ADOPTION OF E-LEARNING TO SUPPORT TEACHING AND LEARNING IN MOI UNIVERSITY

BY

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DECLARATION

Declaration by the Candidate

This research thesis is my original work and has not been presented for a degree in any other University. No part of this thesis may be reproduced without the prior written permission of the author and/or Moi University.

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DEDICATION

This work is dedicated to my dear wife Lucy and my son Ryan whose support, encouragement and understanding culminated in the completion of this work. Also to my grandmother Veronicah Barno and my uncle Johness Keiyo who made my life easy while instilling in me virtues of hard work.

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ABSTRACT

In recent years, there has been significant growth in the use and acceptance of e-learning in Kenyan universities including Moi University. However, adoption of e-learning in Moi University still faces many challenges chief among them being lack of research facts and policies on e-learning which has continued to negatively impact on its effective adoption. Further, they are hindered by learning management systems that are still complex for untrained end-users. The purpose of this study was therefore to investigate and analyze the important components necessary for the adoption of e-learning in Moi University with a view to developing a simpler open source learning management system to support e-learning in Moi University. The specific objectives of the study were to: assess the level of awareness on existence of e-learning in Moi University; find out the measures being undertaken by Moi University towards the adoption of e-learning; assess the level of available ICT and e-learning infrastructure to support the adoption of e-learning; assess the level of e-learning skills of staff and students; investigate the constraints faced by the University towards the adoption of e-learning; recommend possible strategies that the University could use to enhance the adoption of e-learning; and design and develop a simpler open source learning management system to support e-learning in Moi University. The study was guided by the Theory of Transactional Distance, which is a concept describing the universe of teacher-learner relationships that exist when learners and instructors are separated by space and/or by time. The study adopted a descriptive survey research design. Using stratified proportionate sampling, 521 respondents drawn from four Moi University campuses were selected to participate in the study. Data was collected using questionnaires and interviews as research instruments. Quantitative data was presented in form of tables while qualitative data was presented by organizing it into themes and concepts. A simpler open source learning management system was designed and developed that can support e-learning in Moi University. The findings indicated that successful adoption of e-learning was dependent on many components including ICT and e-learning infrastructure; awareness and sensitization on e-learning; operational and appropriate e-learning policies; e-learning skills; learner support; financial investments on e-learning; top university management support; and adoption of a simpler learning management system. The study concluded that though the adoption of e-learning in Moi University is still in its take off and infancy stage, it holds substantial promise and opportunity to expand access to university education both within and outside its borders. The study recommends some effective strategies that Moi University could embrace which include: comprehensive sensitization and training of stakeholders in e-learning; formulation of appropriate and operational e-learning policies; allocation of adequate funds to e-learning; expansion of ICT and e-learning infrastructure; collaborations and partnerships in e-learning; provision of learner support to e-learning students; using blended learning approach and piloting with few schools as a starting point; introduction of compulsory ICT and e-learning courses for students; and adoption of a simpler open source learning management system.

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LIST OF ABBREVIATIONS

AVU	-	African Virtual University
CD-ROM	-	Compact Disks Read Only Memory
DODL	-	Directorate of Open and Distance Learning
E-CONTENT	-	Electronic Content
E-LEARNING	-	Electronic Learning
EU	-	European Union
HOD	-	Head of Department
ICT	-	Information and Communication Technology
IT	-	Information Technology
IUC	-	Institutional University Cooperation
KENET	-	Kenya Education Network
LAN	-	Local Area Network
LMS	-	Learning Management System
MHO	-	Joint-financing Program for Co-operation in Higher Education
MU	-	Moi University
MUK	-	Moi University, Kenya
MUSOMI	-	Moi University System of Managing Instruction
MUWEBCAMPUS	-	Moi University Web Campus
ODL	-	Open and Distance Learning
SCORM	-	Sharable Courseware Object Reference Model
SPSS	-	Statistical Package for the Social Sciences
SSADM	-	Structured Systems Analysis and Design Methodology
UN	-	United Nations
UNESCO	-	United Nations Educational Scientific and Cultural Organizations
VLIR	-	Flemish Inter-university Council
VPN	-	Virtual Private Network
WAN	-	Wide Area Network
WWW	-	World Wide Web

CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter presents the background to the study, statement of the problem, aims of the study, objectives of the study, research questions, assumptions of the study, scope of the study, limitations of the study and significance of the study. This section sets an impetus for understanding the entire thesis.

E-learning refers to learning facilitated and supported through the use of Information and Communications Technology (Jenkins and Hanson, 2003). This broader definition will be used for the purpose of this study. E-learning has been growing in scope and importance during the past few years (Trow, 2000). It is difficult and maybe even impossible to imagine future learning environments that are not supported, in one way or another, by information and communication technologies (ICTs). According to Chambers (in Rosenberg, 2001), "the biggest growth in the Internet, and the area that will prove to be one of the biggest agents of change, will be in e-learning." E-learning has the potential to revolutionise the way we teach and how we learn (DfES, 2003).

While e-learning is not replacing traditional classroom instruction, it allows instructors to enhance and add value to traditional classroom delivery methods. It can be effective particularly where it is used to support and enhance existing teaching methods rather than to replace them. Many successes use a combination of e-learning with conventional face to face delivery. This is currently referred to as 'blended' learning (DfES, 2003).

According to Daniels (1999), E-learning offers convenience for the student (training anytime or anywhere), consistency of delivery and delivery of content on a global basis via the Internet. With the world moving rapidly into digital and information society, the role of e-learning in teaching and learning is becoming more and more crucial and its importance will continue to grow and develop in the 21st Century. E-learning can be synchronous (real-time) or asynchronous (flexible-time).

Countries that have harnessed the potential of information and communications technologies have attained significant social and economic growth. In the developed countries, information technology-led growth is creating jobs, raising productivity, increasing efficiency and effectiveness (Hess and Siciliano, 1996).

Kenyan universities are being compelled by the government to introduce e-learning and blended learning as alternative delivery system (Kenya Vision 2030, 2007). From a survey visit by the researcher to Kenyan public universities including Moi University, there was clear evidence that public universities in Kenya are still at the infancy stage in utilization of the current developments in ICT and adoption of e-learning.

1.1 The Study Area

Moi University is located in Eldoret, 310 Kilometres Northwest of Nairobi, the capital city of Kenya. It was established as the second public university in Kenya by an Act of Parliament, the Moi University Act of 1984. The first cohort of 83 students was admitted in 1984 through a transfer from the Department of Forestry, University of Nairobi. Since then, the University has experienced phenomenal growth from its initial one Faculty in 1984, to a total of fourteen (14) Schools and five (5) Directorates in 2009. By 2009, Moi

University was operating four (4) campuses, namely: Main Campus, Chepkoilel Campus, Town Campus, and Eldoret West Campus; two (2) constituent colleges, namely: Kabianga and Narok university colleges; and nine (9) Satellite Campuses, namely: Nairobi, Kitale, Kericho, Southern Nyanza, Central Kenya, Odera Akang'o, Northern Kenya and Coast satellite campus (Moi University Strategic Plan, 2009). However, in 2010, Chepkoilel campus and Central Kenya satellite campus were accorded the status of constituent colleges of Moi University namely Chepkoilel University College and Karatina University College respectively.

The total student enrollment in 2009 was 19,127 out of which 17,773 were undergraduate (see appendix 4). The number of students is envisaged to increase to 42,000 by 2014/15, taking into account the current annual student growth rate of approximately 16% per year cumulatively in all categories of Government sponsored, Privately sponsored and student population growth at the satellite campuses. The figure could still go higher with the inception of the Open and Distance learning programmes. Between 1984 and 2009, the number of staff at all levels has also increased from 143 in 1984 to 3,662 in 2009 out of whom 934 are academic staff. Implementation of e-learning in Moi University started in 2007 with the establishment of the Directorate of Open and Distance Learning.

1.2 Global Trends of E-Learning

The global overview shows great differences in adoption of e-learning between all regions of the world, although there are also a number of similarities.

United States for instance are using multiple strategies to expand their postsecondary e-learning. According to Thompson et al (2000), United States are investing in upgrading

the skills of educators so that they can employ new e-learning technologies more effectively. They are also promoting access to e-learning through infrastructure investments and financial incentives. Current challenges frequently identified by the United States are the costs of developing content and training instructors, the necessary enlargement of infrastructure capacity, the quality of courses and content, the responsiveness of traditional institutions, and issues of privacy and intellectual property rights. Pantazis (2001) recommends that for the government, the challenge is to create a nurturing policy environment for e-learning by removing barriers that restrict access to e-learning's benefits.

In Australia, according to UNESCO (2002), Australia's open and distance learning dates back to the first decade of the nineteenth century, giving the system long experience from which significant lessons have been drawn by later open and distance learning initiatives (e.g. the UK Open University). Dual mode institutions characterize open and distance learning in Australia, providing similar curriculum for on-campus and off-campus students. This promotes student choice and flexibility combining courses in a variety of modes in accordance with student needs. Australia is an active participant in providing tertiary education online through various different providers across the country. It offers a wide range of courses and programs electronically. Australia's open and distance learning providers are well-equipped with high level technologies. Asynchronous rather than synchronous forms of learning have been adopted in order to promote flexibility for the learner.

In Europe, the demand for e-learning is growing. A report by European Commission (2003) on "Better *e*Learning for Europe" points out that Europe had first to make sure it could rely on a sound infrastructure. The provision of infrastructure and equipment was the first action line of the "*e*Learning Action Plan". As of March 2002, 93% of EU schools were connected to the Internet. Over half of Europe's teachers have been trained in the use of computers and/or the Internet. The European Commission has co-financed the interconnection of the high-speed backbones for universities and research institutes. The report further points out that it is a standard practice in Europe to mix e-learning with conventional face to face teaching in a blended delivery approach. According to Bell (2006), the most significant theme that emerged in Europe was the change from "choosing" to "using" platforms. In the past, there was much debate about which was the best software to choose for the university Virtual Learning Environment (VLE), now most universities have made a decision about which platform to use and concerns have moved on to making the best use of the system. The most commonly used platforms are: WebCT, Moodle, Claroline, Dokeos and Blackboard. Moodle and Claroline has a strong community of users and this inspires a sense of ownership. Funding is provided at the national level and at EU-level for initiatives in research and supporting adoption of e-learning.

In Africa, according to eLearning Africa Post Conference report (2008), e-learning has a very important role to play in education and capacity-building as the continent works towards meeting the millennium development goal of "education for all". However, this requires a substantial investment in building the requisite infrastructure as well as developing the human resource capacity required for development of relevant content as

well as service delivery. The most commonly used e-learning platforms in African universities include Moodle, Chisimba and Claroline.

E-learning has the potential to enable Africa achieve education for all. As Africa faces a severe shortage of trained teachers, e-learning is increasingly gaining universal acceptance as a viable means of enabling large numbers of students to access education. Although blended learning is ideal for beginners, the eventual advantage of e-learning lies in its capacity to serve both on-campus and distance learning students concurrently (Huynh et al., 2003).

1.3 E-Learning Trends in Africa

Most Universities in Africa have taken the initiative of adoption of e-learning in their universities. However, different universities in the region are at different stages of adoption of e-learning.

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. Awidi (2008) recommends that Ghanaian 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. He points out that most Ghanaian lecturers lack formal training in instructional methods. The culture of Ghanaian public universities was identified as a major barrier to adoption of e-learning.

In South Africa, according to South Africa's Council on Higher Education, enrollment in the long-established single mode institutions (University of South Africa and Technikon

SA) dropped by 41,000 students, or 21 percent, from 1995 to 1999 as a result of the growth of new dual mode institutions. These drew 31,000 new distance students, an increase of 111 percent, according to the Council. The six campuses with the largest distance education programmes have about 65,000 students on open and distance learning courses (UNESCO, 2002).

In Botswana, the University of Botswana realized the need and urgency to empower their academic staff with the information, communication and technological skills that contribute to quality education. The Educational Technology Unit (EduTech) in the Centre for Academic Development (CAD) has been mandated to infuse ICTs into teaching and learning. After a slow start in 2002, the University has seen a rapid increase in the development of e-learning courses. The focus of e-learning at the University of Botswana is on a blended approach in which various modes, methods and media – traditional and innovative, are integrated and organised for appropriate learning. Lecturers embarking on e-learning are guided by the e-learning support team offering services in Instructional Design, Online Media Development and Graphic Design. To overcome resistance to technology by academic staff, an extensive amount of support and coaching is required. This is especially crucial during the early stages of venturing into the unknown e-learning environment. To make sure that teaching staff have opportunities to build and develop the necessary pedagogical and technological skills to implement e-learning, the Education Technology Unit (EduTech) at University of Botswana has offered a wide range of training, from novice to advanced skills levels since 2002 (Gachago et al., 2007).

1.4 Status of E-Learning in Kenyan Public Universities

There are seven public universities in Kenya, each one of them having several campuses and/or constituent university colleges distributed in different parts of the country. E-learning initiatives have been introduced in most of these universities though on a limited scale, most of them being at the early stages.

At the University of Nairobi for instance, implementation of e-learning started in 2004 with the support of Flemish Inter-university Council (VLIR) in collaboration with the University of Nairobi. A well tested e-learning platform Wedusoft (a framework of Chisimba) is in use to provide e-learning courses within and off campus. Over 300 lecturers have been trained on e-content development and over 250 online and asynchronous interactive courses have been developed (Omwenga, 2010).

Kenyatta University launched the e-learning mode of teaching in 2005. An open source learning management system Moodle is currently in use. Selected lecturers have been trained on how to write and upload the teaching materials (source: Kenyatta University ICT Centre).

E-learning programmes have also been in operation at Jomo Kenyatta University of Agriculture and Technology (J.K.U.A.T) since the establishment of the School of Learning in 2006. Moodle is currently in use as an e-learning platform (source: J.K.U.A.T ICT Centre).

In Moi University, the implementation of e-learning started way back in 2007 with the establishment of the Directorate of Open and Distance Learning (DODL) to facilitate the integration and implementation of open and distance learning, e-learning and blended

approaches in order to expand access to education. An open source learning management system MUSOMI (customized from Chisimba framework) is in use as an e-learning platform to enable lecturers develop and upload e-content in digital format. Sensitization of the university management on e-learning has been done while training of academic staff on developing and uploading e-content is on-going (source: Directorate of DODL).

1.5 ICT and E-Learning Policies in Kenya

The presence of coherent ICT and e-learning policies in education invariably promotes coordination, harmonization and full utilization of e-learning. The Kenya National ICT Policy (2006) has several sections, including information technology, broadcasting, telecommunications, and postal services. However, it is the section on information technology that sets out the objectives and strategies pertaining to ICT and education. This section identifies e-learning as a priority area.

The related strategies, under the heading “E-Learning” are to:

- Promote the development of e-learning resources.
- Facilitate public-private partnerships to mobilise resources in order to support e-learning initiatives.
- Promote the development of an integrated e-learning curriculum to support ICT in education.
- Promote distance education and virtual institutions, particularly in higher education and training.
- Promote the establishment of a national ICT centre of excellence.
- Provide affordable infrastructure to facilitate dissemination of knowledge and skill through e-learning platforms.

- Facilitate sharing of e-learning resources between institutions.
- Exploit e-learning opportunities to offer Kenyan education programmes for export.
- Integrate e-learning resources with other existing resources.

However, it points out that the lack of a policy framework on e-learning has hampered its development and utilization.

The Ministry of Information Strategic Plan (2006) points out that there is poor and inadequate infrastructure as well as low adoption of technological changes.

Among the strategies of the Kenya Vision 2030 is introducing e-learning and blended learning as an alternative delivery system. This will improve both access and quality of education (Kenya Vision 2030, 2007).

1.6 ICT and E-Learning Policies in Moi University

Moi University developed an ICT policy Plan and an ICT Master Plan in 2003 with the assistance from Delft University of Technology (the Netherlands) under the MHO project. The ICT policy is currently being revised to incorporate the changing and emerging ICT and e-learning technologies. It is currently awaiting Moi University Council approval. The Moi University draft ICT policy (2010) identifies two goals and strategies that relate to the integration of ICTs into the teaching and learning processes;

- To improve the quality of graduates, by utilizing modern instructional materials and methods, including increased use of ICT in teaching and research.
- To provide greater access to university education, by developing capacity for increased enrollment through non-conventional approaches in teaching and learning i.e distance education and virtual university.

On the other hand, the Moi University draft ODL policy was recently approved by University Senate and currently awaiting Moi University Council approval. The policy is expected to guide the University in the utilization of alternative and flexible approaches to education provision through distance, open and electronic learning (Moi University draft ODL Policy, 2009).

1.7 ICT and E-Learning Infrastructure in Moi University

The Directorate of Information and Communication Technology (ICT) was established in 1998 within the office of the Vice Chancellor of Moi University whereas the Directorate of Open and Distance Learning (DODL) was established in 2007 within the office of the Deputy Vice Chancellor (Planning and Development) as a facilitator of ODL and e-learning programmes. Each of the Directorates is headed by a Director who oversees the ICT and ODL activities respectively in all the University campuses. E-Learning in Moi University is spearheaded by the Directorate of Open and Distance Learning (Source: Moi University Directorates of ICT and ODL).

Moi University, through the Directorates of ICT and ODL with support from development partners MHO Project (1998 - 2004) and MUK-VLIR-UOS programme (2006 -2017) has set up the necessary ICT infrastructure in its main campus and other campuses that will operationalize e-learning. These include a fibre optic backbone network interconnecting all major buildings, schools and departments in the Main campus, Chepkoilel campus and Town campuses (School of Medicine, School of Dentistry, School of Public Health and School of Law). Servers for Internet, e-mail, intranet, e-learning, MIS and bandwidth management have been installed in the main campus server room. LANs have also been installed in various schools and departments

in the University to facilitate accessibility to Moi University network, internet and the e-learning portal. At least one student computer lab has been established in every school and all deans, heads of departments and computer labs have been connected to the University intranet and internet to facilitate accessibility to the e-learning platform. ICT and e-learning training labs have also been established for training staff in ICT modules and e-learning skills. All the libraries including the Margaret Thatcher Library in Main campus, Chepkoilel campus library, Town campus Learning Resource Center and Moi University Annex campus library are connected to the internet and are equipped with top of the range computers (Source: Directorates of ICT and ODL).

The last few years have seen the number of computers and related ICT equipment at the University increase exponentially as shown in Table 1.1. By 2009, the University had 2,953 computers out of which 2,587 were connected to the Internet (see Table 1.1). Although these computers have enabled students and staff to access the e-learning portal and other ICT services, they are still inadequate.

Table 1.1: Growth of Computers and Internet Data Points in MU in the last 7 years

Year	**No. of Computers**	**No. of Internet Data Points**
2003	384	103
2004	531	139
2005	789	217
2006	1099	361
2007	1642	850
2008	2279	1340
2009	2953	2587

Source: Directorate of ICT, Moi University

All the major campuses have Internet connectivity. The University in partnership with KENET has increased the total cumulative internet bandwidth from 4Mbps in 2008 to 42Mbps in 2010. Main campus has a 23Mbps internet bandwidth through a wireless radio. Town campus has a fibre link of 13Mbps internet bandwidth. Chepkoilel campus and Moi University Annex campus (School of Law) each has a connectivity of 3Mbps internet bandwidth. All Moi University campuses have been interconnected via Virtual Private Networks (VPN) (Source: Moi University Directorate of ICT).

To enhance the process of teaching and learning, an e-learning management platform MUSOMI has been installed in Main campus ICT server room and can be accessed both through the Intranet and Internet. However, the usage of the platform is still low. In addition, the University is an active member of Kenya Education Network (KENET) whose mission is to establish a high-speed, reliable, and sustainable network for the interconnectivity of all learning institutions in Kenya. The objectives of KENET include: to establish an Internet infrastructure for educational institutions; to provide affordable tariffs; to develop human resources in information content development, and to develop and improve local content. KENET members benefit by receiving substantially lower connectivity costs, as well as having access to technical support and staff training. The University has also been consistently upgrading the internet bandwidth to support e-learning (Source: Moi University Directorates of ICT and ODL).

1.8 Partnerships in ICT and E-Learning Development in Moi University

In the year 2006, Moi University was selected as a partner institution under the MUK-VLIR-UOS programme, a partnership between Moi University, Kenya and the

collaborating Flemish Universities of Belgium under the IUC programme in a 10 year collaboration programme through the Flemish Inter-university Council (VLIR). One of the projects in this collaboration is “Creating an Enabling Environment at Moi University for Communication and Research (ICT project)”. The main aim of this project is achieving increased research output through expansion of the ICT network; library automation; development of e-learning; and training of staff and end-users. The specific objectives of the ICT project are: increase research output; increase impact of ICT in academic programmes; improve management of ICT services; and strengthen teaching and research capacity in computer related courses.

Among the expected outputs of this project include: introduction of e-learning programmes; expanded network; enhanced maintenance of ICT infrastructure; improved utilization of ICT applications; improved e-library resources; and improved human resource capacity in ICT related academic fields (Source: Moi University Directorate of ICT).

1.9 Statement of the Problem

The challenges posed by the rising university students enrollment and the increasing demand for higher education necessitates a new approach to teaching and learning in Kenyan public universities. In most of the Kenyan public universities including Moi University, the mode of delivery of educational content is still conventional classroom teaching. Moi University therefore needs to come up with other alternative and innovative approaches to teaching and learning that will address the problem of rising student enrollment and increasing demand for university education.

E-learning as an approach that improves competitiveness has resulted from challenges to cope with increasing teaching loads and dwindling resources. This is supported by Moi University Strategic Plan (2009) which points out that the exchequer funding significantly continues to decline thus impacting on the provision of quality services. It further observes that there is still inadequate academic staff in some of the programmes in the University. Adoption of e-learning therefore will address the challenges of dwindling resources and shortage of teaching staff.

The Moi University draft ODL Policy (2009) points out that the intake from both public and private universities still leaves out annually over 30,000 qualified Kenyans who seek university admission. In addition, there is increasing demand from individuals in employment who want to obtain higher qualifications yet they cannot easily get access to the programmes of their choice. Concrete interventions which include adoption of e-learning are therefore necessary to mitigate the challenges of accessibility to higher education in Kenyan universities.

The adoption of e-learning in Moi University is still faced with many barriers chief among them is lack of technical e-learning skills by most of the users to use the existing learning management system (MUSOMI). This has slowed down the expected benefits that would have arisen from the adoption of e-learning in the instructional process. A preliminary survey carried out by the researcher indicated that Moi University has made significant attempts to adopt e-learning as an alternative approach to teaching and learning but little progress has been recorded so far in its adoption. In the light of these barriers and challenges, there is need to carry out a research to establish among other things, how a simpler learning management system may be designed to support teaching and learning in Moi University.

1.10 Aim of the Study

The aim of the study was to investigate and analyze the important components necessary for the adoption of e-learning in Moi University with a view to developing a simpler open source learning management system to support e-learning in Moi University.

1.11 Objectives of the Study

The specific objectives of the study were:

1. To assess the level of awareness on existence of e-learning in Moi University.
2. To find out the measures being undertaken by Moi University towards the adoption of e-learning.
3. To assess the level of available ICT and e-learning infrastructure to support the adoption of e-learning in Moi University.
4. To assess the level of e-learning skills of Moi University staff and students.
5. To investigate the constraints faced by the University towards the adoption of e-learning.
6. To recommend possible strategies that the University could use to enhance the adoption of e-learning.
7. To design and develop a simpler open source learning management system to support e-learning in Moi University.

