly for your time and effort in participating in this research, in case of any enquiries contact the researcher as follows:

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