1.12 Research Questions

1. Are the staff and students aware of the existence of e-learning in Moi University?
2. What measures are being undertaken by Moi University towards the adoption of e-learning?
3. Does the available ICT and e-learning infrastructure adequate to support the adoption of e-learning in Moi University?

4. Does Moi University staff and students posses the relevant e-learning skills?
5. What constraints does the University face in its bid to adopt e-learning?
6. What strategies would be most appropriate for the University to enhance the adoption of e-learning?
7. Does the University need a simpler open source learning management system to support teaching and learning?

1.13 Assumptions of the Study

This study assumes the following facts:

(i) That Moi University is in the process of embracing e-learning as an alternative approach to teaching and learning.

(ii) That the respondents are aware of the currently existing learning management system in Moi University.

1.14 Scope of the Study

The scope of the study was limited geographically to four major campuses of Moi University namely Main campus, Chepkoilel campus, Town campus and Moi University Annex campus (School of Law). These campuses are home to the 14 Schools of Moi University and it is in these campuses where majority of the permanent staff are located.

The content of this study was limited to investigating and analyzing the important components necessary for the adoption of e-learning and developing a simpler open source learning management system to support e-learning in Moi University.

1.15 Limitations of the Study

E-learning is a rather new concept in Kenya. Literature related to this topic on the Kenyan situation is therefore still scanty since not much has been written about it. A thorough literature review necessary in any scientific research was difficult to achieve. Despite the limitation, a lot of literature was obtained from the Internet and the researcher ensured that much of the existing related literature was reviewed.

Secondly, some respondents had only a scanty understanding of the area under study hence faced some difficulties in responding to the questionnaire and interview questions. However, the researcher was able to explain and clarify some technical questions to the respondents where necessary before administering the questionnaire and interview schedule.

1.16 Significance of the Study

This study is both theoretical and practical, hence it is significant in several ways.

The findings of this study will unearth the strengths and weaknesses of Moi University as far as adoption of e-learning is concerned. The findings will therefore aid the University towards coming up with effective strategies for its adoption. It will provide an insight into the important components necessary for the adoption of e-learning in the University.

Secondly, the findings and recommendations of this study will most probably serve as a reference material and a basis for further research for researchers interested in the topic. Data availability on e-learning on the Kenyan situation is still scanty since e-learning is still a rather new concept in Kenya. The findings of this study will therefore add onto the pool of knowledge on adoption of e-learning in Moi University and widen the frontiers of knowledge in other Kenyan Universities.

Thirdly, it will assist education policy makers gain an insight into the challenges and best practices that can contribute to successful adoption and management of e-learning and its policy formulation. This will enable them base their strategies, policies, decisions and actions on concrete knowledge of issues on e-learning supported by research findings.

Lastly, its practical value is that it will result in the design and development of a simpler open source learning management system that can support e-learning in Moi University and other educational institutions.

1.17 Definition of Operational Terms

Adoption: A decision to make full use of an innovation as the best course of action (Rogers, 2003).

Blended Learning: The combination of conventional classroom teaching and e-learning practices (Jack and Curt, 2001).

Claroline: Open source learning management system framework.

Dean: Head of a School/Faculty in a University.

Distance Education (DE): The delivery of learning or training to learners who are separated, mostly by time and space, from those who are teaching or training, therefore requiring some kind of technology or media to bridge the gap (Moi University draft ODL Policy, 2009).

E-Learning: Refers to learning facilitated and supported through the use of information and communications technology (Jenkins and Hanson, 2003).

Information and Communication Technology (ICT): All the hardware, software, communication facilities and procedures used to process, store and transfer data in the scope of automated data processing and information management (Looijen, 1998).

Learner Support: All forms of assistance that is provided to learners to support their learning (Naidu, 2006).

Learning Management System (LMS): Is a software application or a Web-based system that provides an instructor with tools to create and deliver online content, monitor student participation and assess student performance.

Lifelong Learning: It relates to people learning consistently throughout their lifespan covering all life from and which may start at any age (Smith and Spurling, 1999).

Millennium Development Goals (MDGs): Refers to time-bound targets formulated by the UN Assembly for all signatory nations. These targets are to be met by all member-nations by the year 2015.

MUK-VLIR-UOS programme: A partnership between Moi University, Kenya and the collaborating Flemish Universities of Belgium under the IUC programme.

MUSOMI: A Moi University open source learning management system customized from Chisimba open source LMS framework.

MUWEBCAMPUS: A Moi University simpler open source learning management system designed and customized by the researcher from Claroline open source LMS framework.

Open and Distance Learning (ODL): It is a form of education designed to facilitate learning where the teacher and learner are physically separate and therefore requires some form of mediation (Agalo, 2002).

Pedagogy: Science of teaching (Naidu, 2006).

School: A unit of the University that teaches a particular discipline/subject.

1.18 Chapters Summary

This chapter gave a general introduction to the study, statement of the problem, objectives of the study, scope of the study, limitations and significance of the study. Chapter two will cover literature review related to the study; chapter three will cover research methodology and systems methodology; chapter four will cover data presentation, analysis and interpretation; chapter five will cover systems analysis, design and development; and finally chapter six will cover summary of major findings, conclusions, recommendations, dissemination and publication of research findings and suggestions for further research.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter reviews existing literature and theories relevant to the study area. According to Fraenkel and Wallen (2003), a literature review helps researchers learn what others have written about a topic. It also lets researchers see what have been the results of other related studies. It involves examining documents such as books, magazines, journals and dissertations that have a bearing on the study being conducted (Kombo and Tromp, 2006). The aim of this chapter therefore is to gain considerable insight of earlier literature related to the study and to understand the theories that underlie this study. The concepts discussed in this chapter include the conceptual framework, theoretical framework and other literature related to adoption of e-learning. The literature review addresses the issues contained in the research problem and objectives of the study.

2.1 The Conceptual Framework of E-Learning Process

E-learning is conceptualised in a number of ways. Adoption of new teaching and learning technologies supported by ICT has the potential to fundamentally alter the teaching and learning transaction, and it is particularly important that our ideals are clear. Ariwa and Rui (2005) points out that e-learning has become the protagonist for change in education sector. The researcher conceptualizes in this study that the strategies used by Moi University in adopting e-learning can only succeed if they were geared towards attempts to harness the approach to teaching and learning. The main components necessary for the successful adoption of e-learning can be looked at broadly as technological, organizational and pedagogical components. These components are summarized in Figure 2.1.

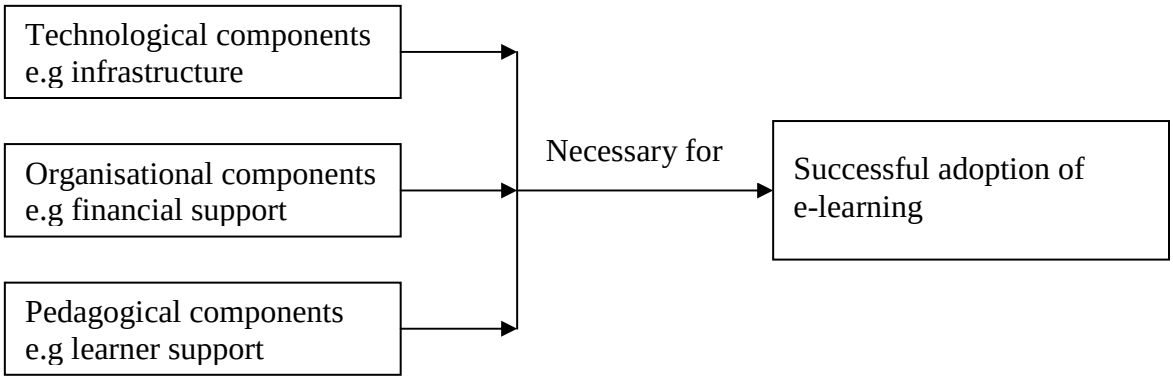


Figure 2.1: Broad categories of the important components of e-learning

2.2 Theoretical Framework

A theory is a system of explaining phenomena which states constructs and the laws that interrelate the constructs to one another (Mugenda and Mugenda, 1999). Many theories of e-learning by different authors exist. Three such theories are discussed in this section.

2.2.1 Laurillard's Conversational Framework (2002)

Laurillard's conversational framework (Laurillard, 2002) has been very useful in the development of UK e-learning, at least among educational developers in higher education. Laurillard analyses academic learning as learning mediated through conversations between learners and teachers, rather than situated in direct experience.

Laurillard's prescription is constructivist, but places more emphasis on the *interaction* between teacher and individual student, and stresses the need for meaningful intrinsic feedback to be a central feature of e-learning. This sets out the requirements for academic learning, and Laurillard considers how far current learning technology can help to meet these by subjecting each 'media form' to an analysis in terms of the conversational framework (Laurillard, 2002). The following table (Table 2.1) summarises this analysis.

Table 2.1: Mapping of learning experience onto method, technology and media form (Laurillard, 2002).

Learning experience	**Methods/Technologies**	**Media forms**
Attending, apprehending	Print, TV, video, DVD	Narrative
Investigating exploring	Library, CD, DVD, Web	Interactive
Discussing, debating	Seminar, online conference	Communicative
Experimenting, practising	Lab, field trip, simulation	Adaptive
Articulating, expressing	Essay, product, animation, model	Productive

2.2.2 Mayes and Fowler's framework (2005)

Mayes and Fowler's framework (Mayes and Freitas, 2005) maps the stages of learning onto categories of e-learning. The learning cycle is described in three stages:

Conceptualisation - refers to the users' initial contact with other peoples' concepts. This involves an interaction between the learner's pre-existing framework of understanding and a new exposition.

Construction - refers to the process of building and combining concepts through their use in the performance of meaningful tasks. Traditionally these have been tasks like laboratory work, writing, preparing presentations etc. The results of such a process are products like essays, notes, handouts, laboratory reports and so on.

Application - the testing and tuning of conceptualisations through use in applied contexts. In education the goal is testing of understanding, often of abstract concepts. This stage is best characterised in education, then, as dialogue. The conceptualisations are tested and further developed during conversation with both tutors and fellow learners, and in the reflection on these. The following figure (Figure 2.2) illustrates the Mayes and Fowler framework mapping.

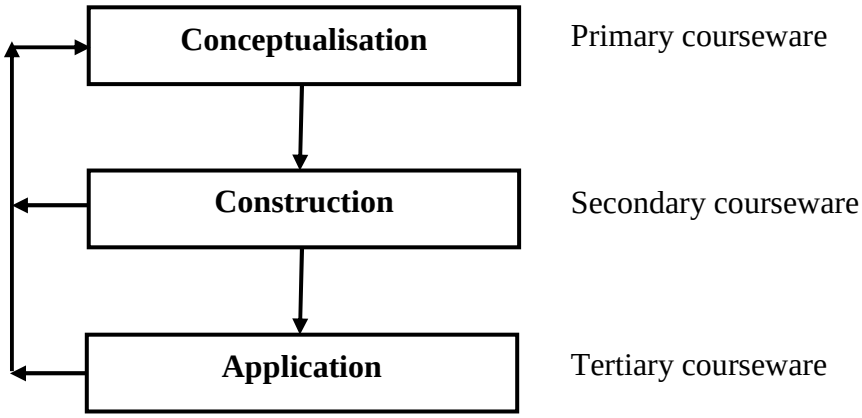


Figure 2.2: Mayes and Fowler framework mapping (Mayes and Freitas, 2005).

Primary Courseware is courseware intended mainly to present subject matter. It would typically be authored by subject matter experts but is usually designed and programmed by courseware specialists.

Secondary Courseware describes the environment and set of tools by which the learner performs learning tasks, and the tasks (and task materials) themselves. Here, the products are volatile and of varied quality.

Tertiary Courseware is material which has been produced by previous learners, in the course of discussing or assessing their learning tasks. It may consist of dialogues between learners and tutors, or peer discussions, or outputs from assessment (Mayes and Freitas, 2005).

2.2.3 Moore's Theory of transactional distance (1993)

This study is based on Moore's Theory of transactional distance (Moore, 1993). Moore Theory of transactional distance was found suitable for this study since it focuses on distance education as well as teacher-learner relationships that exist when learners and instructors are separated by space and/or by time. According to the Moore Theory of

transactional distance, distance education is not simply a geographic separation of learners and teachers, but more importantly, is a pedagogical concept. It is a concept describing the universe of teacher-learner relationships that exist when learners and instructors are separated by space and/or by time. The transaction that we call distance education occurs between teachers and learners in an environment having the special characteristic of separation of teachers from learners. This separation leads to special patterns of learner and teacher behaviours. It is the separation of learners and teachers that profoundly affects both teaching and learning. This universe of relationships can be ordered into a typology that is shaped around the most elementary constructs of the field - namely, the structure of instructional programmes, the interaction between learners and teachers, and the nature and degree of self-directedness of the learner. According to Moore, the extent of transactional distance in an educational programme is a function of three sets of variables. These are not technological or communications variables, but variables in teaching and in learning and in the interaction of teaching and learning. These clusters of variables are dialogue, structure, and learner autonomy.

Instructional dialogue - Dialogue is developed by teachers and learners in the course of the interactions that occur when one gives instruction and the others respond. It is communication between teacher and learner.

Programme structure - Programmes are structured in different ways to take into account the need to produce, copy, deliver, and control these mediated messages. Structure expresses the rigidity or flexibility of the programme's educational objectives, teaching strategies, and evaluation methods. It describes the extent to which an education

programme can accommodate or be responsive to each learner's individual needs. It describes course elements, such as activities, learning outcomes and content.

The autonomy of the learner - Learner autonomy is the extent to which in the teaching/learning relationship, it is the learner rather than the teacher who determines the goals, the learning experiences, and the evaluation decisions of the learning programme.

Rumble (1986) points out that in any educational programme, even in face-to-face education, there is some transactional distance. Seen in this way, distance education is a subset of the universe of education, and distance educators can draw on, and contribute to, the theory and practice of conventional education. Nevertheless, in what we normally refer to as e-learning, the separation of teacher and learner is sufficiently significant that the special teaching-learning strategies and techniques they use can be identified as distinguishing characteristics of this family of educational practice.

2.2.3.1 Application of Moore Theory of Transactional Distance in E-Learning

E-learning is a sub-component of Distance Learning, hence fits well into this theory. The theory of transactional distance has assisted the educationists and learners meet their educational goals irrespective of the geographical distance and time.

However, in adopting the Moore Theory of transactional distance for this study, the researcher is not ignorant of its shortcomings. According to Mayes and Freitas (2005), a theoretical framework of e-learning has been hard to come by. There are really no models of e-learning *per se* – only e-enhancements of models of learning. Mayes and Freitas caution that it is all the more important, when implementing e-learning approaches, to be clear about the underlying assumptions. A model of e-learning would need to

demonstrate on what pedagogic principles the added value of the ‘e’ was operating. Where, for example, the ‘e’ allows remote learners to interact with each other and with the representations of the subject matter in a form that could simply not be achieved for those learners without the technology, then we have a genuine example of added value. However, the role of the technology here is primarily to get remote learners into a position to learn as favourably as though they were campus-based, rather than offering a new teaching method.

2.3 Concept of E-Learning

The term e-learning reflects both the fact that all or most of the teaching is conducted by someone removed in time and space from the learner. The main emphasis of e-learning is the management and delivery of quality teaching material electronically without the limitation of the learner access location and time. Henry (2001) explains that the total e-learning solution comprises the integration of three elements: content, technology and services. His concept is also underpinned by the assumption that learners will be responsible for the cognitive tasks that will lead to learning. A leading researcher Laurillard (2001) cautions that the way in which teaching is approached should be considered more important than the technology medium. This point is supported by Butson (2003) who stresses that technology is limited in helping learners to understand how to think.

There are compelling arguments for e-learning. E-learning, when done well, can be as good or better than being in the classroom. It offers students a rich, compelling, and motivating experience (Neal, 2001). According to Roffe (2002), e-learning not only

enhances access, but improves engagement, enhances learning, extends experiences in exploring, and empowers the learners to take responsibility for scheduling and managing the learning journey. His claims assume that the learner already has the skills and attributes to use the technology and adequately contextualize, integrate and apply the content to create new knowledge and understanding, and be transformed by the experience.

The turn towards computer-based teaching and learning over the past 20 years is assumed to have revolutionized and revitalized the university sector. Thus, stark ultimatums continue to be made by education technologists that universities must either ‘transform or die’ in the face of technological progress (Bates, 2004). The last decade has seen a significant expansion in e-learning technologies for enhanced access to education and training. Many organisations recognise the benefits of e-learning because it provides just-in-time, contemporary learning and can be accessed from any site using the right technology (Roffe, 2002). It is seen as a cost effective approach to facilitating learning to large groups using information and communication technology. Many e-learning programs are interactive and can be updated rapidly. These and similar benefits were acknowledged in Young’s (2002) research on the first major benchmarking study of e-learning organisations in the United Kingdom.

The rapid growth in e-learning, experienced particularly during the 1990s, has overcome many of the barriers to Higher Education, providing traditional universities with an opportunity to meet the changing worldwide demand for education (National Committee of Enquiry into Higher Education, 2001).

2.4 History of E-Learning

The development of the e-learning revolution arose from a number of other 'educational revolutions'. Four such revolutions cited by Billings and Moursund (1988) are:

- the invention of reading and writing
- the emergence of the profession of teacher/scholar
- the development of moveable type (print technology)
- the development of electronic technology

When discussing the 'beginnings' of e-learning, it is important to note that valid tools of e-learning include now somewhat overlooked technologies such as calculators, VCRs, radio and bulletin board systems (or BBS). All of these developments have contributed to ideas concerning the uses of the e-learning systems (Billings and Moursund, 1988).

According to Billings and Moursund (1988), Computer Assisted Learning projects first began in the late 1950's and yielded research that suggested computers were a valuable addition to education. According to Oblinger and Oblinger (2005), the 1960s and 70s saw growing enthusiasm in the use of computers in education. Technological advancement has been the major inspiration for change, beginning with the integration of radio broadcasting in the 1980's. Today, e-learning includes the use of the Internet, intranets/extranets, satellite broadcast, interactive TV etc to deliver content. The growth of e-learning is directly related to the increasing access to information and communications technology, as well as its decreasing cost (Naidu, 2003).

2.5 E-Learning as a New Paradigm Shift in Education

In conventional classroom-based educational settings, teachers spend a great deal of their teaching time in subject matter content presentation. This activity usually takes the form of lectures where teachers go through a body of subject matter content. Students on the

other hand, spend a great deal of their study time in lectures taking down lecture notes (Naidu, 2003).Adoption of e-learning should be viewed as part of educational reform. The new e-learning technologies, certainly offer us the rich promise and potential of formal/informal learning delivery at anytime, anywhere and on any topic; It may promise relevant learning effectiveness, more learner-centered approaches, just-in-time learning, higher degrees of inter-activity and a different, perhaps better, range of teacher-learner, learner-learner interactions (Daniels, 1999). Today, most university students work part-time; many part-time students work full time, commute and often have families to support. Students have found that going to college in the traditional way is difficult. They need innovative ways to help them study and work more efficiently in this competitive world. To meet student needs, many universities offer online courses on the web with related technologies and applications software; studies indicate that online learning can be effective (Shea and Boser, 2001). According to Goddard (1998), the demand for higher education is expanding exponentially throughout the world and by 2025 as many as 150 million people will be seeking Higher Education.

2.6 Dimensions of E-Learning

The extent of e-learning technology used in course delivery varies widely. E-learning can be synchronous (real-time) or asynchronous (flex-time). Synchronous e-learning includes technology such as video conferencing and electronic white boards (Romiszowski, 2004), requiring students to be present at the time of content delivery. Asynchronous applications include programmed instruction and tutorials that allow students to work through the screens at their own pace and at their own time. Most of the courses available on the Internet are based on this asynchronous model (Greenagel, 2002). Students can be involved in e-learning from distributed locations, as in distance learning, or from the

same place, such as using a group support system in a classroom to work on an assignment (Gunasekaran et al., 2002).

The mode of course delivery can be entirely electronic (with or without an instructor) or take a more blended approach integrating electronic and classroom delivery to varying extents. Many current e-learning offerings follow the latter mode, taking advantage of the benefits of various types of delivery (Jack and Curt, 2001). Table 2.2 shows the different dimensions and attributes of e-learning.

Table 2.2: The Dimensions of E-Learning

Dimension	Attribute*	Meaning	Example
Synchronicity	Asynchronous	content delivery occurs at a different time than receipt by the student	lecture module delivered via email
	Synchronous	content delivery occurs at the same time as receipt by the student	lecture delivery via web cast
Location	Same place	students use an application at the same physical location as other students and/or the instructor	using a GSS to solve a problem in a classroom
	Distributed	Students use an application at various physical locations, separate from other students and the instructor	using a GSS to solve a problem from distributed locations
Independence	Individual	students work independently from one another to complete learning tasks	students complete e-learning modules autonomously
	Collaborative	students work collaboratively with one another to complete learning tasks	students participate in discussion forums to share ideas
Mode	Electronically Only	all content is delivered via technology, there is no face-to-face component	an electronically enabled distance learning course
	Blended	e-learning is used to supplement traditional classroom learning	in class lectures are enhanced with hands-on computer exercises

* The definitions of these attributes are discussed in a variety of sources including (Ong et al., 2004), (Jack and Curt, 2001), and (Greenagel, 2002).

From table 2.2, it should be noted that a single course component will consist of a single attribute value from each dimension, yet a course may contain several components, each with different attribute values. For example, some components of a course may be delivered synchronously and others asynchronously, or a course may involve some online components and some in-class components.

2.7 Electronic Content (e-content)

According to UNESCO (2005), electronic content (e-content) is content that is stored in electronic form. It is content that is generated using computers and stored using electronic media devices such as CD-ROMS, Computer Disks, DVDs and other forms of media that are emerging from time to time. There are large variations of storage and even production technologies and the choice of one form of media over another is dependent on the intended use of the information stored, the place where the information will be used, the purpose and the amount of information as well as the cost of production. Different media types may require specific types of players. For instance information stored on a DVD will require a DVD player. This player will be an electronic gadget that will come attached to a computer or other electronic devices such as TV set or can be a standalone piece of equipment requiring an appropriate software driver.

As the content is used for instructional purposes, great care and professional competence must be observed during its design and development. Any person who teaches students needs to be trained on how to create content. It is not a question of converting old teaching notes into printed format but it is rather a piece of work that requires commitment, training and talent. One must determine who the target audience is and where the audience is and what other instructional aids this learner has access to during the learning process (UNESCO, 2005).

2.8 E-Learning Stakeholders

In an organizational context, a stakeholder is a constituency of an organization (Thompson and Strickland, 2001). In the same sense, the stakeholders of e-learning are those that are affected by it. The main e-learning stakeholders include students, instructors, educational institutions, content providers and technology providers. Each of these stakeholder groups is described in the following sections.

2.8.1 Students

Students are the consumers of e-learning. In the context of higher education, they are undergraduate or graduate students enrolled at a university or college. In courses that are entirely electronic, students are much more independent than in the traditional setting. This requires that they be highly motivated and committed to learning (Huynh et al., 2003), with less social interaction with peers or an instructor. Students in online courses tend to do as well as those in classrooms, but there is higher incidence of withdrawal or incomplete grades (Zhang et al., 2006). E-learning requires technical sophistication from instructors as well as students (Jones, 2003). This becomes less of an issue over time as computer literacy increases.

2.8.2 Instructors

In e-learning, as in traditional classroom learning, instructors guide the educational experiences of students. Depending on the mode of e-learning delivery, instructors may or may not have face-to-face interaction with their students. Instructors may be motivated to use e-learning in their courses for a variety of reasons. For example, they may be encouraged or pressured by their institutions; they may wish to reach a broader audience

of students; or they may have an interest in the benefits of technology-mediated learning. Course administration may require instructors to learn new software applications. E-learning technologies bring as much change to instructors as they do to students, again requiring a new set of skills for success (Jones, 2003). In the e-learning environment, instructors shift from being the primary source of students' knowledge to being the manager of the students' knowledge resources (Romiszowski, 2004). For example, in a traditional classroom scenario, the instructor delivers the content to the class and responds to their questions. In contrast, in a technology only asynchronous e-learning environment, the instructor is more of a coordinator of the content, which students then peruse at their own pace (Teo and Gay, 2006). Thus, the skills that are most important for an instructor to possess may depend on the e-learning attributes of their course. Instructors may also be concerned with the acceptance of e-learning tools among their students. In order to increase perceived usefulness and enjoyment, instructors should vary the types of content, create fun, provide immediate feedback, and encourage interaction to increase acceptance (Lee et al., 2005).

2.8.3 Educational Institutions

Educational institutions, in the context of higher education, include colleges and universities. In addition to the traditional list of postsecondary institutions, the rise in popularity of e-learning has led to the creation of new, online only educational institutions. Educational institutions integrate technology into classrooms to facilitate lecture delivery and create new technology mediated learning opportunities for students. They provide distance learning, including e-learning, to create access to a larger pool of students. As e-learning becomes more widely accepted and more courses are offered

online, geographic boundaries between institutions and students are removed (Young, 2001).

Often, budgetary restriction is a primary concern for institutions (Huynh et al., 2003). Tight budgets make it difficult to implement broad, campus-wide e-learning solutions. Depending on the technological infrastructure in place at an institution, the implementation of e-learning courses can involve very costly technology upgrades (Weller, 2004). E-learning systems require several components including sufficient bandwidth, course management systems, technology equipped classrooms, and adequate computer facilities for student use (Arabasz and Baker, 2003). This increase in technology generally requires a corresponding increase in support staff as well (Young, 2001).

Resistance from faculty is another important concern for institutions. Many faculty members firmly believe that e-learning is inferior to face-to-face instruction (Huynh et al., 2003). Studies have shown, however, that there is no significant difference between the performance of students in the two methods (Huynh et al., 2003).

2.8.4 Content Providers

In the higher education context, online course content may be created by instructors or acquired from external sources. The growth in e-learning has created a market for commercialized educational content creators, particularly for more introductory courses that are offered consistently at multiple institutions. Whether the content provider is the instructor or an external source, their motivation is to provide content modules that will result in effective learning. Commercial content providers are motivated by profit to

develop content modules that are flexible enough to be readily utilized across institutions with minimal adaptation efforts (Huynh et al., 2003).

The main concern for content providers in e-learning tends to be intellectual property rights. Independent content providers in particular, need to ensure their retention of copy rights in order to sell their product to multiple customers (Huynh et al., 2003).

Technology standards are another relevant concern for this stakeholder group (Teo and Gay, 2006). Content should be created in a format that will allow its utilization across various e-learning technology platforms. Failure to do so would restrict their potential target market. It is equally important to make certain that the content provided is consistent with the learning methodologies in use at various institutions and thus being more likely to result in successful learning (Greenagel, 2002). Learning can be impacted by the type of content, the learning environment, and even the characteristics of each learner (Zhang et al., 2006). E-learning content providers need to take this into consideration when developing content.

2.8.5 Technology Providers

Technology providers develop the technology that enables e-learning delivery. This category consists of a broad range of services, from the facilitation of individual distance learning courses, to complete Learning Management Systems (LMS) provided by companies such as Blackboard. Similar to content providers, technology providers are motivated to provide learning environments that will result in effective learning for students (Young, 2001; Friesen, 2005).

Technology standards are an important consideration for this stakeholder group as well. Since educational institutions often have different solutions implemented by various departments, adherence to common standards facilitates interoperability (Young, 2001; Friesen, 2005). Constant evolution in hardware and consumer expectations creates pressure for technology providers to rush to market with new product offerings (Huynh et al., 2003).

Many industry experts attribute the shortcomings of e-learning to technological issues (Woodill, 2004). Similar to content providers, technology providers should make provisions for personalizing the learning experience based on the context of learning and the characteristics of the student.

2.9 Benefits of E-Learning and ODL

E-learning is a subset of Open and Distance Learning (ODL). To the learner, open and distance learning means more freedom of access, and thereby a wider range of opportunities for learning. The barriers that may be overcome by distance learning include not only geographical distance and time, but also other confining circumstances, such as personal constraints, cultural and social barriers and lack of educational infrastructure. Since many people cannot afford to leave their work in order to study, it is important that distance education and training be combined with work. For employers, open and distance learning offers the possibility of organizing learning and professional development in the workplace itself, which is often more flexible and saves costs of travel, subsistence etc. With sufficient numbers of employees being trained, open and distance learning is usually cost-effective (UNESCO, 2002).

According to UNESCO, e-learning offers the following specific benefits;

- *24/7* access to materials and support by learners.
- Increases efficiency and effectiveness in learning, teaching and administration.
- Improves the ICT skills of teachers and students.
- Enables collaboration on joint projects and conduct lessons from a remote location.
- Supports student centered e-learning paradigm.
- Increases access to learning and training opportunity.
- Improves cost-effectiveness of educational resources.
- Extends geographical access to education.
- Offers the combination of education with work and family life.
- Content is more timely and dependable: Because it is web-enabled, e-learning can be updated instantaneously, making the information more accurate and useful for a longer period of time.
- Scalability: E-learning solutions are highly scalable. Programs can move 10 participants to 100 or even more participants with little effort or incremental cost (as long as the infrastructure is in place).
- Builds communities: The Web enables students to build enduring communities of practice where they can come together to share knowledge and insight. This can be a tremendous motivator for learning.
- E-Learning lowers costs: Despite outward appearances, e-learning is often the most cost effective way to deliver instruction or information. It cuts travel expenses; it can also reduce teaching time, and significantly reduce the need for a classroom/teacher infrastructure.

A study carried out by Unwin (2008) identified the following as other potential benefits of e-learning;

- The potential for interactivity amongst and between learners and teachers.
- Combination of both synchronous and asynchronous learning.
- Potential for re-use of content.
- Students can learn at their own pace.
- Facilitates the management of student records.
- No cancellation of classes in case the lecturer is out to attend a conference.
- Tracking students' progress also helps to rectify their problems before it is too late to help them.
- Enhances quality in terms of content and pedagogy.

2.10 E-Learning Challenges in Kenya Public Universities

According to CERI (2005) there are numerous challenges to overcome when implementing e-learning. The main barrier for e-learning adoption by Kenyan public universities appears to be a lack of awareness on the possibilities and benefits that e-learning could offer. There are also challenges associated with the implementation of e-learning by teachers into their classroom such as skill development, changes in their role and the pedagogies they employ.

According to Rodrigues (2008), the challenges facing ICT and e-learning development in Kenyan public universities include;

- Most Kenyan universities have not yet developed comprehensive ICT and e-learning policies and strategies.

- Most universities allocate only about 1% of their revenues to ICT yet they need to dramatically increase ICT investments and recruitment.
- Kenyan universities find it very expensive to establish and maintain the ICT infrastructure.
- In addition to the cost of establishing the campus networks, internet bandwidth is also expensive and increases operational costs.
- Kenyan universities are still unable to provide classroom ICT services or even to equip all faculty offices with computers.
- Some Kenyan universities do not have an e-learning platform.
- There are very few incentives for the use of ICT in teaching and learning. Faculty staff and students outside the ICT degree areas are not using ICT in teaching and learning.
- There is very limited locally relevant content that faculty could use for teaching or that students could access. Most of the faculties in the universities are also not prepared or trained to use ICT in their work.
- Lack of adequate support from all levels and stakeholders within the organization.
- Lack of basic computer and Internet skills by learners.
- Copyright issues.
- Personnel resistance to change.
- Cultural and attitude issues among the staff and students.

2.11 Role of ICT in E-Learning

ICTs are the major driving force behind globalised knowledge-based societies. ICT developments are harnessed to support learning. The growth of e-learning is directly

related to the increasing access to information and communications technology, as well as its decreasing cost (Naidu, 2003). Growing number of teachers are increasingly using information and communications technology to support their teaching. The contemporary student population (often called the “Net Generation”, or “Millennials”) who have grown up using information and communications technology also expect to see it being used in their educational experiences (Brown, 2000; Oblinger, 2003; Oblinger and Oblinger, 2005).

The fundamental obstacle to the growth of e-learning is lack of access to the necessary technology infrastructure, for without it there can be no e-learning (Naidu, 2003). When looking at the current widespread diffusion and use of ICT in modern societies, especially by the young – the so-called digital generation – then it should be clear that ICT will affect the complete learning process today and in the future.

There is, in other words, a widespread belief that ICTs have an important role to play in changing and modernising educational systems and ways of learning. E-learning presents an entirely new learning environment for students, thus requiring a different skill set to be successful (Romiszowski, 2004). E-learning by its very nature requires a certain level of technical sophistication. This becomes less of an issue over time as computer literacy increases.

2.12 ICT and E-Learning Infrastructure

According to Blinco et al (2004), the term “infrastructure” is highly contextual in its meaning. In e-learning context “e-learning infrastructure” includes computers, LANs, WANs, connectivity/bandwidth and web services. Infrastructure is only as useful as the end products that it helps to create and deliver. For the purpose of this study

‘infrastructure’ describes everything that supports both the flow and processing of information, including but not limited to hardware, software and protocols. Infrastructure in its various manifestations should be the enabler for process-centric learning whether managed by organisations, communities of interest or individuals (Blinco et al., 2004). For e-learning to be effective, we need better infrastructure including availability of bandwidth and electricity. Currently, in many developing countries, there is low uptake of e-learning courses, mainly due to poor infrastructure and the high cost of bandwidth.

According to Laundon and Laundon (2006), networks and connectivity are almost universally assumed to be critical to the development of successful infrastructure. It should be noted that connectivity is not just an enabler of networks and access to content but it is an organizing principle in its own right. Broadband data communication services are a critical element for the successful utilization of ICT and e-learning. Most Kenyan universities are characterized by inadequate infrastructure and expensive and scarce bandwidth.

According to ESIB (2003), the institution providing e-learning must provide adequate technological infrastructure, including network connectivity, computers and technical support for both students and staff. The absence or inadequacy of infrastructure is a barrier to access especially among students coming from less developed countries or from less privileged backgrounds.

Most African countries have inefficient ICT related infrastructure such as electricity, telecommunications, computers and trained personnel. A survey carried out by the AVU revealed that internet connectivity in tertiary institutions in Africa is inadequate, expensive and poorly managed (Twinomugisha et al., 2004). Therefore, the three pillars

of the ICT revolution, that is, connectivity, capacity and content, are yet to be realised in Africa. According to a World Bank Institute survey, the state of ICT infrastructure in African universities can be summed up as “too little, too expensive, and poorly managed.” The survey report goes on to say that “the average African university has bandwidth capacity equivalent to a broadband residential connection available in Europe, [and] pays 50 times more for their bandwidth than their educational counterparts in the rest of the world” (Steiner et al., 2005). According to Jacobsen (2005), the technological infrastructure 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 (Gebhart, 2005; Salmon, 2004).

2.13 Policy Issues in E-Learning

According to Catherall (2005), a range of methods should be utilised to support the initial and ongoing use of e-learning environments for both staff and students. The first method should be through the development of a policy or procedural document that outlines the standard practices for activity on the system. It is worrying that most Kenyan public universities have no ICT and e-learning policies of any sort or where it is available, it is still in draft form. The policy arena is certainly one where there is need for support to ensure that all the relevant policies are enacted by all public universities. Further, having a policy and actually operationalizing that policy are two different things. A study carried out by the African Virtual University (AVU) found out 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.

2.14 Training Staff on E-Learning Skills

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. The need for teacher training is widely acknowledged. Teachers need training in general ICT skills as well as online tutoring and also for the students there should be adequate support in "learning to learn virtually".

As an African example, the Centre for Higher Education Development at the Durban University of Technology (DUT) offers staff development on e-learning, based on the principles of skills, pedagogy, research and community. This intensive one-year training programme for a small group of educators combines workshops with online activities and individual consultancy sessions with instructional designers. In the process of collaboration, a communal resource base (comprising journals, papers, online classrooms and discussions) is built. The outcomes of one year participation are for a member to participate in an online class as a learner; design an online course; manage a class online; facilitate online learning for students; conduct action research into online learning; and interact with other online practitioners in a community of practice. This programme will be linked to a degree in Higher Education Development through Recognition of Prior Learning (Pete and Fregona, 2004).

Conventional training activities most often take the form of once-off workshops, focusing on the transfer of technical skills, and fall short in providing the pedagogical linkages needed in e-learning. This results in a didactic, teacher-centered use of technology (Littlejohn and Sclater, 1999). This 'new way of doing something familiar' (Salmon,

2005: 201) does not challenge underlying assumptions about learning and knowledge sharing. This type of training also does not support the transfer of new practices into the lecturers' day-to-day work, which is, in most cases, not conducive to educational innovation (Carr et al., 2005).

At the most basic level, Moi University offers training programmes on its learning management system MUSOMI combining workshops and online resources, and a set of accessible, easy to read manuals. This is facilitated by the directorates of ODL and ICT and other technical and pedagogy experts from partners like MUK-VLIR-UOS programme (Source: Moi University DODL).

The key elements for successful implementation of staff development in e-learning include: provision of a structured training programme with a clear time frame/duration as opposed to once-off workshops; combination of skill workshops with online learning; promotion of collaboration to develop a community of practice; peer support and mentoring; opportunity for research as an incentive to staff investing their time in e-learning; and the possibility of accreditation of the staff development programme and recognition of prior learning (Carr et al., 2005).

2.15 Pedagogical Issues in E-Learning

Pedagogy refers to the science of teaching (Naidu, 2006). Pedagogy in the e-learning process should be at centre stage. The pedagogical goals of higher education remain the same in both traditional approach and e-learning. An integral mission of higher education is to foster critical thinking and reflection as well as facilitate learning on how to construct new knowledge. However, according to ESIB (2003), the pedagogical aspects

of e-learning are widely undeveloped. Placing existing course material into the web is still often considered as constituting e-learning, although this does not take advantage of any of the pedagogical opportunities presented by ICT. E-learning invites a change in the way that the roles of students and teachers are perceived and if implemented properly, may lead to enhanced learning experience. ESIB (2003) emphasizes that adequate pedagogical and technical support for the teachers need to be in place. If teachers are willing to develop e-learning courses, this should be taken into account when assigning their workload. Intellectual property rights related to e-learning material, as well as current problems related to privacy protection need to be solved. Groups consisting of people with expertise in all the different aspects of e-learning should be involved in designing e-learning courses. It further stresses that a strong emphasis should be placed on assuring adequate student counseling and guidance. Pedagogical innovation and acquisition of useful skills need to be stressed in e-learning courses.

ESIB (2003) however, does not believe that e-learning can be used as a sole method of provision in all fields of study. In fields requiring extensive practical training (such as medicine, psychology, teacher training, certain natural sciences etc.) the e-learning approach can never fully substitute conventional face to face teaching and training. However, e-learning may supplement traditional learning and in certain fields possibly even substitute it to some extent in the future. However, at present both the technological and pedagogical requirements are not yet met for the e-learning to be the sole method of learning. The use of e-learning draws from two distinctive areas of expertise: technical skills and a pedagogical understanding of how to use technology to support teaching and learning.

2.16 E-Learning and Access: Issues and Implications

Access in the context of e-learning refers to the ability to access a computer and compatible software necessary to undertake e-learning. According to Yeomans (1996), an adequate level of access to the ICT and e-learning infrastructure is the foundation of a college's ability to deliver e-learning effectively. The biggest fear so far of ICT technology is digital exclusion. Similar to most forms of exclusion, digital exclusion is organised on the same demographic lines inclusive of age, ethnicity or educational levels. In recent years, there has been much public debate on the educational access and equity of developing nations, this is particularly a contentious issue due to the increased amounts of technology currently involved in education. Yeomans (1996) advises that special attention should be paid to bridging the technological gap between developed and less developed countries in building relevant and up-to-date e-learning facilities and related ICT infrastructure. As reflective practitioners we must be aware of, and seek to avoid, the development of a digital divide and a two-tier system, whether in business, education and training organisations, community settings, or individual learning careers. 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.

Yeomans (1996) further outlines some aspects of this access related agenda which are worth considering:

Awareness: Are users and providers sufficiently aware of the technology and resources surrounding e-learning to make effective use of it and ensure widespread availability at an affordable cost?

Situation/Location: Perhaps the greatest claim made in favor of e-learning is the ability to collapse space and time making learning resources readily available in diverse settings. Does this apply to geographically remote areas, and urban areas with low levels of spending and/or low credit ratings?

User Cost and Perceptions: The major capital cost and the rapid obsoleteness of computer hardware and software remains major barriers to access. Student support services are vital issues in the context of user cost.

Personal Competence and Skills: Computer illiterate persons may be barred not only from the rapidly increasing volume of rich educational material available electronically, but may also be prevented from taking part in formal courses which feature such materials. Access and competence may be affected by cultural, personal and socio-demographic factors including: age, attitude to learning, 'learning styles', gender, language and ethnicity. The salience of this point is asserted by one writer who claims that "the technology is beginning to be seen as a cultural form dominated by the English language, literate (as opposed to oral) codes, and male oriented applications. ESIB (2003) stresses that e-learning must never become a privilege for the affluent few. However, sharp disparities and substantial imbalances in relation to attitudes, technology use, ICT training, and satisfaction with the internet may distort access to, participation in, and use of e-learning.

Other issues that have implications on access to e-learning include technical ICT and e-learning infrastructure, licensing modalities of the LMS and e-learning component portability.

2.17 Learner Support in E-Learning

Learner Support refers to all forms of assistance that is provided to learners to support their learning (Naidu, 2006). In the context of e-learning, learner support takes on an added importance, as learners become separated in time and place from the teacher and the educational organization. This does not mean that necessarily more learner support is required. What changes is how learner support is provided, where and when and how often it is provided and who provides it (Holmberg, 1986). An online learning course may not be supported and facilitated by those who developed these courses.

Beamish (2002) points out that whilst it is important to have good connectivity, equipment, content and services, it is not usually sufficient to ensure effective e-learning. Experience has shown that the key factor for success in learning supported by ICT is the guidance and support offered by the teacher, trainer or tutor. Major corporations have implemented e-learning widely, but there is now recognition that success requires more than just installing e-learning software and programs. It requires focusing away from the technology and onto the learner.

2.18 Teacher's Role and Responsibility

The traditional role of a teacher is based on behaviour where the teacher is in control of learning material and how the student learns. This role is challenged in an e-learning classroom as the situation teachers find themselves in is quite different. However, the principles and responsibilities involved in traditional education are transferable into an e-learning environment. A teacher in an online classroom is faced with a different type of student, one which requires interaction and collaboration with other learners, content and information sources as a result of their existence in the Information Age. These students call for information from around the world, and immediate feedback on their work. They are

known as lifelong learners as the skills they acquire means that they are continuously challenging and searching for information (Reisman ed. 2003, 240).

Teachers in online environments are unable to be assessed in the same way that traditional teachers are. Garrison and Anderson (2003) points out that a teacher's presence is evaluated in a conventional classroom, however in e-learning, the teaching presence is considered. Teaching presence refers to "what a teacher does to create a community of inquiry that includes both cognitive and social presence". The three major elements of teaching presence in an online classroom are design, facilitation of discourse and direction of instruction in order to realise meaningful and worthwhile learning outcomes. The teacher's use of the online classroom aims to improve student retention by ensuring more involvement in the learning process (Garrison and Anderson 2003, 66). Teachers in online classrooms primarily need to understand distance education and how it differs from conventional methods. These people are required to be subject matter experts, education designers, social facilitators and teachers in an online environment (Garrison and Anderson 2003, 67). It is imperative that online teachers understand that in these environments, the relationship between teacher and student is complementary. Without this relationship, students are unable to benefit completely from their learning environment.

2.19 Learning Management Systems

A Learning Management System (LMS) is a software application or a Web-based system that provides an instructor with tools to create and deliver online content, monitor student participation and assess student performance. A LMS may also support collaboration and provide features such as chat facilities and discussion forums. LMS provides a community for students where responsibilities are shared, discussions are facilitated and purposeful, and social and theoretical learning can occur. The systems are designed to be used by multiple

publishers or providers and typically focus on “managing courses created from a variety of other sources” (Paulsen, 2003, 30; Hall, 2001, 13). Communication within learning management systems is broadened not only between student and teacher, but also between students. This issue of effective interaction is often questioned in regards to online classrooms, but LMS facilitate the use of interaction between users. The most well-known learning management systems are WebCT, Moodle, Blackboard, Chisimba, Claroline, ATutor and Dokeos which are commonly used by universities.

The major functions of LMS in e-learning environments are; authoring, classroom management, competency management, knowledge management, certification or compliance training, personalisation, mentoring, chat and discussion boards (Paulsen 2003, 31). Through an LMS, it is possible to track very detailed information about individual learners, thus making the system highly beneficial to large online environments (Hall 2001, 5).

Learning management systems obviously have disadvantages, as any other educational system does. One of these is that support for students or users with difficulties is only available at specific times, clearly when educators themselves are interactive within the system. There is also bound to be many untrained instructors working within LMS who may provide users with irrelevant or insufficient information, thereby inhibiting their learning. Finally, users themselves may lack technical skills necessary to function within the LMS. This may result in users trailing behind others and losing motivation (Reisman ed. 2003, 57). However, some of the disadvantages identified above such as support for students or users with difficulties can be fairly addressed by the synchronous mode of e-learning.

2.20 A Workable Template for Design of E-Learning

According to Hung and Der-Thanq (2001), the major problems with e-learning are closely related to its design and adoption. A significant problem in the creation of a truly electronic university is the lack of a practical and standardized template for the design and implementation of e-learning courses. E-learning is part of a long history of educational innovations implemented as a result of technological advances. The problem with current e-course design is it appears to have adopted a largely technological design focus, which generally lacks an educationally sound, theoretical basis for design. Hung and Der-Thanq (2001) further points out that there are many factors necessary for consideration and inclusion in a workable template for e-course design. All courses must primarily establish and maintain strong connections between knowledge and skills developed in e-learning courses and those learners encounter in their day-to-day lives. To preserve the traditional structure of learning, designers need to produce more than just the analysis of good design characteristics; they must also produce a model capturing the positive elements present in traditional learning.

2.21 The Cost of E-Learning

Many e-learning initiatives have been justified on the assumption that ICT could improve the quality of learning while at the same time improving access to education at reduced costs (Bates, 1997). Jenkins and Hanson (2003) observes that e-learning was initially seen as an opportunity to cut costs and make savings in staffing, resources and space; though such savings are unlikely to be realised in the short term, if at all. It is therefore important that institutions seek to understand the costs of e-learning and recognise how it should be supported. The costs of e-learning must be considered from the perspective of

the institution, the academic and the student. Institutional costs for e-learning include investment costs, development and delivery costs.

E-learning is the most efficient and cost effective way of educating the workplace, as it means that companies are saving on the travel, accommodation and food expenses that are spent on former means of education (Schrader 2003, 226).

Jenkins and Hanson (2003) advises that institutions must consider the potential costs of not investing in e-learning. With an increased demand for flexibility in access and delivery, increasing globalisation and more competition in higher education, the long term costs of not investing in e-learning may be the greater.

Overall, the cost to educate per student will decrease as a result of e-learning and the opportunities it provides, however the overall market for online education will increase (Downes 2005, 6).

2.22 Preconditions of E-Learning

Any efforts to embark on e-learning must be preceded by very careful planning. This would necessarily comprise strategic and operational planning that is consistent with the values, mission and goals of an organization. For e-learning to succeed in any setting, there has to be complete support for the initiative from the highest levels. This is important not only because it will have implications for funding allocation for any such new initiative, but also because of its implications for the mindset of the rest of the organization. Staff needs to buy into the initiative and be committed to its success (Hawkridge, 1979).

Educational organizations that have a history of employing alternative approaches to learning and teaching such as distance education will have many of the prerequisites and dispositions for e-learning already in place which they can easily capitalize and build upon. However, conventional campus-based educational organizations that have traditionally relied on residential face-to-face classroom-based learning and teaching activity would need to reconsider their values, mission and goals of educational provision in order to adequately accommodate the adoption of e-learning activities (Naidu, 2003). The above preconditions for successful deployment of e-learning have to be in place as part of the preparation for its deployment in any organization. Without adequate attention to these preconditions, e-learning is unlikely to achieve its full potential, no matter how robust and reliable is the technology and the infrastructure to support it.

2.23 Educational Requirements of E-Learning

Like any organized educational activity, e-learning needs to be very systemically (i.e. from a systems level) managed. Foremost this will include attention to the technology and the infrastructure that is necessary to support it. It will include different approaches to course design and development and strategies for generating and managing subject matter content from that which is suitable in conventional educational settings (Naidu, 2003).

The technology: While this is crucial to the success of any e-learning activity, technology is not the driver of the initiative. It is there to serve an educational function and as such, it is a tool for learning and teaching. However, it has to be robust, reliable and affordable. It is critical to ensure that this is so, just as it is important to ensure that in a classroom-based educational setting, the classroom is available and it is comfortable,

and it has the necessary equipment such as tables and chairs and other tools for teaching and learning to take place. E-learning technology needs to work just as transparently and fluidly to allow teachers and students to concentrate on learning and teaching and not be distracted by the technology. Technology in and of itself may not guarantee better learning. But when effectively deployed, technology can help focus attention while attracting and maintaining a learner's interest. Technology engages learners by structuring and organizing information, and by displaying and demonstrating procedures and operations. It can help make a learning experience more memorable and can help relate new information to that which is already known. Perhaps even more important, technology allows us to have relationships with information in our own, unique ways. This phenomenon effectively shifts the question from "Will technology improve learning?" to "How much further will technology let us push the envelope of human cognitive, affective, and kinesthetic experience?" (Naidu, 2003).

Course design and development: Like any other organized educational activity, e-learning, is a team effort, as a number of people and a range of expertise need to be brought together to make e-learning work. In conventional educational systems, course design and development is the sole responsibility of the subject matter expert who is also the teacher. A more efficient and effective model of course development is the team approach, which brings together people with subject matter knowledge and expertise in the development of technology enhanced learning materials (Naidu, 2003).

Subject matter content management: In conventional educational settings, the generation and presentation of the subject matter content is the sole responsibility of the teacher. In e-learning, while the teacher may still be generating this content, for it to be made accessible to the learners, it needs to be modified, enhanced and presented in a

form that is amenable to the technology that is in use (Lewis, 1971; Lockwood, 1994; Riley, 1984; Rowntree, 1994).

Content once generated will need to be updated in order to retain its currency and relevance. For this to happen, academic staff and other content developers will need expert assistance with learning and instructional design activities. They will need to be supported in the design and development of such self-study materials in alternative media forms. Permissions will be required in the form of copyright clearance to publish some of this material in such form (Naidu, 2006).

2.24 Implementation Requirements of E-Learning

For e-learning to be efficient and effective, a great deal of care and attention needs to go into its implementation. This comprises attention to the recruitment and registration of students, facilitating and supporting learning, assessing learning outcomes, providing feedback to learners, evaluating the impacts of e-learning on the organization, and a host of other issues related to these functions (Naidu, 2003).

Student registration: Most educational and training organizations have rigorous systems and processes in place to manage student registrations and their graduation. Those who choose to adopt on-line learning would want to also ensure that they are able to recruit, register and manage their students online in the fashion of e-commerce and e-business. Doing so would be consistent with an ethos and philosophy of making one's registration processes accessible online. This would require administrative systems to be in place and that the staff members are appropriately trained.

Assessment of learning and the provision of feedback: While in e-learning, the fundamental and guiding principles of assessment of learning outcomes and providing

feedback on learning remains the same as that for any other educational setting, what changes is how some of the learning outcomes can and might be assessed and also how feedback may be provided. Most educational settings must also deal equitably and fairly with unfair practices such as plagiarism and authenticity of student work. E-learning because of the flexibility it affords in terms of time and space independence are more prone to unfair learning and assessment practices.

Evaluation of the impacts of e-learning: It is crucial to have processes in place for knowing how you are doing with what you have initiated. This will include how your staff and students are engaging in e-learning. Evaluation of impacts is often neglected or inefficiently carried out in most educational settings. Evaluation of the impacts of your processes should be closely integrated into the planning and implementation of any e-learning activity (Naidu, 2006).

2.25 Managing and Implementing E-Learning Successfully

E-learning, like any organized educational activity is a very complex undertaking. According to Stochkley (2006), e-learning can be a disaster if it is not managed correctly. To be successful, e-learning has to have the right fit with the organisation. It should not be chosen because it is fashionable. It should be chosen because it is the most efficient and effective way to meet the identified learning need. Lack of careful planning and implementation of e-learning can actually lead to decreasing standards and morale, poor performance in learning and teaching, and wasted resources and loss of revenue. Similar with other technology based systems, the success of implementing an e-learning system in organizations relies on its effective adoption by users. Successful implementation of e-learning is dependent on the extent to which the needs and concerns of the stakeholder groups involved are addressed (Stochkley, 2006). Blinco et al (2004) articulates that e-

learning's success rests on the fundamental requirement that instructors and students possess adequate technical skills to use e-learning tools effectively.

Stochkley (2006) further points out that like most change implementations in organisations, success comes from careful planning and execution. The normal project management principles apply. Special attention should be placed on managing expectations, ensuring management commitment and involving other key stakeholders. The credibility of the e-learning implementation team is critical. Change management involves planning for the change itself as well as planning for the introduction of the new techniques or processes. The starting point for an e-learning project involves consideration of both individual and organisational issues. At the individual level, the likely reaction to e-learning by employees needs to be identified. Have they had exposure to e-learning previously? Are they computer literate? How do they generally react to change? These are just some of the questions that should be considered at the individual level. If the needs of individuals are satisfied, then there is some likelihood that organisational needs will also be met (Stochkley, 2006). Agalo (2002) points out that Distance Education success story in developed world accrues from utilization of emerging information and communication technologies. By safeguarding against pitfalls that may result due to wholesome adoption of modern technological innovation, use can be made of basic ICT technologies to enable Kenya adapt some of the Distance Learning strategies practiced in universities in developed countries.

D'Antoni (2002) points out that 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.
- **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.

2.26 Summary and Gaps to be filled in the Study

This review of literature on adoption of e-learning has revealed that the future holds tremendous opportunity for innovative approaches to learning. The success of adoption and implementation of e-learning in many organizations relies on its effective adoption by the e-learning stakeholders. However, institutions must be prepared to respond to the major organizational, technological and pedagogical components necessary for the implementation of e-learning. Though a number of studies on e-learning has been carried out in other regions of the world, not many studies have been carried out in this area of e-learning in Kenya. However, this study will bridge the gap that exists in the current knowledge on adoption of e-learning by adding onto the pool of knowledge on adoption of e-learning in Moi University and other Kenyan universities.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter describes the research methodology and systems design methodology used in the study. The study is both quantitative and qualitative in nature. Quantitative data was collected using questionnaires while qualitative data was collected using interviews. The methodology adopted in designing and developing the learning management system was Structured Systems Analysis and Design Methodology (S.S.A.D.M).

Pertinent issues discussed in this chapter include research design, location of the study area, study population, study sample, sampling procedures, data collection instruments, pilot study, reliability and validity of research instruments, ethical considerations, data analysis and systems design methodology.

3.1 Research Design

This study employed a descriptive survey research design. The major purpose of descriptive research is description of the state of affairs as it exists (Kombo and Tromp, 2006). According to Orodho (2003), a descriptive survey is a method of collecting information by interviewing or administering a questionnaire to a sample of individuals. Kerlinger (1969) points out that descriptive studies are not only restricted to fact findings, but may often result in the formulation of important principles of knowledge and solution to significant problems. They are more than just a collection of data. They involve measurement, classification, analysis, comparison and interpretation of data. Leedy and Ormrod (2001) points out that in a descriptive study, the researcher can use the results

obtained from the sample to make generalizations about the entire population only if the sample is truly representative of the population. Descriptive research design was appropriate for this study because the study involved collection of qualitative and quantitative data from a varied number of respondents by interviewing or administering a questionnaire to a sample of individuals.

3.2 Location of the Study Area

This study was carried out in four major campuses of Moi University, namely Main campus, Chepkoilel campus, Town campus and Moi University Annex campus (see Figure 3.1). Purposive sampling was used to select the four Moi University campuses as the study sites because these 4 campuses are home to the 14 schools of Moi University and they are the pioneer campuses in the University. They also constitute the highest number of permanent teaching staff in the University. Figure 3.1 shows the geographical location of the study area from Eldoret town.

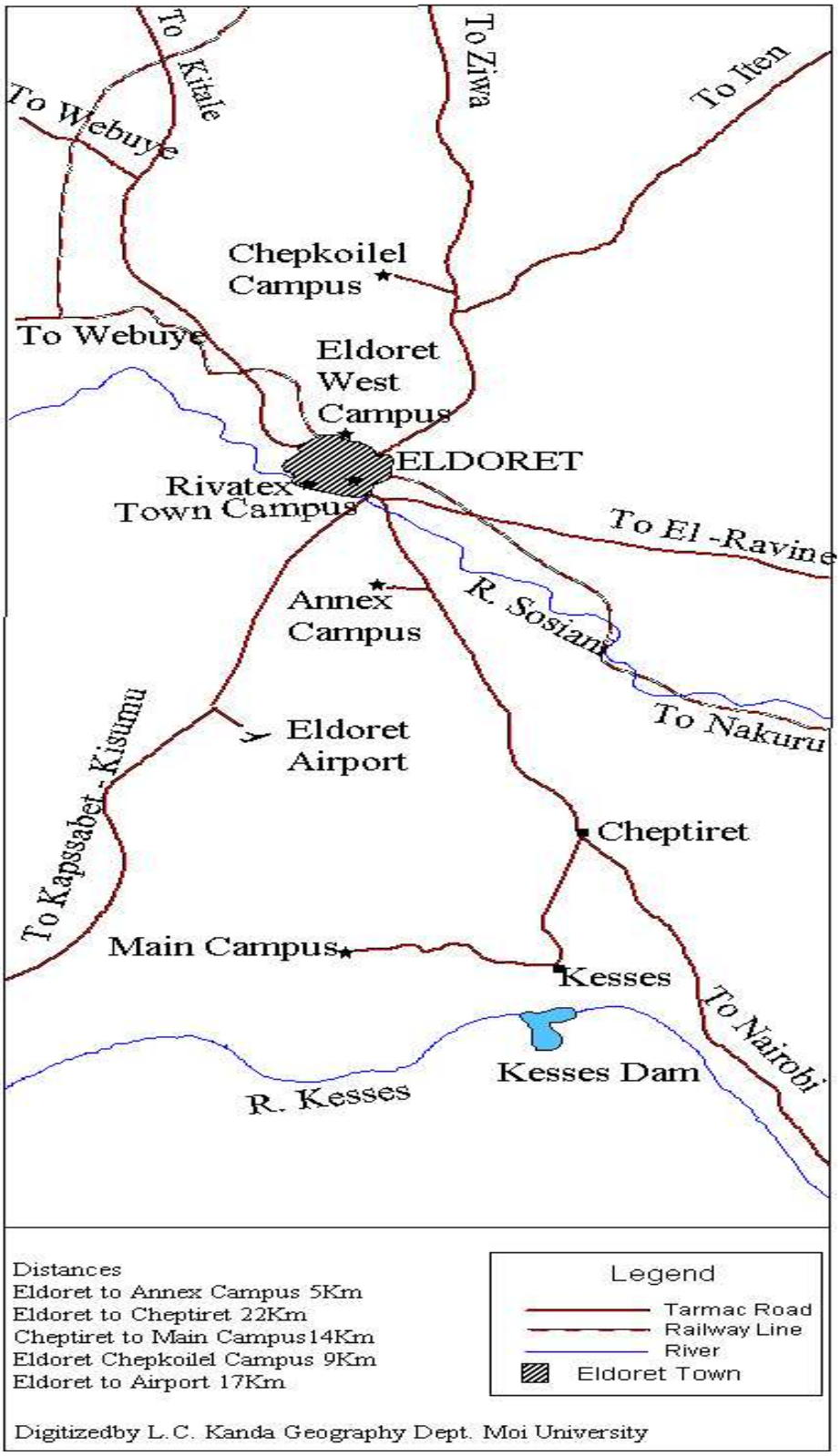


Figure 3.1: Map showing Moi University Major Campuses (Study Area)

3.3 Study Population

A population refers to an entire group of individual events or objects having a common observable characteristic (Mugenda and Mugenda, 1999). According to Fraenkel and Wallen, (2003), a population refers to all the members of a particular group of interest to the researcher, the group to whom the researcher would like to generalize the results of a study.

The study targeted a population of 20,077 respondents (950 staff and 19,127 students). The staff target population comprised of 834 teaching staff, 14 ICT staff, 76 heads of academic departments, 14 deans, 4 directors and 8 members of senior university management. This population is representative of the e-learning stakeholders in the University. Table 3.1 shows the different categories of staff and students that constituted the study population.

Table 3.1: Study Population

Category	**Population**
Teaching Staff	834
Heads of Academic Departments	76
Deans of Schools	14
Directors	4
Senior University Management	8
ICT staff	14
Students	19,127
TOTAL	**20,077**

3.4 Study Sample

A sample is a smaller group obtained from the accessible population. A total of 521 respondents constituted the sample size. The study sample included senior university management (3), deans of schools (14), directors - ICT and ODL (2), heads of academic departments (21), teaching staff (90), ICT staff (14) and students (377). This study sample is representative of the target population, hence the data collected can be generalized to the entire population. The sample size for students was reached following a table for determining sample sizes for a given population provided by R.V. Krejcie and D. Morgan (1970, 30, 607-610) (see appendix 10). Table 3.2 shows the sizes of the different categories of the study sample.

Table 3.2: Study Sample

Category	**Sample Size**
Teaching Staff	90
Heads of Academic Departments	21
Deans	14
Directors (ICT and ODL)	2
Senior University Management	3
ICT staff	14
Students	377
TOTAL	**521**

3.4.1 Sampling procedures

Sampling refers to the process of selecting the individuals who will participate in a research study (Fraenkel and Wallen, 2003). In this study, purposive sampling was used to select Moi University's four campuses as the study sites because it is home to the 14 schools of Moi University and the staff in these campuses are permanent and pensionable.

Stratified proportionate sampling technique was used to group up teaching staff and students into schools since these categories of respondents are spread in different schools. Teaching staff were grouped into schools, while students were grouped into both school and study level i.e undergraduate or postgraduate (see Appendix 4). Out of these groups, the teaching staff and the students were randomly picked using simple random sampling to obtain a representative sample.

On the other hand, purposive sampling was used to draw samples from the university senior management, deans of schools, directors, heads of academic departments and ICT staff. Purposive sampling allows a researcher to use cases that have the required information with respect to the objectives of his or her study. Subjects in this category were therefore selected purposively because they were considered as key informants.

3.5 Research Instruments of Data Collection

Research instruments refers to the tools that are used for data collection. In this study questionnaires and interview schedules was used as the main tools for data collection from the respondents. The selection of these tools was guided by the nature of the data to be collected, the category of the respondents, the time available as well as the objectives of the study. Though the questionnaire was used to collect data for all the objectives,

interview schedules was used to supplement data collected by the questionnaire as well as capture in-depth data that may not have been captured by the questionnaire. However, interview schedule was more appropriate for objectives 5 and 6 since it required more elaborate answers to the research questions. There was also need to probe for further information related to the answers to research questions 5 and 6.

3.5.1 Questionnaires

According to Kombo and Tromp (2006), a questionnaire is a research instrument that gathers data over a large sample. Each item in the questionnaire is developed to address a specific objective, research question or hypothesis of the study. For this study, questionnaires (see appendix 2) were used to collect data from the students, ICT staff and teaching staff due to their large numbers. This method was also preferred since it would have been very expensive and time consuming to interview all the teaching staff and students. In this particular case, semi structured questionnaires were used. The open-ended questions permitted a greater depth of response while closed-ended questions provided the ease of analyzing the data since they are in an immediate usable form. Closed-ended questions were also easier to administer because each item is followed by an alternative answer.

The questionnaires were administered by the researcher with the help of two research assistants to various respondents in schools and campuses. The respondents were asked to fill the questionnaire. The researcher and the two research assistants collected the filled questionnaires after two weeks. The research assistants were inducted prior to commencing piloting and administration of the questionnaire.

3.5.2 Interviews

This method involves questioning or discussing issues with people. Mugenda and Mugenda (1999) defines it as an oral administration of the questionnaire or an interview schedule. Interviews are therefore face-to-face encounters. The interview method was used to collect data from senior University management, deans of schools, directors of ICT and ODL, and heads of academic departments who are considered as key informants and policy makers in this study. An interview schedule (see appendix 3) was administered by the researcher himself to each of these key informants to obtain information from them. An interview schedule is a set of questions that the interviewer asks when interviewing. They are used to standardize the interview so that the interviewer can ask the same questions in the same manner. Semi structured interview schedules was used in this study. The interview schedule was used to guide a face to face interview with the respondents.

The interview method was suitable for these categories of respondents since it was possible to obtain in-depth information through probing questions. Furthermore, e-learning is a relatively new phenomenon which may not be understood by many people. The interview method became handy for the key informants in this case since the researcher was able to clarify issues thereby helping the respondents give relevant responses.

3.6 Pilot Study

The researcher carried out a pilot study prior to the main study for the purpose of pre-testing the research instruments. The pilot study was carried out among students and staff of Moi University's main campus to standardize data collection methodologies and to

free them from any errors before the actual usage. The purpose of pre-testing the instruments was to improve the reliability and validity of the instruments.

The pilot study took a period of one month and relied on a group of 30 respondents (22 students, 5 teaching staff, 2 ICT staff and 1 HOD) with similar characteristics as that of the study population. The 30 respondents who participated in the pilot study were not part of the study sample.

Among the areas of improvement in the questionnaire pointed out by the respondents include: inclusion of definition of e-learning in the letter of introduction (see appendix 1); and exemption of students from answering some questions in the "Questionnaire for Teaching Staff, ICT Staff and Students" (see appendix 2) which it was deemed they may not have accurate information concerning such questions. The respondents however confirmed that other areas such as spellings and grammar, font sizes, numbering, spacing and flow of the questions was correct in both the questionnaire and interview schedule (see appendix 2 and appendix 3). The researcher made the necessary adjustments on the questionnaire after the pilot study.

3.7 Validity and Reliability of the Research Instruments

Validity refers to the appropriateness, meaningfulness, correctness, and usefulness of any inferences a researcher draws based on data obtained through the use of an instrument (Fraenkel and Wallen, 2003). According to Mugenda and Mugenda (1999), it is the degree to which results obtained from the analysis of the data actually represent the phenomenon under study. Validation of the content was done by the experts in the area under study. The e-learning experts from Moi University examined the relevance of the

content used in the questionnaire and the interview schedule. Their recommendations were incorporated into the final questionnaire and interview schedule.

Reliability refers to the consistency of scores or answers provided by an instrument (Fraenkel and Wallen, 2003). To test the reliability of the research instrument, the questionnaire and interview schedule was piloted in Moi University main campus to a small group of 30 respondents (not part of the sample). This was to establish the accuracy, consistency, dependability and predictability of the research instruments. Respondents were asked to identify the difficult and ambiguous items while in the process of filling the questionnaire and answering the interview questions. The identified faults were then corrected in the questionnaire and interview schedule as explained in section 3.6 on Pilot Study.

3.8 Ethical Considerations

Ethics refers to questions of right and wrong (Fraenkel and Wallen, 2003). Consent and a research permit to carry out the research as is required by the Kenyan Law was obtained from the Moi University, School of Information Sciences (see appendix 7) since the study was conducted within Moi University campuses where the researcher is a student.

Prior to the administration of the research instruments of data collection, the researcher and the research assistants explained to the respondents the real purpose of the research (see appendix 1) and their consent was obtained before data collection. All the respondents in the research were assured that any data collected from or about them will be held in confidence.

The data collected was treated with confidentiality. Once the data had been collected, the researcher made sure that no one else had access to the data. Any names of the respondents that was used was kept private and was not indicated in the final report.

Notifications and appointments for interviews with the key informants was made in advance and scheduled at a convenient place and time. The researcher honoured the appointments by arriving in time to administer the interview.

Finally, the researcher adhered to the ethical principles that govern research internationally and at Moi University as outlined in the Moi University Research Policy (2008).

3.9 Data Presentation, Analysis and Interpretation

Being a qualitative/quantitative research, the study employed both qualitative and quantitative data analysis techniques. The returned questionnaires were screened for completeness and accuracy. Responses from all the open ended and closed ended questions were analyzed to facilitate coding, processing and entry into the computer in preparation for analysis.

Quantitative data analysis was carried out using SPSS statistical analysis software. Descriptive statistics i.e frequencies and percentages was used to summarize and present the results in tables.

Qualitative data was analyzed by coding and organizing it into themes and concepts then descriptions and discussions given. Statements from open-ended responses and interview schedules were grouped following content analysis to determine specific categories.

After analysis of both quantitative and qualitative data, it was interpreted (as per the objectives) by use of descriptive narrations.

3.10 System Analysis, Design and Methodology

After data analysis, a learning management system (LMS) based on open source software was designed and developed as a platform for teaching and learning.

3.10.1 Systems Methodology

Many different system methodologies exist, each suitable for a particular type of application. Saleemi (2007) identifies three methodologies which are used for developing a computer based information system. These include:-

a. Systems Development Life Cycle (S.D.L.C)

b. Structured Systems Analysis and Design Methodology (S.S.A.D.M)

c. System Prototype Method (S.P.M)

The methodology adopted in developing the learning management system was Structured Systems Analysis and Design Methodology (S.S.A.D.M). SSADM was chosen largely because of its widespread usage and acceptance in the software engineering community. Lester (1993) points out that in Structured Systems Analysis and Design Methodology (SSADM), data is at the core and the data model is developed first as part of the requirements gathering. It is highly prescriptive and has well-defined stages, steps and products. As such it is useful for the development of a large information system like a learning management system (LMS). SSADM provides an orderly approach to system design and development. This structured methodology uses modules, stages, steps and tasks to improve project management and control, resulting in higher quality systems. SSADM adopts a waterfall model where each phase is completed and approved before subsequent phases can begin. The tools used in SSADM include data flow diagrams (DFDs) and centralized data dictionary. SSADM uses the top-down approach. The approach requires that one step leads on to the next, with increasing refinement throughout (Lester, 1993).

3.10.2 Benefits of SSADM

Timelines: Theoretically, SSADM allows one to plan, manage and control a project well. These points are essential to deliver the product on time.

Usability: Within SSADM, special emphasis is put on the analysis of user needs. Users are intensively involved at the requirements analysis stages. Simultaneously, the systems model is developed and a comprehensive demand analysis is carried out. Both are tried to see if they are well suited to each other.

Respond to changes in the business environment: In SSADM, documentation of the project's progress is taken very seriously, issues like business objectives and business needs are considered while the project is being developed. This offers the possibility to tailor the planning of the project to the actual requirements of the business.

Effective use of skills: SSADM does not require very special skills and can easily be taught to the staff. Normally, common modelling and diagramming tools are used. Commercial CASE tools are also offered in order to be able to set up SSADM easily.

Better quality: SSADM reduces the error rate of information systems by defining a certain quality level in the beginning and constantly checking the system.

Improvement of productivity: By encouraging on-time delivery, meeting business requirements, ensuring better quality, using human resources effectively as well as trying to avoid bureaucracy, SSADM improves the overall productivity of the specific project and the company.

Cuts costs: SSADM separates the logical and the physical systems design. So the system does not have to be implemented again with new hardware or software (Weaver et al., 1998).

In developing the learning management system, the methodology involved customizing the free open source learning management system (Claroline framework) to satisfy the local Moi University e-learning requirements. The new customized LMS is called MUWEBCAMPUS. The system is developed using PHP (see appendix 6) as front-end, Apache as middle-ware and MySQL database as back-end.

3.10.3 Customization of MUWEBCAMPUS Learning Management System

MUWEBCAMPUS is an open source LMS that was customized from Claroline and allows the teacher to create, administer and add effective online courses as well as manage learning and collaborative activities on the web. Customization was guided by simplicity features suggested by the respondents which include: ease of use and learn; user friendly interface with consistent command buttons; and menu driven commands.

Claroline framework is customizable and offers a flexible and custom-made working environment. Claroline framework is capable of hosting a large number of users easily. It is compatible with Linux, Mac and Windows environments. It has been developed following teachers' pedagogical experience and needs. It offers intuitive and clear spaces administration interface (Chaparro and Canas, 2004).

3.11 Summary

This chapter laid down the research methodology that this study adopted. It explains how the sample was determined and the data collection procedures. It further explains the systems analysis and design methodology adopted in developing the learning management system. The next chapter details the data analysis and interpretation.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.0 Introduction

This chapter presents the analysis of data and presentation of the major findings from the study. As it was stated in chapter one, the aim of the study was to investigate and analyze the important components necessary for the adoption of e-learning in Moi University with a view to developing a simpler open source learning management system to support e-learning in Moi University. Using questionnaires and interviews, the researcher sought for relevant information from 521 respondents who constituted the sample size. The respondents included senior university management (3), deans of schools (14), directors of ICT and ODL (2), heads of academic departments (21), teaching staff (90), ICT staff (14) and students (377). The information obtained through completed questionnaires and interviews provided the basis for data presentation, analysis and interpretation. The results presented in this chapter were derived from data collected from four major campuses of Moi University guided by the study objectives.

Descriptive statistics such as frequencies and percentages have been used to analyze and tabulate responses to various questionnaire and interview items. Analysis of student and staff questionnaires was done separately. Tables have been used to summarize and illustrate the findings of the study where necessary. Attempts have also been made to make reference to other related information in different parts of the thesis. Analysis was guided by the research objectives stated in chapter one.

4.1 Background Information of the Respondents

The study attempted to obtain information from respondents with diverse characteristics. For those respondents who filled the questionnaire, they were categorised in terms of: category (teaching staff, student or ICT staff); campus; school; and student study level (see appendix 2). Those respondents who were interviewed were categorised as either head of academic department, director, dean of school or senior university management. The main reason for this diversity is because e-learning may be perceived differently by respondents with these diverse characteristics, hence when studying adoption of e-learning in a university setting, it is important that this diversity is captured. Table 4.1 shows the distribution of respondents by their category.

Table 4.1: Respondents distribution by category

Category of Respondent	**Frequency**	**Percentage (%)**
Teaching Staff	90	17%
Heads of Academic Departments	21	4%
Deans of Schools	14	3%
Directors (ICT and ODL)	2	0.4%
Senior University Management	3	0.6%
ICT staff	14	3%
Undergraduate Students	351	67%
Postgraduate Students	26	5%
TOTAL	**521**	**100%**

Number of respondents: (N = 521)

4.2 Response Rate

Table 4.2 gives a summary of the response rate from those who participated in the study.

Table 4.2: Study sample and response rate

Category	**Sample Size**	**Response**	**% Response**
Teaching Staff	90	75	83%
Heads of Academic Departments	21	18	86%
Deans of Schools	14	11	79%
Directors (ICT and ODL)	2	2	100%
Senior University Management	3	3	100%
ICT staff	14	14	100%
Students	377	328	87%
TOTAL	**521**	**451**	**87%**

Out of the 521 respondents targeted in this study, questionnaires was administered to 481 respondents (90 teaching staff, 14 ICT staff and 377 students) and 40 respondents (3 senior university management staff, 14 deans of schools, 2 directors and 21 heads of academic departments) were targeted for interview. A total of 417 respondents (75 teaching staff, 14 ICT staff and 328 students) completed and returned the questionnaires while a total of 34 respondents (3 senior university management staff, 11 deans of schools, 2 directors and 18 heads of academic departments) were interviewed successfully and their responses recorded. This represents a response rate of 87% for questionnaires and 85% for interviews.

4.3 Awareness on the existence of e-learning in Moi University

The first objective of this study was to assess the level of awareness on the existence of e-learning by staff and students of Moi University. Table 4.3 shows the levels of awareness on the existence of e-learning in Moi University by students and staff.

Table 4.3: Levels of awareness on the existence of e-learning in Moi University by students and staff

Awareness on existence of E-Learning in Moi University	***No***	***%***	***Yes***	***%***
Students	141	43%	187	57%
Staff	24	27%	65	73%
Total	**165**	**40**%	**252**	**60**%

Number of respondents: Students (N = 328), Staff (N = 89)

From the table 4.3, 57% majority of student respondents and 73% majority of staff respondents were aware of the existence of e-learning in Moi University. However, 43% of student respondents and 27% of staff respondents were not aware of the existence of e-learning in the University. The differences in levels of awareness among the students and staff could be attributed to the level and extent of awareness and sensitization programmes that has been carried out by the University through the Directorates of ODL and ICT which initially targeted mostly staff in the first phase of training and sensitization on e-learning. According to the key informants in this study, the staff who have undergone e-learning awareness and sensitization workshops and seminars include senior university management, deans of schools, directors, heads of academic departments, ICT and e-learning technical staff and some teaching staff.

All the key informants who were interviewed in this study who included the senior university management, deans of schools, directors and heads of academic departments were aware of the existence of e-learning in Moi University. From the findings above, it emerged that majority of both students and staff are aware of the existence of e-learning in Moi University.

4.4 Measures being undertaken by Moi University towards the adoption of e-learning

The second objective of this study was to find out measures that have been undertaken by Moi University towards the adoption of e-learning. Tables 4.4 (a) and 4.4 (b) illustrate the responses and perceptions of students and staff respectively regarding the different measures that have been undertaken by the University towards the adoption of e-learning.

Table 4.4 (a): Measures that have been undertaken by Moi University towards the adoption of e-learning (Student Responses).

E-Learning Measures Undertaken	***Strongly Disagree***	***Disagree***	***Undecided***	***Agree***	***Strongly Agree***
	N (%)	**N (%)**	**N (%)**	**N (%)**	**N (%)**
Appropriate and operational e-learning policies.	105(32%)	118(36%)	35(11%)	53(16%)	17(5%)
Creating student awareness and sensitization on e-learning.	115(35%)	121(37%)	31(9%)	35(11%)	26(8%)
Integration of ICT technologies into teaching.	83(25%)	75(23%)	34(10%)	105(32%)	31(10%)

Number of respondents: (N = 328)

Table 4.4 (b): Measures that have been undertaken by Moi University towards the adoption of e-learning (Staff Responses).

E-Learning Measures Undertaken	***Strongly Disagree***	***Disagree***	***Undecided***	***Agree***	***Strongly Agree***
	N (%)	**N (%)**	**N (%)**	**N (%)**	**N (%)**
Appropriate and operational e-learning policies.	30(34%)	26(29%)	9(10%)	22(25%)	2(2%)
Adequate financial allocation to support e-learning.	19(21%)	21(24%)	29(33%)	16(18%)	4(4%)
Creating staff awareness and sensitization on e-learning.	29(33%)	31(35%)	2(2%)	19(21%)	8(9%)
Creating student awareness and sensitization on e-learning.	23(26%)	36(40%)	21(24%)	4(4%)	5(6%)
Integration of ICT technologies into teaching.	17(19%)	29(33%)	3(3%)	28(32%)	12(13%)

Number of respondents: (N = 89)

It is evident from the two tables that the University is yet to undertake most of the measures towards the adoption of e-learning. The responses on specific measures are explained in the following sections.

4.4.1 Appropriate and operational policies to guide the adoption of e-learning

From table 4.4 (a) and 4.4 (b), majority of both student and staff respondents indicated that there are no appropriate and operational policies in place to guide the University towards the adoption of e-learning. Majority (68%) of student respondents and 63% of

staff respondents (who either strongly disagree or disagree) believe that there are no appropriate policies in place to guide the University towards the adoption of e-learning. These respondents may have made such a response probably because they have never seen any policy related to e-learning in the University.

Another 21% minority of student respondents (who either agree or strongly agree) and 27% minority of staff respondents (who either agree or strongly agree) believe that the University has put in place appropriate policies to guide the University towards the adoption of e-learning.

Majority (72%) of the respondents who were interviewed indicated that there are two draft ICT and ODL policies awaiting Moi University Council approval. However, the policies are not yet operational. Since the two policies are still in draft form and yet to be approved by the University Council, then majority of the respondents were not aware of its existence.

4.4.2 Financial allocation to support the adoption of e-learning

The results on table 4.4 (b) for staff respondents show that a larger proportion of the staff respondents believe that the University has not allocated adequate finances to support the adoption of e-learning. As seen from table 4.4 (b), 45% of staff respondents (who either strongly disagree or disagree) felt that there is inadequate financial allocation to support the adoption of e-learning in the University.

Still, some 22% minority of staff respondents felt that the University has made adequate financial allocation to support the adoption of e-learning. Another 33% of staff respondents were undecided whether or not the University has made adequate financial

allocation to support the adoption of e-learning. The sizeable number of respondents that gave a response of “undecided” could be attributed to lack of information regarding to University’s financial allocations. However, the researcher established that information on financial allocations (recurrent estimates) is readily available in schools and departments.

Majority (68%) of the key informants interviewed indicated that the University has not allocated adequate finances for e-learning. However, some key informants acknowledged that though the University has allocated finances to the DODL for running the directorate and conducting sensitization workshops and training, the allocation is not adequate for comprehensive e-learning training and e-learning infrastructure development. The respondents indicated that most of the e-learning activities currently are supported by development partners including MUK-VLIR-UOS Programme.

4.4.3 Creating staff awareness and sensitization on e-learning

From table 4.4 (b) for staff respondents, majority of the respondents indicated that staff awareness and sensitization on e-learning has not been created comprehensively to reach all the teaching staff. Majority (68%) of staff respondents (who either strongly disagree or disagree) felt that the University has not created staff awareness and sensitization on e-learning to reach all the teaching staff.

A further 30% minority of staff respondents felt that awareness and sensitization on e-learning among the staff has been created. Another 2% of staff respondents were undecided.

Majority (71%) of the key informants interviewed indicated that staff awareness and sensitization on e-learning has not been achieved comprehensively to reach all the staff. They pointed out that only a few teaching staff have been sensitized on e-learning alongside the senior university management, deans of schools, heads of academic departments and ICT staff, hence majority of the teaching staff are yet to be sensitized on e-learning.

4.4.4 Creating student awareness and sensitization on e-learning

From table 4.4 (a) and 4.4 (b), majority of the respondents believe that student awareness and sensitization on e-learning has not been created. According to the tables, 72% of student respondents and 66% of staff respondents (who either strongly disagree or disagree) indicated that awareness and sensitization on e-learning among the students has not been created.

Another 19% of student respondents and 10% of staff respondents felt that awareness and sensitization on e-learning among the students has been created. A further 9% of student respondents and 24% of staff respondents were undecided on whether awareness and sensitization on e-learning among the students has been created.

This agrees with the results from the interview of the key informants where 63% majority indicated that very little sensitization and awareness had been created among the students. Most of the students have not been sensitized on e-learning since e-learning is still a new concept in the University.

4.4.5 Integration of ICT technologies into teaching

According to table 4.4 (a) and 4.4 (b), 45% of student respondents and 52% of staff respondents (who either strongly disagree or disagree) indicated that ICT technologies has not been integrated into teaching.

A minority (42%) of student respondents and 45% of staff respondents (who either agree or strongly agree) are of the view that ICT technologies has been integrated into teaching. However, according to some respondents, ICT technologies has been integrated into teaching mostly in some schools and departments especially in engineering, science and ICT related programmes. This includes using LCD projectors and PowerPoint presentations in teaching. However, the respondents indicated that the level of integration of ICT technologies in other programmes especially arts and social science based programmes is still very low. The respondents pointed out that lack of adequate ICT equipment is an obstacle to integrating ICT technologies into teaching. Most teaching staff have also not been trained in use of ICT technologies in teaching.

4.5 Available ICT and e-learning infrastructure to support e-learning

The third objective of this study was to assess the level of available ICT and e-learning infrastructure to support the adoption of e-learning. Tables 4.5 (a) and 4.5 (b) shows the responses of students and staff respectively regarding the available ICT and e-learning infrastructure in Moi University. It is clear from the two tables that the level of available ICT and e-learning infrastructure to support e-learning in Moi University is still inadequate. The responses on specific areas of available ICT and e-learning infrastructure to support e-learning are explained in the following sections.

Table 4.5 (a): Available ICT and e-learning infrastructure in Moi University to support e-learning (Student Responses).

Available ICT and e-learning infrastructure	***Strongly Disagree***	***Disagree***	***Undecided***	***Agree***	***Strongly Agree***
	N (%)	**N (%)**	**N (%)**	**N (%)**	**N (%)**
Adequate No. of computers to support e-learning.	117(36%)	65(20%)	5(1%)	43(13%)	98(30%)
Adequate network connectivity to support e-learning.	149(45%)	18(6%)	7(2%)	35(11%)	119(36%)
Reliable Internet connectivity to support e-learning.	132(40%)	39(12%)	8(2%)	22(7%)	127(39%)

Number of respondents: (N = 328)

Table 4.5 (b): Available ICT and e-learning Infrastructure in Moi University to support e-learning (Staff Responses).

Available ICT and e-learning infrastructure	***Strongly Disagree***	***Disagree***	***Undecided***	***Agree***	***Strongly Agree***
	N (%)	**N (%)**	**N (%)**	**N (%)**	**N (%)**
Adequate No. of computers to support e-learning.	21(24%)	28(32%)	3(3%)	17(19%)	20(22%)
Adequate Internet bandwidth to support e-learning.	27(30%)	16(18%)	10(11%)	22(25%)	14(16%)
Adequate network connectivity to support e-learning.	15(17%)	24(27%)	7(8%)	26(29%)	17(19%)
Reliable Internet connectivity to support e-learning.	14(16%)	31(35%)	5(6%)	18(20%)	21(23%)

Number of respondents: (N = 89)

4.5.1 Number of computers to support e-learning

From table 4.5 (a) and 4.5 (b), 56% majority of student respondents and 56% majority of staff respondents (who either strongly disagree or disagree) indicated that the number of computers to support e-learning in Moi University is not adequate.

However, a minority of 43% of student respondents and 41% of staff respondents (who either agree or strongly agree) felt that there is adequate number of computers to support e-learning.

Majority (51%) of the key informants who were interviewed indicated that the number of computers to support e-learning in Moi University is not adequate. They also pointed out that the distribution of computers between different schools in the University is not uniform due to the nature of academic programmes offered in different schools. ICT, Science and Engineering related schools have more computers than other schools since their programmes rely heavily on computers. According to Table 1.1 in chapter one, in 2009, there were 2,953 computers in Moi University for use by a student and staff population of 19,127 and 3,662 respectively which translates to a higher student and staff to computer ratio.

4.5.2 Internet bandwidth to support e-learning

From table 4.5 (b), 48% of staff respondents felt that the Internet bandwidth to support e-learning in Moi University is not adequate.

Another minority of 41% of staff respondents (who either agree or strongly agree) were of the view that there is adequate Internet bandwidth to support e-learning whereas 11% of the staff respondents were undecided.

Majority (57%) of the key informants who were interviewed alluded that the current Internet bandwidth is inadequate. This was attributed to the current high cost of Internet bandwidth in Kenya. However, the respondents pointed out that with the arrival and operationalization of the backbone undersea fibre optic cable in Kenya, adequate bandwidth should be available at an affordable cost in the near future.

4.5.3 Network connectivity to support e-learning

From table 4.5 (a), 51% majority of the student respondents (who either strongly disagree or disagree) indicated that there is inadequate network connectivity to support e-learning in the University. However, 47% minority of the student respondents felt that there is adequate network connectivity to support e-learning in the University.

Table 4.5 (b) shows that 48% (who either agree or strongly agree) of staff respondents felt that the network connectivity to support e-learning in Moi University is adequate. A further 44% of staff respondents thought that there is inadequate network connectivity to support e-learning in the University. The differences in perception between the two categories of respondents could have been as a result of the fact that the network connectivity is concentrated more in staff offices and departments but not available in other places like student lecture halls and hostels.

According to some respondents who were interviewed, the distribution of the network data points is not uniform across the schools. Some schools have more data points than others, hence this could have accounted for differences in perception.

4.5.4 Reliability of Internet connectivity to support e-learning

From table 4.5 (a) and 4.5 (b), majority of both student (52%) and staff (51%) respondents (who either strongly disagree or disagree) responded that the Internet connectivity to support e-learning in Moi University is not reliable.

However, a minority of 46% of student respondents and 43% of staff respondents (who either agree or strongly agree) felt that the Internet connectivity to support e-learning in the University is reliable.

Majority (56%) of the key informants who were interviewed indicated that though the speed of the internet has improved over the last few years, it is still unreliable due to frequent downtimes that are experienced occasionally.

The findings above revealed that the Internet connectivity is not reliable to support the adoption e-learning.

4.6 Skills of Moi University staff and students on e-learning

The fourth objective in this study was to assess the level of e-learning skills of Moi University staff and students to support the adoption of e-learning. Tables 4.6 (a) and 4.6 (b) shows the responses of students and staff respectively regarding the e-learning skills of Moi University staff and students. It is evident from the two tables that majority of the students posses the relevant e-learning skills whereas majority of the teaching staff lack the relevant e-learning skills. However, both students and teaching staff require training in e-learning. The responses on individual aspects of e-learning skills are explained in the following sections.

Table 4.6 (a): Skills of Moi University staff and students on e-learning (Student Responses).

E-Learning skills	***Strongly Disagree***	***Disagree***	***Undecided***	***Agree***	***Strongly Agree***
	N (%)	**N (%)**	**N (%)**	**N (%)**	**N (%)**
Students have relevant e-learning skills.	36(11%)	60(18%)	52(16%)	101(31%)	79(24%)
There is need to train students on e-learning.	31(9%)	22(7%)	34(10%)	140(43%)	101(31%)

Number of respondents: (N = 328)

Table 4.6 (b): Skills of Moi University staff and students on e-learning (Staff Responses).

E-Learning skills	***Strongly Disagree***	***Disagree***	***Undecided***	***Agree***	***Strongly Agree***
	N (%)	**N (%)**	**N (%)**	**N (%)**	**N (%)**
Teaching staff have relevant e-learning skills.	16(18%)	43(48%)	5(6%)	16(18%)	9(10%)
Students have relevant e-learning skills.	10(11%)	23(26%)	13(15%)	36(40%)	7(8%)
There are adequate e-learning staff to support e-learning.	11(12%)	33(37%)	6(7%)	30(34%)	9(10%)
There is need to train teaching staff on e-learning.	0	4(4%)	6(7%)	33(37%)	46(52%)
There is need to train students on e-learning.	0	3(3%)	9(10%)	29(33%)	48(54%)
Teaching staff have skills in e-content development.	17(19%)	43(48%)	15(17%)	8(9%)	6(7%)

Number of respondents: (N = 89)

4.6.1 Relevant e-learning skills of Moi University teaching staff

From table 4.6 (b), majority of staff respondents believe that Moi University teaching staff lack the relevant technical skills on e-learning as indicated by a majority of 66% of staff respondents (who either strongly disagree or disagree).

Another minority of 28% of staff respondents (who either agree or strongly agree) believe that Moi University teaching staff have the relevant technical skills on e-learning whereas 6% of staff respondents were undecided on the issue.

Majority (59%) of the key informants who were interviewed also indicated that most of the teaching staff lack the relevant technical skills on e-learning since they have not been trained on e-learning skills. According to some key informants, only some few teaching staff have been trained so far in e-learning. However, the training of teaching staff on e-learning is on-going.

From these findings, it is clear that majority of the teaching staff lack the relevant e-learning skills.

4.6.2 Relevant e-learning skills of Moi University students

From table 4.6 (a) and 4.6 (b), majority of student and staff respondents believe that Moi University students have the relevant e-learning skills to take e-learning courses as indicated by 55% and 48% of student and staff respondents respectively (who either strongly agree or agree).

A further 29% minority of student respondents and 37% of staff respondents (who either strongly disagree or disagree) thought that Moi University students lack the relevant e-

learning skills to take e-learning courses. Another small proportion of 16% and 15% of student and staff respondents respectively were undecided.

Majority (62%) of the key informants who were interviewed agreed that majority of the students have the necessary technical skills to take e-learning courses. However, they felt that those in first year who may have had no prior exposure to ICT may not have the relevant skills to take e-learning courses.

From the above findings, it emerged that majority of the students have the relevant e-learning skills.

4.6.3 E-learning personnel to support e-learning

According to table 4.6 (b), 49% of staff respondents (who either strongly disagree or disagree) indicated that there are inadequate e-learning personnel to support e-learning in Moi University. A further minority of 44% of staff respondents (who either agree or strongly agree) believe that there are adequate qualified e-learning personnel to support e-learning in Moi University. Another 7% of staff respondents were undecided.

Majority (54%) of the key informants who were interviewed indicated that there are inadequate qualified e-learning personnel to support e-learning in Moi University. Though they pointed out that there are qualified ICT and e-learning personnel in the directorates of ICT and ODL respectively, they are not adequate to support e-learning in all the 14 schools of Moi University.

4.6.4 Need to train teaching staff on e-learning

From table 4.6 (b), majority (89%) of staff respondents (who either strongly agree or agree) felt that there is need to train the teaching staff on e-learning skills. A minority (4%) of staff respondents (who either strongly disagree or disagree) were of the view that there is no need to train teaching staff on e-learning skills. Another 7% of staff respondents were undecided.

Majority (93%) of the key informants interviewed responded that there is need to train the teaching staff on e-learning skills since majority of them lack these skills. According to some of the key informants, some few members of the teaching staff have already been trained on e-learning skills. It is clear from the findings that majority of the teaching staff have not been trained on how to use e-learning in teaching.

4.6.5 Need to train students to take courses through e-learning

From table 4.6 (a) and 4.6 (b), majority of both student and staff respondents responded that the there is need to train students to take courses through e-learning. A clear majority of 74% of student respondents and 87% of staff respondents (who either strongly agree or agree) felt that there is need to induct students to take courses through e-learning.

Minority (16%) of student respondents and 3% of staff respondents (who either strongly disagree or disagree) are of the view that there is no need to induct students to take courses through e-learning. Another minority of 10% and 10% of student and staff respondents respectively were undecided.

Majority (89%) of the key informants interviewed pointed out that there is need to induct students to take courses through e-learning.

4.6.6 Teaching staff skills in e-content course development

From table 4.6 (b), majority of staff respondents believe that majority of the Moi University teaching staff lack the relevant skills in e-content course development as illustrated by a majority of 67% of staff respondents (who either strongly disagree or disagree).

A further minority of 16% of staff respondents (who either agree or strongly agree) thought that the teaching staff have the relevant skills in e-content development while 17% of staff respondents were undecided.

Majority (76%) of the key informants interviewed indicated that the teaching staff lack the relevant skills in e-content course development since most of them have not been trained on the new technology.

4.7 Constraints hindering the adoption of e-learning in Moi University

The fifth objective in this study was to investigate the constraints hindering the adoption of e-learning in Moi University. Tables 4.7 (a) and 4.7 (b) shows the responses of students and staff respectively regarding the constraints hindering the adoption of e-learning in Moi University.

The two tables reveal that Moi University faces a number of constraints which hinder adoption of e-learning. The responses on individual constraints hindering the adoption of e-learning are elaborated in the following sections.

Table 4.7 (a): Constraints hindering the adoption of e-learning in Moi University (Student Responses).

E-Learning constraints	***Strongly Disagree***	***Disagree***	***Undecided***	***Agree***	***Strongly Agree***
	N (%)	**N (%)**	**N (%)**	**N (%)**	**N (%)**
Inadequate ICT and e-learning infrastructure.	31(9%)	22(7%)	13(4%)	96(29%)	166(51%)
Fear of new technology by students.	153(47%)	78(24%)	14(4%)	57(17%)	26(8%)

Number of respondents: (N = 328)

Table 4.7 (b): Constraints hindering the adoption of e-learning in Moi University (Staff Responses).

E-Learning constraints	***Strongly Disagree***	***Disagree***	***Undecided***	***Agree***	***Strongly Agree***
	N (%)	**N (%)**	**N (%)**	**N (%)**	**N (%)**
Financial constraints.	13(15%)	10(11%)	7(8%)	19(21%)	40(45%)
Inadequate skilled e-learning personnel.	9(10%)	31(35%)	6(7%)	13(14%)	30(34%)
Lack of interest among the teaching staff.	7(8%)	23(26%)	10(11%)	33(37%)	16(18%)
Lack of technical skills on e-content.	3(4%)	25(28%)	2(2%)	32(36%)	27(30%)
Amount of time required to develop e-learning courses.	8(9%)	26(29%)	5(6%)	38(43%)	12(13%)
Inadequate ICT and e-learning infrastructure.	11(12%)	9(10%)	3(3%)	30(34%)	36(41%)
Lack of affordable and adequate Internet bandwidth.	12(13%)	15(17%)	6(7%)	17(19%)	39(44%)
Lack of an operational e-learning policy.	10(11%)	12(14%)	11(12%)	43(48%)	13(15%)
Fear of new technology by students.	26(29%)	41(46%)	6(7%)	12(13%)	4(5%)

Number of respondents: (N = 89)

4.7.1 Financial constraints

From table 4.7 (b), 66% majority of staff respondents (who either agree or strongly agree) believe that one of the constraints hindering the adoption of e-learning in Moi University is financial constraints.

However, 26% minority of staff respondents (who either strongly disagree or disagree) do not agree that financial constraints have hindered the adoption of e-learning in the University. Another 8% of the staff respondents were undecided.

Financial constraints was also singled out by the key informants who were interviewed as a constraint hindering the adoption of e-learning in Moi University. Despite the fact that the University makes some budgetary allocations to the directorate of ODL for running the directorate each financial year, the financial allocation is inadequate to carry out e-learning activities like training of staff and students on e-learning, e-content development and e-learning infrastructure development. Currently, implementation of most activities related to e-learning in the University is supported by the development partners such as MUK-VLIR-UOS Programme.

From the findings above, it emerged that though the University makes financial allocations for e-learning annually, it is not adequate to support e-learning activities.

4.7.2 Inadequate skilled e-learning personnel

From table 4.7 (b), 48% of staff respondents (who either agree or strongly agree) believe that inadequate skilled e-learning personnel in Moi University is a constraint hindering the adoption of e-learning.

However, a minority of 45% of staff respondents (who either strongly disagree or disagree) think that the adequacy of skilled e-learning personnel is not a constraint hindering the adoption of e-learning in the University. Another 7% of staff respondents were undecided.

The key informants interviewed also pointed out that there is inadequate skilled e-learning personnel in the University to support e-learning, hence it is a constraint hindering the adoption of e-learning. Though the key informants pointed out that there are qualified and skilled e-learning personnel in the directorate of ODL, the number is still inadequate to offer e-learning technical support in all the 14 schools of Moi University.

The findings thus reveal that the existing e-learning personnel are not adequate to support e-learning in the entire University.

4.7.3 Lack of interest among the teaching staff to use e-learning

From table 4.7 (b), 55% majority of staff respondents (who either agree or strongly agree) felt that lack of interest among the teaching staff to use e-learning is one of the constraints hindering the adoption of e-learning in Moi University.

Another minority of 34% of staff respondents (who either strongly disagree or disagree) were of the view that lack of interest among the teaching staff to use e-learning is not a constraint hindering the adoption of e-learning, while 11% of staff respondents were undecided.

The key informants who were interviewed also pointed out that there is lack of interest among majority of the teaching staff to use e-learning, hence it is one of the constraints hindering the adoption of e-learning. From the above findings, it is evident that there is lack of interest among majority of the teaching staff to use e-learning.

4.7.4 Lack of technical skills on e-content development by the teaching staff

From table 4.7 (b), 66% majority of staff respondents (who either agree or strongly agree) believe that lack of relevant technical skills on e-content development by the teaching staff is a constraint hindering the adoption of e-learning.

However, a minority of 32% of staff respondents (who either strongly disagree or disagree) thought that lack of technical skills on e-content development by the teaching staff is not a constraint hindering the adoption of e-learning in the University. Another small proportion of 2% of staff respondents were undecided.

Lack of relevant technical skills on e-content development by the teaching staff was also identified by the key informants as a constraint hindering the adoption of e-learning in the University. This was attributed to lack of training in e-content development among majority of the teaching staff. Only a few teaching staff have been trained in e-content development so far.

4.7.5 Amount of time required to develop e-learning courses

From table 4.7 (b), 56% majority of staff respondents (who either agree or strongly agree) indicated that the amount of time required to develop e-learning courses is a constraint hindering the adoption of e-learning.

Another 38% minority of staff respondents (who either strongly disagree or disagree) felt that the amount of time required to develop e-learning courses is not a constraint hindering the adoption of e-learning whereas 6% of staff respondents were undecided.

The key informants who were interviewed indicated that the amount of time required to develop e-learning courses was a constraint hindering the adoption of e-learning. Majority of the key informants pointed out that it takes a long time to develop e-content. However, once developed, it is easier and less time consuming to maintain and update.

4.7.6 Inadequate ICT and e-learning infrastructure

From table 4.7 (a) and 4.7 (b), 80% majority of student respondents and 75% majority of staff respondents (who either agree or strongly agree) indicated that inadequate ICT and e-learning infrastructure in Moi University is a constraint hindering the adoption of e-learning.

A minority of 16% of student respondents and 22% of staff respondents (who either strongly disagree or disagree) believe that the ICT and e-learning infrastructure is not a constraint hindering the adoption of e-learning. A further 10% and 11% of student and staff respondents respectively were undecided.

A 90% majority of the key informants who were interviewed affirmed that inadequate ICT and e-learning infrastructure is a major constraint hindering the adoption of e-learning in Moi University. They cited ICT and e-learning infrastructure like computers, LANs, internet connectivity and computer labs as inadequate to support e-learning in comparison to the student and staff population. However, some key informants pointed

out that though the ICT and e-learning infrastructure is not adequate, the University has made significant progress in building its ICT and e-learning infrastructure base in the last few years.

4.7.7 Lack of affordable and adequate Internet bandwidth

From table 4.7 (b), 63% majority of staff respondents (who either agree or strongly agree) indicated that lack of affordable and adequate Internet bandwidth in Moi University is a constraint hindering the adoption of e-learning.

However, a 30% minority of staff respondents (who either strongly disagree or disagree) indicated that lack of affordable and adequate Internet bandwidth is not one of the constraints hindering the adoption of e-learning in the University. A smaller minority of 7% of staff respondents were undecided.

Majority of the key informants who were interviewed indicated that there is lack of affordable and adequate Internet bandwidth in the University, hence it is a constraint hindering the adoption of e-learning. However, the respondents were optimistic that with the arrival and operationalization of the undersea backbone fibre optic cable in Kenya, the cost of Internet bandwidth will drop significantly in the next few years, hence the University will be in a position to acquire adequate bandwidth at an affordable cost.

4.7.8 Lack of an operational e-learning policy

From table 4.7 (b), 63% majority of staff respondents (who either agree or strongly agree) indicated that lack of an operational e-learning policy in Moi University is a constraint hindering the adoption of e-learning.

A further minority of 25% of staff respondents (who either strongly disagree or disagree) felt that lack of an operational e-learning policy is not a constraint hindering the adoption of e-learning while 17% of staff respondents were undecided.

Lack of an operational e-learning policy was also identified by majority of the key informants as a constraint hindering the adoption of e-learning. However, the key informants pointed out that there are draft ODL and ICT policies that will guide the University towards the adoption of e-learning. The two draft policies are currently awaiting approval by the Moi University Council, hence they are not yet operational.

4.7.9 Fear of new technology by the students

From table 4.7 (a) and 4.7 (b), 71% majority of student respondents and 75% majority of staff respondents (who either strongly disagree or disagree) felt that students do not fear new technology, hence it is not a constraint hindering the adoption of e-learning in the University. Another minority of 25% of student respondents and 18% of staff respondents (who either agree or strongly agree) thought that students fear new technology while 4% and 7% of student and staff respondents respectively were undecided.

4.7.10 Other constraints hindering the adoption of e-learning in Moi University

Other constraints identified by the respondents as hindering the adoption of e-learning include: widely distributed campuses of Moi University which are spread all over the country with most of them located in rural areas and lacking modern ICT and e-learning infrastructure; lack of modern lecture halls and labs equipped with ICT and e-learning facilities; lack of prioritization of ICT and e-learning; and lack of motivation of lecturers to use e-learning and convert courses to e-content.

4.8 Strategies that the University could use to enhance the adoption of e-learning

The sixth objective in this study was to recommend possible strategies that the University could use to enhance the adoption of e-learning. Various strategies were suggested by the respondents who filled the questionnaire and those who were interviewed as possible strategies that the University could use to enhance the adoption of e-learning. These strategies were summarized as:

- Introduction of compulsory ICT and e-learning courses for all students at first and second year of study in the University.
- Ensuring that students have accessibility to e-learning and as well as provision of learner support to the students.
- Using blended learning approach which combines both e-learning and conventional face to face learning as a starting point.
- Collaborations and partnerships in e-learning with the government, private sector, development partners and other institutions which have implemented e-learning successfully to acquire best practices.
- Equipping student labs, lecture halls, lecturers' offices and student hostels with the relevant ICT and e-learning equipment to enable students and staff access e-learning content anytime.
- Identifying a way of motivating the teaching staff to use e-learning and convert their course materials to e-content.
- Encouraging students to study using e-learning mode by subsidizing the cost of study through e-learning.

- More support and involvement from top university management in adoption and implementation of e-learning.
- Making it compulsory for each student to have a laptop when reporting to the University to enhance their ICT and e-learning literacy.
- Piloting e-learning in few selected schools and finally rolling it out to the entire University once the piloting has succeeded.

4.9 Necessity for a Simpler Open Source LMS in Moi University

The seventh objective in this study was to develop a simpler open source learning management system to support e-learning in Moi University. It was therefore necessary for the researcher to first establish whether a simpler open source learning management system was required in the University. Table 4.9 shows the responses of students and staff regarding the necessity for a simpler open source learning management system in Moi University.

Table 4.9: Necessity for a simpler open source learning management system

Necessity for a simpler open source Learning Management System in Moi University	***No***	***%***	***Yes***	***%***
Students	20	6%	308	94%
Staff	17	19%	72	81%
Total	**37**	**9%**	**380**	**91%**

Number of respondents: Students (N = 328), Staff (N = 89)

From table 4.9, a clear majority of both student and staff respondents agreed that a simpler open source learning management system is required in Moi University. Majority

(94%) of student respondents and 81% of staff respondents felt that Moi University requires a simpler open source learning management system to support e-learning in the University.

All the key informants interviewed indicated that a simpler open source learning management system is required in Moi University. Among the features of the simpler open source learning management system that the respondents suggested include: ease of use and learn; user friendly interface with consistent command buttons; and menu driven commands.

Based on objective 7 of this study and the recommendations by the respondents in section 4.9 on the need for a simpler learning management system, the researcher chose to develop a simpler open source learning management system called MUWEBCAMPUS with the features suggested by the respondents.

CHAPTER FIVE

ANALYSIS, DESIGN AND DEVELOPMENT OF THE LEARNING MANAGEMENT SYSTEM (MUWEBCAMPUS)

5.0 Introduction

The last couple of years has seen a growing dependency on computers and information systems in carrying out diverse number of tasks including teaching and learning. In this digital era, the use of online learning management systems to support teaching and learning in a modern institution like Moi University is no longer an option but a necessity. Teaching and learning can be facilitated and supported through the use online learning management systems. However, most of the existing learning management systems are still quite complex for use by the novice users, hence hindering their implementation. This has resulted in several challenges both for the teaching staff and the students.

The goal of this project is to develop a simpler open source learning management system comprising the simplicity features suggested by the respondents in section 4.9. The system should satisfy the learning and teaching needs of both the students and the teaching staff in the University. The new learning management system MUWEBCAMPUS is a simpler open source LMS that will facilitate efficient and effective delivery of e-learning content to students by enabling the teaching staff to easily upload e-content and students to access e-content online. MUWEBCAMPUS is written in PHP (see appendix 6), and it is installed (see appendix 9) on the server-side, along with MySQL database and Apache web server software.

5.1 Systems Analysis and Design Methodology

Structured Systems Analysis and Design Methodology (SSADM) was used in the design and development of MUWEBCAMPUS learning management system. SSADM is a data driven, 'waterfall' systems approach to the analysis and design of information systems. SSADM can be thought to represent a pinnacle of the rigorous document-led approach to system design, and contrasts with more contemporary Rapid Application Development methods (Weaver et al., 1998). SSADM follows the waterfall life cycle in full from the feasibility study through to the physical design stage of development.

5.1.1 Steps used in SSADM

SSADM is a waterfall approach with sequences of events that run in series and each step leads on from the last. There are five steps in total (see figure 5.1), and each step can be broken down further.

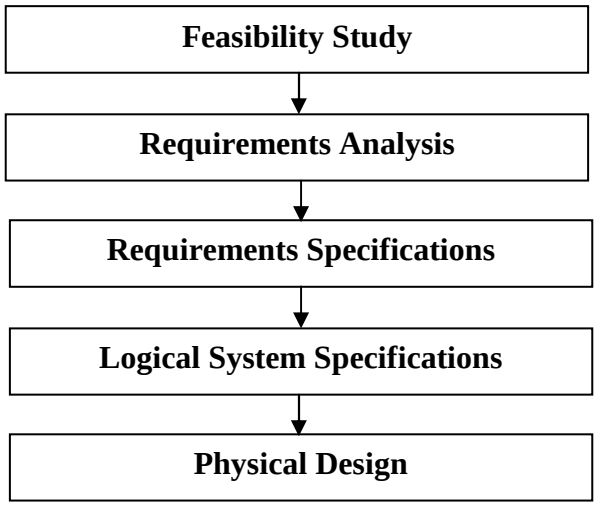


Figure 5.1: Steps Used in SSADM (Adopted from Al-Humaidan and Rossiter (2002))

Feasibility Study – To determine whether it is cost effective to go ahead with the system and whether it is actually feasible to develop a particular system.

Requirements Analysis – Identifying of the requirements and needs of the system and modelling these needs in terms of the processes carried out.

Requirements Specification – The functional and non functional requirements are identified in detail.

Logical System Specification – Technical systems options are created and the logical design of the system created. This includes the design of update and enquiry processing.

Physical Design – The logical system specification and technical system specification is used to design a physical database and set of program specifications.

For each of the above stages, SSADM defines techniques and procedures for recording and communicating the information. This includes both textual and diagrammatic representations (Weaver et al., 1998).

5.2 Feasibility Study

According to Sommerville (2004), a feasibility study decides whether or not the proposed system is worthwhile. Feasibility study includes a short focused study that checks:

- If the system contributes to organisational objectives;
- If the system can be engineered using current technology and within budget;
- If the system can be integrated with other systems that are used.

The objective of carrying out a feasibility study therefore was to find out if the learning management system should be developed. Both technical and economic feasibility study was carried out.

5.2.1 Technical Feasibility Study

The purpose of technical feasibility study was to establish if the learning management system project is feasible within the limits of the current technology. From a survey visit by the researcher to the Directorate of ICT in Moi University, it was established that Moi University had the necessary hardware and software to facilitate the development of a MUWEBCAMPUS learning management system. The University had 8 high capacity servers in the ICT server room out of which any of them is capable of hosting the learning management system. The University also has established LANs in most schools and departments. The LANs are interconnected via a fiber backbone network to facilitate accessibility to the learning management system. The servers in the University supports both Windows and Linux platforms. The MUWEBCAMPUS learning management system will run on any of the platforms. However, the recommended platform is Linux since it's a free open source operating system. The ICT end-users in the University (staff and students) are using workstations and laptops having Internet explorer and/or Mozilla browsers which are required to access MUWEBCAMPUS learning management system online. The learning management system project is therefore technically feasible.

5.2.2 Economic Feasibility Study

The purpose of economic feasibility was to investigate if the project is possible given resource constraints and whether the benefits that will accrue from the new system are worth the costs. Since the proposed MUWEBCAMPUS learning management system will be developed by customizing Claroline framework using open source tools (php, mysql and apache), then the cost of the software licenses will not be incurred since these open source software are free. The only little costs that will be incurred will be in training

of the users and customization. Once the system is operational, it will enable lecturers teach many students in different locations at no extra cost. The project is therefore economically feasible.

5.2.3 Justification of the MUWEBCAMPUS LMS

MUWEBCAMPUS was developed using php by customizing Claroline framework. Claroline was chosen from among other alternative platforms which included WebCT, Moodle, Dokeous, Chisimba, ATutor and Blackboard. Claroline was found to be a more appropriate platform for customizing a simpler open source LMS because it is easy to install, simple and easy to use, capable of hosting a large number of users and can easily be customized to suit local requirements (http://www.claroline.net/about-us.html).

A number of institutions of higher learning worldwide have customized open source based learning management systems. In Kenya for instance, University of Nairobi (http://elearning.uonbi.ac.ke) and Moi University (http://elearning.mu.ac.ke/chisimba/) have customized Chisimba framework while Kenyatta University (http://soma.ku.ac.ke/moodle/), Strathmore University (http://www.elearning.strathmore.edu/) and Jomo Kenyatta University of Agriculture and Technology (http://www.jkuat.ac.ke/elearning/) are using Moodle all of which are open source learning management systems. University of Zimbabwe (http://elearning.uz.ac.zw/), Kigali Independent University (http://www.ulk-kigali.net/), Ghent University in Belgium (http://www.ugent.be/en) and University of Zagreb in Croatia (http://www.unizg.hr/homepage/e-learning/) are among the universities which have customized Claroline framework as their learning management system.

5.3 Systems Analysis

According to Sommerville (2004), systems analysis is a critical component of successful software systems. The objective of systems analysis is to learn exactly what takes place in the current system, to determine and fully document in detail what should take place and to make recommendations to the management on alternative solutions and their costs. The main emphasis of systems analysis is to investigate;

- What takes place in the current existing system?
- What procedures and documents are used and who are involved in each operation?
- What transactions are processed and what information is generated and used?
- What is desired by the end-user in terms of information?
- What are the strengths of the current system that have to be upheld, procedures that should be eliminated and procedures that have to be improved?

In addition, systems analysis is also aimed at determining why certain system activities are done as they are done, and determine where improvements and changes should be done.

A large part of systems analysis and design involves working with current and eventual users of the information system. Therefore, proper systems analysis was carried out to investigate some of the important aspects which are needed to make the learning management system acceptable such as the activities, processes and transactions that take place in the current system; and the strengths and weaknesses inherent in the current system. This was to help in the development of specifications for the new learning management system.

5.3.1 Investigation of the current system

A system can be defined as a set of procedures designed to accomplish a specified common goal. According to Naidu (2006), online learning management systems are software applications that comprise an integrated suite of tools to enable online learning interventions. In large-scale operations, online learning management systems (or LMSs as they are commonly known) can save costs and time. Online learning management systems can help to improve the speed and effectiveness of the educational processes, communication among learners, and also lecturers and students.

The current manual system of conventional face to face teaching receives its inputs mainly from the lecturer. The lecturer prepares learning content which includes lecture notes, assignments, continuous assessment tests, exams etc. The content of lectures is disseminated to the students during lecture time orally or writing the content on the black or white board. Students can acquire the content also through dictation or handouts of hard copies. The current system is mostly teacher centered.

5.3.2 Inputs into the current conventional face to face teaching system

There are quite a number of inputs into the current system which include;

a) Lecture notes provided by the lecturer by writing on the board, oral discussion or handouts.
b) Continuous assessment tests and assignments administered by the lecturer.
c) Exams administered and supervised by the lecturer.

5.3.3 Processes in the current conventional face to face teaching system

There are several processes that take place in the current system which include;

a) Delivery of the lecture.
b) Administration of continuous assessment tests and assignments.
c) Administration and supervision of exams.
d) Marking of continuous assessment tests, assignments and exams.
e) Evaluation of the course.
f) Approval of results by the school board and senate.

5.3.4 Outputs from the current conventional face to face teaching system

The current system produces several outputs amongst which are;

a) Results of student's continuous assessment tests and assignments.
b) Results of student exams.
c) Results of course evaluation.
d) Graduating students.

5.3.5 Shortcomings of the current conventional face to face teaching system

The current conventional face to face mode of teaching is quite inefficient due to the following shortcomings as pointed out in the literature review in chapter two.

i. Lacks flexibility of space, location and time. The student has to be in class at the specific lecture time and in a specific place.
ii. It is teacher centered. Students have little input and participation in the lecture.
iii. In the absence of the lecturer, teaching and learning will not take place.
iv. Access to learning materials and learner support is only available during lecture hours
v. Students have to learn at the pace of the lecturer and not their own pace.
vi. Duplication and repetition of teaching content to students distributed in different campuses.

5.3.6 Advantages of the conventional face to face teaching system

Despite the shortcomings of the current conventional face to face teaching, it has worked well enough for the University for some time. The current conventional teaching system is also cheaper and easy to implement since very few equipment are required. However, as the University continues to expand, it will be very inefficient and expensive to operate.

5.3.7 Benefits of the new Learning Management System

Due to the shortcomings of the conventional face to face teaching system mentioned above, the new learning management system MUWEBCAMPUS will provide a simpler e-learning platform that is expected to increase efficiency in learning and teaching. The LMS is aimed at eliminating the shortcomings associated with the current conventional face to face teaching approach. Among the benefits of the new MUWEBCAMPUS LMS include:

i. It is free and open source, easy to use and learn.
ii. Flexibility: students will be able to access learning content without the limitation of space, location and time.
iii. Students can learn at their own pace (learner centered).
iv. In the absence of the lecturer, teaching and learning will continue with students accessing content through the e-learning platform (MUWEBCAMPUS).
v. Many students at different campus locations can access similar content at the same time.

5.3.8 Inputs to the new Learning Management System

There are a number of inputs to the new learning management system MUWEBCAMPUS. These include;

a) User account information (lecturer or student): last name, first name, user name, password, email and phone number.
b) Course information: course title, course code, lecturer, email, category, department, course access and enrollment.
c) Course description: course title, objectives, goals, course content etc.
d) Assignments, exercises and continuous assessment tests uploaded by lecturers.

5.3.9 Expected Processes in the new LMS

There are a number of processes that take place in the new learning management system MUWEBCAMPUS. These include;

a) Creation of users (lecturers and students): this involves users registering their details into the system.
b) Creation of course information by lecturers: lecturers are assigned privileges by the system administrator to create courses.
c) Course enrollment: a student can enroll to a course if it allows self enrollment or can enroll to a private course if he/she has been added to the course list by the course creator (lecturer).
d) Removing course enrollment.

5.3.10 Expected outputs from the new LMS

a. Electronic content (e-content) for access and use by students.
b. Online exercises, assignments and assessment tests.
c. Results of exercises, assignments and assessment tests that have been marked by lecturers.
d. Electronic list of all lecturers, students and available e-courses.
e. Course enrollment lists.

5.4 Requirements Analysis and Specifications

According to Pressman (2005), requirements engineering involves elicitation. Elicitation is determining what the customer requires. Requirements analysis was categorized into four areas namely:

- Hardware requirements.
- Software requirements.
- Human resources requirements.
- Functional requirements

5.4.1 Hardware Requirements

The recommended hardware requirements for the system to run optimally are specified below:

Recommended Server computer minimum specifications

Make/model: HP Server or Dell Server

Processor Speed: Quad Core 3.0 GHZ

RAM: at least 4GB

Hard disk: 500 GB or above

Monitor/Screen: LCD Flat Screen 17 Inch

Removable media: DVD/CD R/W combo drive, 6 USB ports, Tape Backup Drive

Full multimedia: Audio card and inbuilt speakers

Network interface (Nic): 10/100/1000 Mbps Network Interface Card and Wireless card

Warranty: At least 3 years

Recommended Client computer minimum specifications

Make/model:	HP or Dell
Processor Speed:	Core 2 Duo Genuine Intel 3.0 GHZ
RAM:	2GB
Hard disk:	160 GB
Monitor/Screen:	LCD Flat Screen17 Inch
Removable media:	DVD/CD R/W and 6 USB ports or above
Network interface (Nic):	10/100 Mbps Network Interface Card and Wireless card
Full multimedia:	Audio card, inbuilt speakers and Web Cam
Warranty:	At least one year

The high-end specifications of the server such as 4GB RAM is to enable it to handle many requests from many users accessing the e-learning server. The large hard disk space will facilitate storage of voluminous e-content from many course creators.

5.4.2 Recommended Software Requirements

Server software

Operating System

- Linux (any Linux distribution) to host the MUWEBCAMPUS e-learning platform.

Database and Web Server

- **MySQL database:** is one of the standard query languages for interacting with databases. MySQL is an open source database server that is free and extremely fast. MySQL is also cross platform and it has a high customer base for its flexible licensing terms, ease of use and high performance.

- **PHP:** PHP is the web development language written by and for web developers. PHP stands for Hypertext Preprocessor. It is a robust, server-side, open source scripting language that is extremely flexible and very easy to learn.
- **Apache web server:** Apache is the most popular of all the web servers available because it supplies basic web server functionalities (Linux Web Solutions, 2000).

Client software

- Widows XP/Vista/Windows 7 Operating System
- Internet Explorer or Mozilla Firefox web browsers

5.4.3 Human Resource Requirements

A database or systems administrator with knowledge of databases and Linux servers will be required to maintain the MUWEBCAMPUS e-learning platform and the e-learning server as well as provide technical support to the lecturers creating digital course content. The administrator will also be responsible for backups of content, assigning permissions to course creators and fine tuning the server. Lecturers in schools will also require basic training in creating e-content using MUWEBCAMPUS LMS. These lecturers will be course managers.

5.4.4 Functional Requirements

The new learning management system MUWEBCAMPUS uses a MySQL database-driven system design approach. An interview with the target end-users of the proposed MUWEBCAMPUS learning management system revealed the following functional requirements of the system:

a) Maintain lecturers and students information e.g last name, first name, user name, password, email and phone number.

b) Maintain e-content created and uploaded by the lecturers.

c) Maintain assignments, exercises, continuous assessment tests and other tests created and uploaded by the lecturers.

d) Enable course enrollment by the students.

e) Enable course de-enrollment by the students or lecturers.

f) Facilitate access to e-content by the students.

g) Enable students to undertake assignments, exercises, continuous assessment tests and other tests online and get marked results online.

h) Enable generation of electronic list of all lecturers.

i) Enable generation of course enrollment lists.

j) Management of online class transactions.

k) Tracking and reporting of learner progress.

l) Assessment of learning outcomes.

m) Reporting of achievement and completion of learning tasks.

n) Student records management.

As earlier indicated in table 4.9 in chapter 4, majority of the respondents were of the opinion that Moi University requires a simpler open source learning management system.

5.5 Systems Customization and Implementation

Having identified the main components of the system, including the types of inputs that will need to be processed into the necessary outputs, the next logical step was to download the Claroline open source framework and customize to ensure that the needed functional requirements are translated into the new MUWEBCAMPUS learning management system. Claroline framework was chosen because it is free, open source, easy to use and ideal for low bandwidth environments (http://www.claroline.net/about-us.html). Customization was guided

by the new LMS simplicity features suggested by the respondents in section 4.9 namely: ease of use and learn; user friendly interface with consistent command buttons; and menu driven commands. The customization aims at achieving the following objectives:

i. Correctly and exhaustively represent all the functions to be performed in the new system.
ii. Clearly and explicitly customize the system to meet the local institutional and user requirements.

Because with open source software the source code is released for free, it was possible to modify the source code so that the software meets the learning management system requirements of Moi University.

5.6 Logical System Design and Specifications

The outputs of this stage are implementation-independent and concentrate on the requirements for the human computer interface. The main areas of activity are the definition of the user dialogues. These are the main interfaces with which the users will interact with the system. The logical system design specifies the main methods of interaction in terms of menu structures and command structures (Lester, 1993).

5.6.1 Input Design

The system input interface was designed and customized with the user in mind, considering simplicity factors like ease of use, user friendly interface, consistency of command buttons and menu driven commands as suggested by the respondents in section 4.9. The input is through forms on the screen, which are similar in format in order to maintain consistency.

5.6.2 Output Design

The output format was designed after a careful analysis of the organizational and user requirements (see section 4.9). Output is displayed on the computer screen and can be printed as a hardcopy where necessary.

5.6.3 Screen Layouts

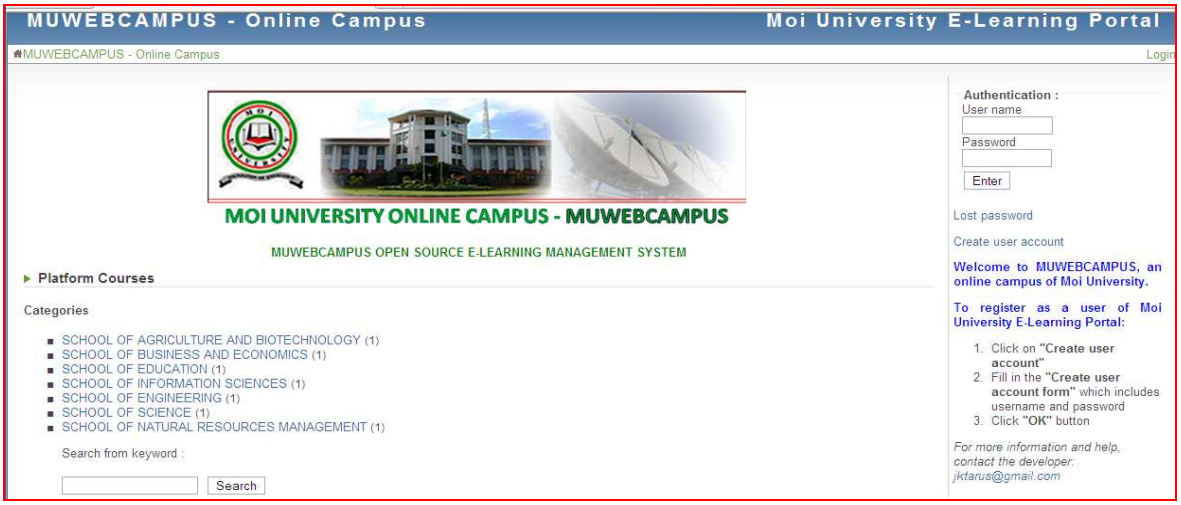


Figure 5.2: MUWEBCAMPUS Home Page and User Login Screen

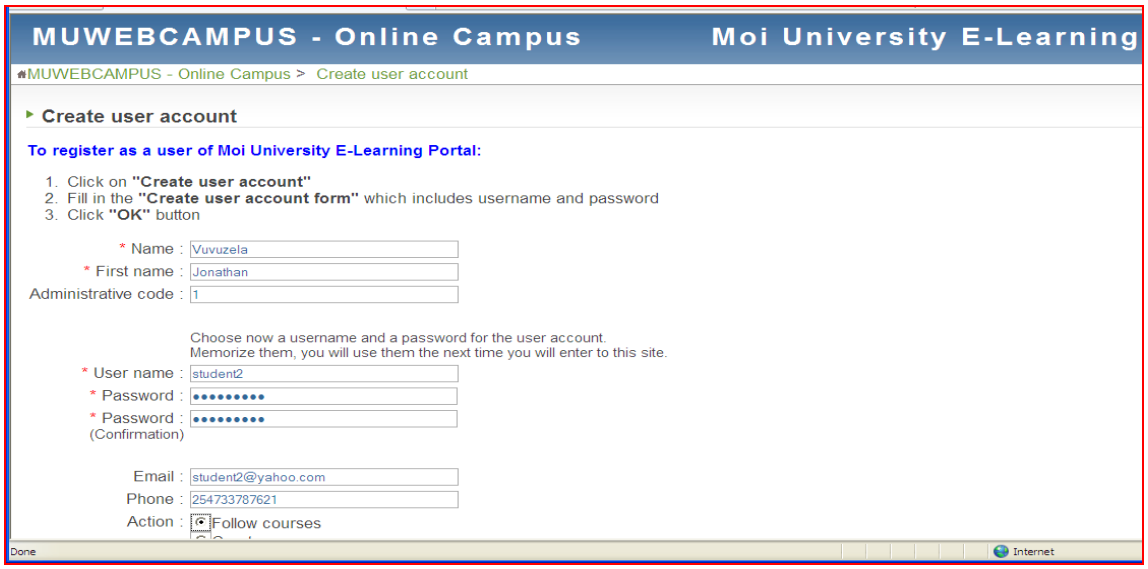


Figure 5.3: Create User Input Screen

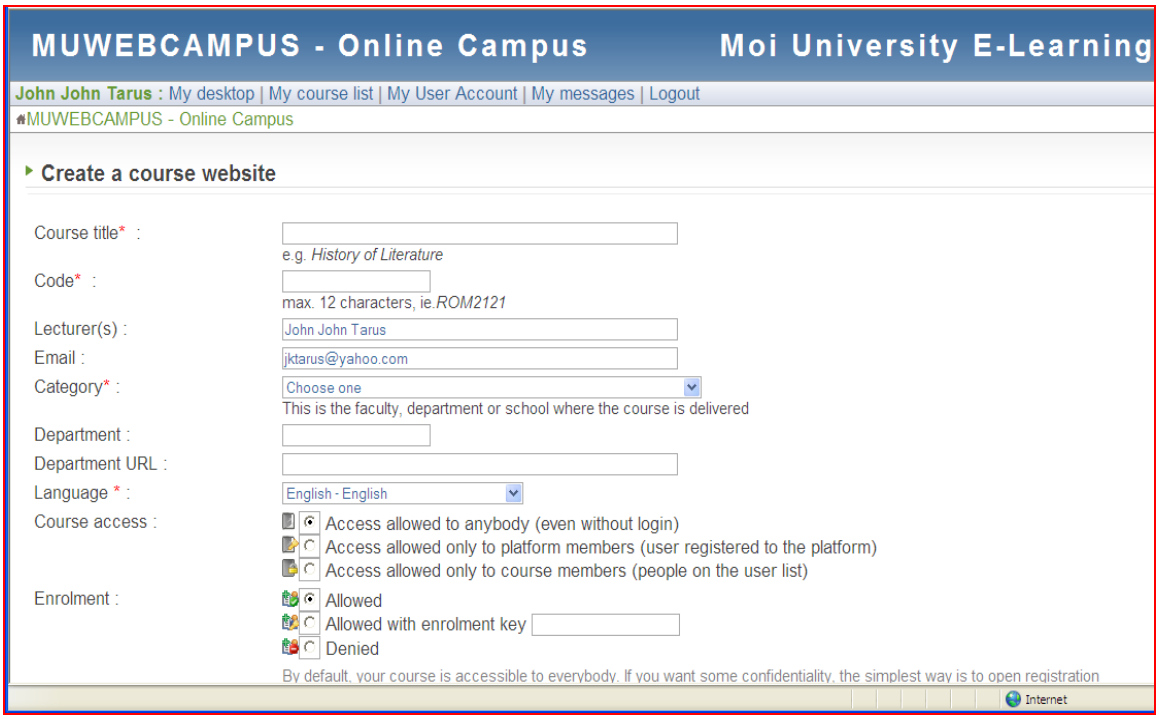


Figure 5.4: Course Creation Screen

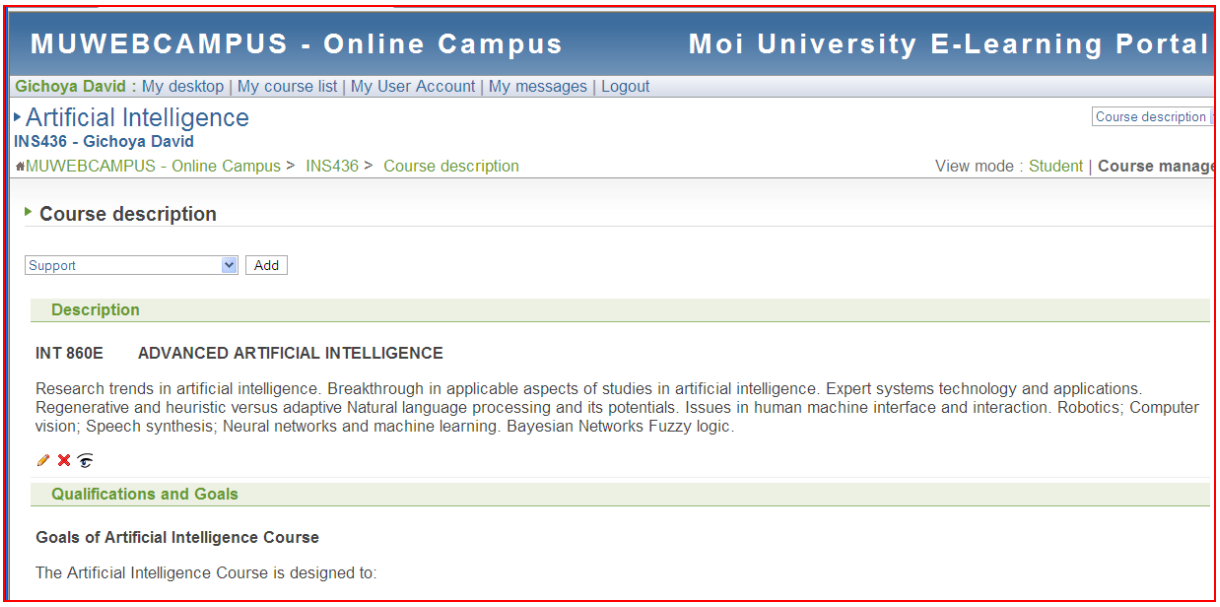


Figure 5.5: Sample Output Screen

5.6.4 Accessing MUWEBCAMPUS Learning Management System

MUWEBCAMPUS learning management system is an online web based system which can be accessed on Moi University intranet/internet using any web browser.

The URL to access MUWEBCAMPUS learning management system is http://mis.mu.ac.ke/muwebcampus/ (see appendix 9).

5.6.5 Control Design

The controls are required to check the accuracy of the system inputs, processes and outputs. This protects the system against unauthorized access and erroneous entries. For a user to create a course in the case of lecturers, the user must login with a user account with such privileges. New users create their accounts by clicking on “Create user account” on MUWEBCAMPUS homepage and filling the relevant details which includes the real names, username and password. Lecturers are granted additional permissions to create courses and enrollment lists by the systems administrator. Users will be required to login using their username and password. The username and password must be correct for a user to login.

5.7 Physical Design

The logical system specification and technical system specification is used to design a physical database and set of program specifications.

5.7.1 Database Schema and Structure

The structure of the database is a relational model. The tables relate to one another via unique primary keys and foreign keys. Figure 5.6 shows a simplified database schema of MUWEBCAMPUS database.

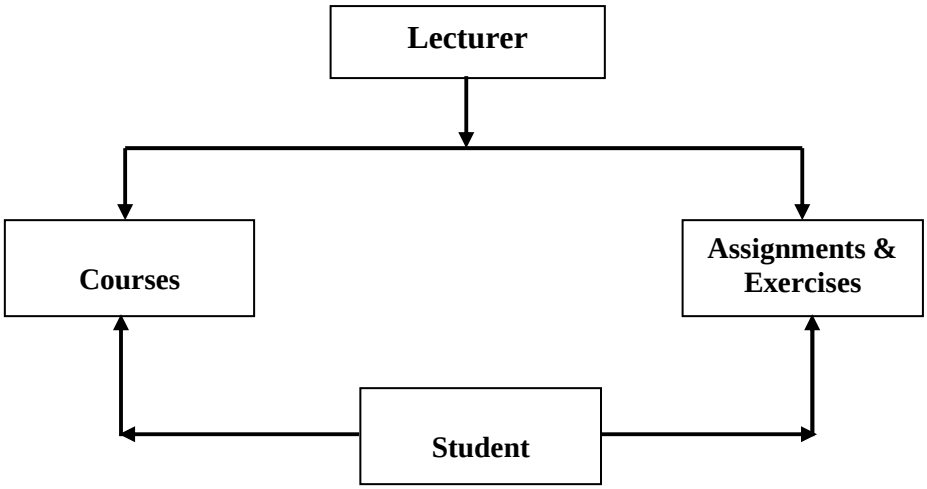


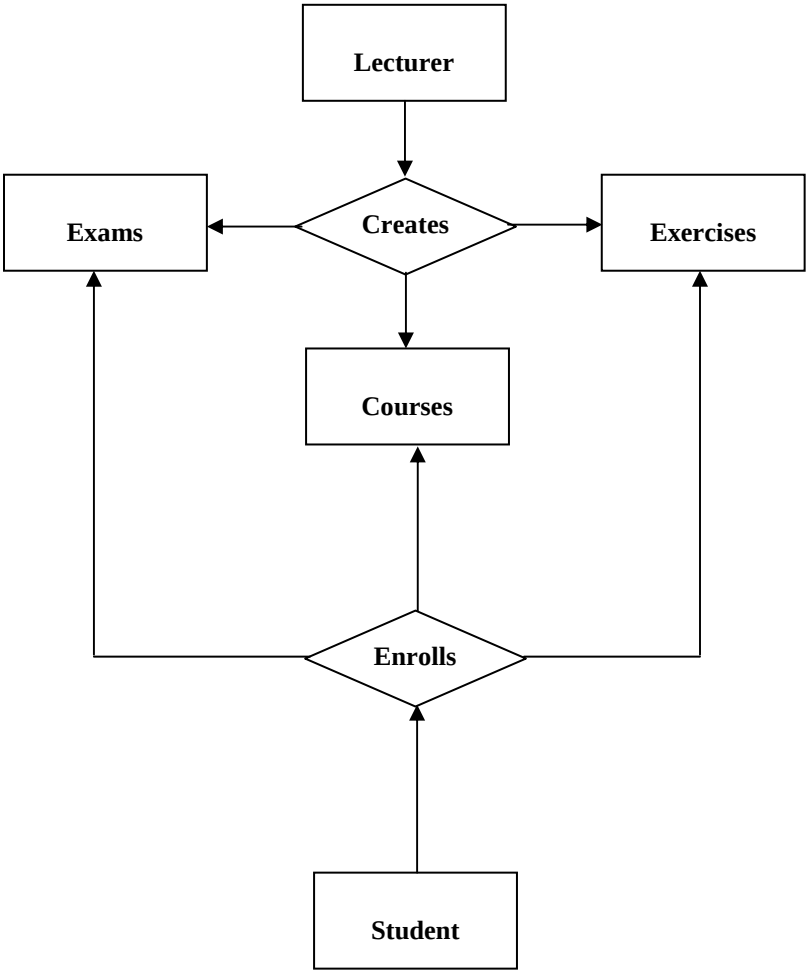
Figure 5.6: MUWEBCAMPUS Database Schema

5.7.2 Entities

Entities entail objects of interest to an organizational setup and which the particular organization would be interested in keeping data about. MUWEBCAMPUS learning management system is made up of 124 entities. Below is a list of some few important entities of MUWEBCAMPUS database.

cl_user
c_com100_001_course_description
c_com100_001_wrk_assignment
c_com100_001_wrk_submission
c_com100_announcement
c_com100_bb_forums
c_com100_calendar_event
c_com100_chat_users
c_com100_qwz_answer_multiple_choice
c_com100_qwz_exercise
c_com100_qwz_question
c_com100_qwz_tracking_questions
c_com100_qwz_tracking_answers

5.7.3 The Global Entity Relationship (ERD) Model



Key:

Entity → ▭ **Relationship** → ◇

Figure 5.7: Global Entity Relationship (ERD) Model

5.7.4 Database Design and Data Dictionary of some selected tables

Table 5.1: cl_cours_user table

Field	Type	Null	Default	Comments
code_cours	varchar(40)	No	0	
user_id	int(11)	No	0	
profile_id	int(11)	No		
role	varchar(60)	Yes	*NULL*	
team	int(11)	No	0	
tutor	int(11)	No	0	
count_user_enrol	int(11)	No	0	
count_class_enrol	int(11)	No	0	
isCourseManager	tinyint(4)	No	0	

Table 5.2: c_com100_001_course_description table

Field	Type	Null	Default	Comments
id	int(11)	No		
category	int(11)	No	-1	
title	varchar(255)	Yes	*NULL*	
content	Text	Yes	*NULL*	
lastEditDate	Datetime	No		
visibility	enum('VISIBLE', 'INVISIBLE')	No	VISIBLE	

Table 5.3: c_com100_001_wrk_assignment table

Field	Type	Null	Default	Comments
id	int(11)	No		
Title	varchar(200)	No		
description	Text	No		
visibility	enum('VISIBLE', 'INVISIBLE')	No	VISIBLE	
Def_submission_visibility	enum('VISIBLE', 'INVISIBLE')	No	VISIBLE	
assignment_type	enum('INDIVIDUAL', 'GROUP')	No	INDIVIDUAL	
authorized_content	enum('TEXT', 'FILE', 'TEXTFILE')	No	FILE	
allow_late_upload	enum('YES', 'NO')	No	YES	
start_date	Datetime	No	0000-00-00 00:00:00	
end_date	Datetime	No	0000-00-00 00:00:00	
prefill_text	Text	No		
prefill_doc_path	varchar(200)	No		
prefill_submit	enum('ENDDATE', 'AFTERPOST')	No	ENDDATE	

Table 5.4: cl_class table

Field	Type	Null	Default	Comments
id	int(11)	No		
name	varchar(100)	No		
class_parent_id	int(11)	Yes	*NULL*	
class_level	int(11)	No	0	

5.8 Systems Security

To ensure MUWEBCAMPUS systems security, the system adopted a multilevel security approach. The users who have been created will need to be authenticated before they can use the system. The user will be required to login to the e-learning platform using a username and password. After the successful login, students can enroll for a course if the course allows enrollment. Some courses will require enrollment key which will be supplied by the course creator while others will require the course creator to add his/her students to the course enrollment list for them to be enrolled. The course creator (lecturer) determines who accesses the course by granting the relevant permissions on course access and course enrollment during course creation process. The students who will access the course can only read, download and print but cannot modify or alter the course. Only the course creator (lecturer) or administrator can alter or make changes to the course.

5.9 Conclusion on MUWEBCAMPUS Learning Management System

MUWEBCAMPUS LMS is expected to overcome most of the inefficiencies of conventional face to face approach to teaching and learning. The e-learning platform has been well customized to meet the user's requirements (see section 4.9) and tested both in terms of input, processing and output and found to be accurate, hence it is ready for use.

MUWEBCAMPUS was found to be a good e-learning platform since it inherited the features of its parent framework Claroline i.e it is simple and easy to use; open source; capable of hosting a large number of users easily; compatible with Linux, Mac and Windows environments; uses the current standards like SCORM for the exchange of contents; and can be easily installed (http://www.claroline.net/about-us.html).

5.10 Recommendations on the MUWEBCAMPUS LMS

The researcher made the following recommendations emerging from the system analysis, design and development of the MUWEBCAMPUS learning management system.

5.10.1 Implementation of MUWEBCAMPUS LMS

The new system should be implemented by initially piloting in a few schools for one academic year before rolling it out to other schools once it has been tested further in the selected schools. However, the e-learning platform has been well tested for correctness, accuracy and reliability. The piloting will make room for evaluation of performance of the new system in the few schools with the aim of checking for any shortcomings before rolling it out to the entire University. This system can be implemented alongside conventional face to face learning (as blended learning) to take advantage of the benefits of the two approaches to teaching and learning.

5.10.2 Training

It is highly recommended that the lecturers who will be creating, managing and uploading courses to MUWEBCAMPUS e-learning platform be trained on how to use the e-learning portal prior to implementation. Online end-user support manuals have also been made available on the e-learning portal available at: http://mis.mu.ac.ke/muwebcampus/ to enable lecturers and students learn more about how to use the e-learning platform. However, the new system is easy to use and learn.

5.10.3 Maintenance and Support

There will be need to hire a database or systems administrator to maintain the MUWEBCAMPUS e-learning platform server and provide technical support to users where necessary. The administrator will be in charge of making backups of e-content, ensuring that the server is up and running all the time, allocation of additional permissions to course creators and ensuring database security. The database should be backed up periodically.

5.10.4 ICT and E-Learning Infrastructure

Servers, computer workstations, local area networks and internet connectivity will be required to facilitate accessibility of the system from remote end-user locations. Being an online web based LMS, an operational and reliable network connectivity will be required.

5.10.5 System Evaluation and Review

It is recommended that the new LMS be evaluated and reviewed from time to time to ensure that it meets the original goals and objectives. Through these regular reviews, any necessary corrective, preventive and adoptive measures can be undertaken.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.0 Introduction

This chapter presents the summary of the findings, conclusions and recommendations of the study. Appropriate conclusions and recommendations were made on the basis of the research study findings and learning management systems analysis, design and development. Finally, suggestions for further research in the area under study were made.

6.1 Answering the Research Questions

The purpose of this study was to analyze and investigate the important components necessary for the adoption of e-learning to support teaching and learning in Moi University with a view to developing a simpler open source learning management system to support e-learning in Moi University. The study had seven objectives as outlined in chapter one guided by seven research questions listed below.

1. Are the staff and students aware of the existence of e-learning in Moi University?
2. What measures are being undertaken by Moi University towards the adoption of e-learning?
3. Does the available ICT and e-learning infrastructure adequate to support the adoption of e-learning in Moi University?
4. Does Moi University staff and students posses the relevant e-learning skills?
5. What constraints does the University face in its bid to adopt e-learning?
6. What strategies would be most appropriate for the University to enhance the adoption of e-learning?
7. Does the University need a simpler open source learning management system to support teaching and learning?

A total of 521 respondents were sampled in this study. Questionnaires were administered to 481 respondents and 40 respondents were targeted for interview. 87% of the 481 respondents completed and returned the questionnaires while 85% of the 40 respondents were interviewed successfully and their responses recorded. The questionnaires and interview schedules were used to collect data related to the above research questions. Using the responses from the questionnaires and interviews, it was possible to answer each research question. The following is the summary of the major findings of the study.

6.2 Summary of Major Findings

This section summarizes the study findings based on the above research questions and data analysis in Chapter 4. The findings below are the important components necessary for the adoption of e-learning.

6. 2.1 Level of awareness of staff and students on existence of e-learning in Moi University

The study sought to establish whether students and staff are aware of the existence of e-learning in Moi University.

The findings revealed that majority of both students and staff in Moi University are aware of the existence of e-learning in the University (see section 4.3 of Chapter 4). However, the level of awareness is higher among the staff than the students. This was mainly attributed to the fact that very little sensitization and awareness on the existence of e-learning in the University has been done among the student community. Most of the senior university staff have undergone sensitization and awareness programmes on e-learning.

Apart from a number of workshops, seminars and trainings that are conducted to create awareness and sensitization on the existence of e-learning, the University should also use other media like University website, notice boards, Moi University FM Radio station and other print and electronic media to increase the level of awareness among both staff and students.

6. 2.2 Measures being undertaken by Moi University towards the adoption of e-learning

The findings revealed that the University is yet to fully undertake most of the measures required for adoption of e-learning (see section 4.4 of Chapter 4). The details of findings on specific measures are explained in the following sub sections.

(a) Appropriate e-learning policies to guide the University towards the adoption of e-learning

The study established that though there are two draft policies on ICT and ODL to guide the University towards the adoption of e-learning, the policies are not yet operational since they have not been approved by the Moi University Council. However, these policies will set the direction and strategy of adoption of e-learning in Moi University. It will provide a framework for the adoption and implementation of e-learning aimed at increasing efficiency and cost effectiveness in teaching and learning.

These findings are supported by Awidi (2008) who pointed out that the universities must have clearly defined strategic plans that spell out e-learning policies and implementation strategies.

(b) Financial allocation to support the adoption of e-learning

The findings indicated that though the University makes annual budgetary allocation to the directorate of open and distance learning (DODL) for running the directorate, there is inadequate financial allocation to support e-learning related activities like training of teaching staff, e-content development and ICT and e-learning infrastructure development. Moi University and other public universities rely heavily on the government for funding. However, in the last few years, government funding has been dwindling gradually, hence forcing universities to reduce funding for some of its projects including e-learning. Most of the ICT and e-learning related projects in Kenyan public universities is donor driven. These findings are also supported by Huynh et al (2003) who found out that budgetary restriction is a primary concern for institutions.

(c) Creating staff awareness and sensitization on e-learning

The results of this study revealed that only the senior university management, deans of schools, directors, heads of academic departments, ICT staff and some few lecturers have been sensitized on e-learning through workshops and seminars. However, creating comprehensive staff awareness and sensitization on e-learning in the University is still at a low level and has not reached majority of the teaching staff who are among the key stakeholders in the adoption of e-learning. Some key informants revealed that majority of the teaching staff are yet to be sensitized on the importance and benefits of e-learning since awareness and sensitization programmes started with top university management going downwards. Creating comprehensive staff awareness and sensitization is by far the greatest measure that must be dealt with before the adoption of e-learning in the institution.

(d) Creating student awareness and sensitization on e-learning

The findings also established that creating awareness and sensitization on e-learning in the University among the students is still at a very low level. Without sensitization of the students who are among the key stakeholders in e-learning, then adoption of e-learning may not be realized within a short time. Awareness and sensitization of students can be created by introducing compulsory ICT courses with a component of e-learning for all students in the first and second years of study. Also awareness can be created by the lecturers by offering part of the courses, assignments and exercises using e-learning approach, hence encouraging students to embrace e-learning.

(e) Integration of ICT technologies into teaching

The results of this study show that the level of integration of ICT technologies into teaching in Moi University is still very low. Though some schools and departments have integrated ICT technologies into teaching to support their programmes, majority still lack the necessary ICT equipment and relevant training to enable them integrate ICT technologies into teaching. Integration of ICT into teaching is among the first steps towards the adoption of e-learning.

6. 2.3 Available ICT and e-learning infrastructure to support e-learning

The findings indicated that the available ICT and e-learning infrastructure is inadequate to support the adoption of e-learning in Moi University (see section 4.5 of Chapter 4). The details of findings on each specific area on available ICT and e-learning infrastructure is elaborated in the following sub sections.

(a) Number of computers to support e-learning

The study revealed that the number of computers in Moi University is not adequate to support the adoption of e-learning. Although the University currently has 2,953 computers (see table 1.1) for use by 19,127 students and 3,662 staff, the student and staff to computer ratio is still very high. For adoption of e-learning to be successful, the student and staff to computer ratio should be reduced. This is also supported by ESIB (2003) who established that the institution providing e-learning must provide adequate technological infrastructure, including network connections and computers, and technical support for both students and staff.

(b) Internet bandwidth to support e-learning

The results further indicate that the Internet bandwidth to support e-learning in Moi University is not adequate. The current cumulative bandwidth of 42Mbps distributed among the four major campuses of Moi University is still inadequate to support e-learning for the entire student population and other prospective non-resident students.

(c) Network connectivity to support e-learning

The findings from the study show that majority of the students believe that there is inadequate network connectivity to support the adoption of e-learning in the University. The findings further reveal that majority of staff respondents believe that the network connectivity to support the adoption of e-learning in Moi University is adequate. The differences in perception by the student and staff respondents can be attributed to the uneven distribution of network data points which seems to be concentrated mostly on staff offices, library and some few student labs. Most of the facilities used by the students like lecture halls and halls of residence still lack network connectivity.

(d) Reliability of Internet connectivity to support e-learning

The study findings indicate that the Internet connectivity to support e-learning in Moi University is not reliable. There is always a possibility of prolonged downtime due to foreseen or unforeseen circumstances such as fibre cut, regular power and equipment failure witnessed in most Kenyan public universities.

Interestingly, most of the respondents interviewed acknowledged that though the internet reliability has improved in the last few years, it is still unstable due to some frequent downtimes. However, most of the problems of downtime are external and are attributed to Internet service and electric power providers.

6. 2.4 Skills of Moi University staff and students on e-learning

The results further revealed that majority of the teaching staff lack the relevant e-learning skills whereas majority of the students have the relevant skills to take e-learning courses (see section 4.6 of Chapter 4). However, the study found out that both students and staff still require training in e-learning skills. The details of findings on specific issues on e-learning skills for both staff and students are explained in the following sub sections.

(a) Relevant skills of Moi University teaching staff on e-learning

The study findings revealed that majority of Moi University teaching staff lack the relevant e-learning skills. This has hindered them from integrating e-learning into routine teaching and learning. However, according the key informants, training of the teaching staff on e-learning is on-going with some few teaching staff already trained. Blinco et al (2004) similarly articulates that e-learning's success rests on the fundamental requirement that instructors and students possess adequate technical skills to use e-learning tools effectively.

(b) Relevant skills of Moi University students on e-learning

The study findings show that majority of Moi University students have the relevant technical skills to take e-learning courses. This could be attributed to the fact that majority of the students in the University use computers and internet in doing their assignments and searching research articles which has prepared them to some extent with the basic prerequisite skills required to take e-learning courses.

(c) Qualified e-learning staff to support e-learning

E-learning experts with the necessary e-learning skills in Moi University and other Kenyan public universities is still in short supply since e-learning is still a new concept. The study revealed that there are inadequate qualified e-learning personnel to support the adoption of e-learning in Moi University. The few e-learning specialists in the directorates of ICT and ODL are inadequate to offer technical support to all the 14 schools of Moi University.

(d) Need to train the teaching staff on e-learning and e-content development

The findings of this study found out that there is need to train the teaching staff on e-learning and e-content development skills. Since e-learning is still a new concept in Moi University, the teaching staff will need to be trained on how to use this technology in teaching. The training will equip the lecturers with both technical and pedagogical skills on how to use e-learning in teaching as well as creating e-content.

This finding is supported by a survey done in Kenya which shows that most of the academics in universities have low ICT skills because most of them were trained in the absence of ICT environment (Wanyembi, 2002).

(e) Need to train students to take courses through e-learning

The findings of this study further indicated that there is need to carry out an induction of students to prepare them to take courses through e-learning. Though most students are computer literate, they will require basic induction on how to use the e-learning platform for learning. Romiszowski (2004) also observes that e-learning presents an entirely new learning environment for students, thus requiring a different skill set to be successful.

6. 2.5 Constraints hindering the adoption of e-learning in Moi University

The study found out that Moi University faces a number of constraints hindering the adoption of e-learning (see section 4.6 of Chapter 4). These constraints as revealed by the findings include:

(a) Financial constraints

The study established that inadequate funding for e-learning is among the constraints hindering the adoption of e-learning in Moi University. The University should therefore devise ways and means of mobilizing additional funds to support the adoption of e-learning. E-learning activities are currently funded by the University in partnership with development partners who include MUK-VLIR-UOS programme.

(b) Inadequate skilled e-learning personnel

Moi University and other public universities in Kenya face a number of challenges in recruiting and retaining qualified ICT and e-learning experts due to the high demand for such graduates by different institutions and organisations.

The study findings revealed that inadequate skilled e-learning personnel to support e-learning is a constraint hindering the adoption of e-learning in Moi University. There is need therefore for the University to recruit additional qualified e-learning personnel and train them to offer support for e-learning users.

(c) Interest among the teaching staff on e-learning

The study found out that lack of interest among the teaching staff to use e-learning is another constraint hindering the adoption of e-learning in the University. However, this constraint can be overcome with more awareness, sensitization and training of the teaching staff on e-learning as a better alternative approach to teaching. The University should also identify ways of motivating the teaching staff to encourage them to use e-learning e.g through promotions, monetary allowances etc for those lecturers using e-learning in teaching.

(d) Lack of technical skills on e-content development by the teaching staff

Lack of e-content to satisfy the needs of Moi University is now one of the main challenges hindering the adoption of e-learning. The study findings show that lack of relevant technical skills on e-content development by the teaching staff is among the constraints hindering the adoption of e-learning.

(e) Amount of time required to develop e-learning courses

The study further established that the amount of time required to develop e-learning courses is a constraint hindering the adoption of e-learning since developing an e-learning course takes a long time.

(f) Inadequate ICT and e-learning infrastructure

The study also revealed that inadequate ICT and e-learning infrastructure is a major constraint hindering the adoption of e-learning. The results indicated that though Moi University has in place ICT and e-learning infrastructure like computers, computer labs, LANs, Internet connectivity and ICT instructional equipment, they are still inadequate to support the adoption of e-learning. The 2,953 computers (see table 1.1) available in Moi

University is not adequate for a student population of over 19,000 and 3,662 staff. It was found out that the student labs, lecture halls, lecturers' offices, conference halls, and student hostels are not adequately equipped with the relevant ICT and e-learning facilities to enable students and staff access e-learning content anytime at their convenient location.

(g) Lack of affordable and adequate Internet bandwidth

Low internet bandwidth discourages most e-learning users in the University from using the e-learning platform. The findings revealed that lack of affordable and adequate Internet bandwidth is a constraint hindering the adoption of e-learning in Moi University. With the arrival and operationalization of the undersea backbone fibre optic cable in Kenya, higher bandwidth should be available in the near future at an affordable lower cost. Twinomugisha et al (2004) in a survey carried out by the AVU also found out that Internet connectivity in tertiary institutions in Africa is inadequate, expensive and poorly managed.

(h) Lack of an operational e-learning policy

The study findings indicate that lack of an operational e-learning policy is one of the constraints hindering the adoption of e-learning in Moi University. Though it was revealed that there is a draft ODL policy and a draft ICT policy awaiting approval by the University Council, these policies are not yet operational. These policies will however guide the University towards the adoption of e-learning.

This result is related to those of Catherall (2005) who established that most Kenyan public universities have no ICT and e-learning policies of any sort or where it is available, it is still in draft form.

(i) Other constraints hindering the adoption of e-learning:

Other constraints established by the study that has hindered the adoption of e-learning in Moi University are summarized below:

- Widely distributed campuses of Moi University spread all over the country with most of them located in rural areas lacking modern ICT and e-learning infrastructure.
- Lack of modern lecture halls and labs equipped with ICT and e-learning facilities.
- Lack of prioritization of ICT and e-learning in the University.
- Lack of motivation of lecturers through incentives to use e-learning in teaching.

6. 2.6 Possible strategies that Moi University could use to enhance the adoption of e-learning

In order to make the adoption of e-learning a success in Moi University, the respondents suggested possible strategies that the University could use to facilitate its successful adoption (see section 4.8 of Chapter 4). These strategies include:

- Introduction of compulsory ICT and e-learning courses for all students at first and second year of study in the University.
- Ensuring that students have access to e-learning as well as provision of learner support to the students.
- Using blended learning approach which combines both e-learning and conventional face to face teaching as a starting point.
- Collaborations and partnerships in e-learning with institutions of higher learning, development partners and other organizations which have succeeded in implementing e-learning in a bid to acquire best practices.

- Equipping student labs, lecture halls, lecturers' offices and student hostels with the relevant ICT and e-learning equipment to enable students and staff access e-learning content anytime.
- Piloting e-learning with a few selected schools and finally rolling it out to the entire University.
- Identifying a way of motivating the teaching staff to use e-learning and develop e-content.
- Encouraging students to study using e-learning mode by subsidizing the cost of study through e-learning.
- More support and involvement from top university management in adoption and implementation of e-learning.
- Making it compulsory for each student to have a laptop computer when reporting to the University to enhance their ICT and e-learning literacy.

6. 2.7 Necessity for a simpler open source learning management system

The study finally established that Moi University requires a simpler open source learning management system (see section 4.9 of Chapter 4). The researcher therefore designed and developed a simpler open source learning management system called MUWEBCAMPUS as an alternative e-learning platform for Moi University by customizing Claroline framework. Among the features of the simpler open source learning management system that the respondents suggested in section 4.9 include: ease of use and learn; user friendly interface with consistent command buttons; and menu driven commands. Claroline was chosen as a platform because it is free and open source, easy to install and use and suitable for low bandwidth environments (http://www.claroline.net/about-us.html).

6.3 Conclusion

Several conclusions can be drawn from this study.

It is evident from the study that adoption of e-learning holds a substantial opportunity for Moi University to expand accessibility to higher education. The study however established that the adoption of e-learning in Moi University is still in its early infancy stages due to absence or inadequacy of most of the important components necessary for the adoption of e-learning as identified by this study which include comprehensive awareness, sensitization and training on e-learning; appropriate and operational e-learning policies; ICT and e-learning infrastructure; top university management support; e-learning and e-content skills; learner support; and funding for e-learning.

The study further found out that the Moi University faces six major constraints hindering the adoption of e-learning which include: inadequate financing for e-learning; inadequate skilled e-learning personnel; lack of technical skills on e-content development by the teaching staff; amount of time required to develop e-learning courses; inadequate ICT and e-learning infrastructure; and expensive and inadequate Internet bandwidth;

The findings revealed that possible strategies that the University could use to enhance the adoption of e-learning include: introduction of compulsory ICT and e-learning courses for all university students at first and second year of study; ensuring accessibility to e-learning by the teaching staff and students; provision of learner support to the e-learning students; using blended learning approach and piloting as a starting point; collaborations and partnerships in e-learning; motivation of the teaching staff to develop e-content and use e-learning; more support and involvement by top university management in adoption

and implementation of e-learning; and making it compulsory for each student to have a laptop computer when reporting to the University.

The study also concludes that a simpler open source learning management system such as the one developed by the researcher can support the adoption of e-learning in Moi University and other educational institutions since it is free and easy to use and learn. This learning management system can be used even by novice users with only basic ICT skills.

Finally, it is evident from the above findings that this study has achieved its aims and objectives. The findings indicate that adoption of e-learning in any institution of higher learning requires the blending of the simpler learning management system with the different components which are critical to the successful adoption of e-learning.

6.4 Recommendations

The findings of this study demonstrated that adoption of e-learning in Moi University is dependent on many components. The researcher therefore made the following recommendations emerging from the study findings.

(i) Need to create comprehensive awareness, sensitization and training of all stakeholders on e-learning

E-learning awareness involves knowing about the existence and the benefits of e-learning to the institution. E-learning stakeholders should be facilitated with a number of e-learning awareness, sensitization and training programmes through e-learning training workshops, seminars, conferences and inclusion of ICT and e-learning courses in student

curricula. The University should also use other media like the University website, notice boards, print and electronic media to increase the level of awareness among both staff and students.

This study recommends that the University should create more comprehensive awareness and sensitization on e-learning among the students, staff and university management through workshops and seminars. Trainings on how to use e-learning and how to develop e-content should also be conducted for the teaching staff. Training of the teaching staff and e-learning technical support staff on technical and pedagogical issues of e-learning is very critical to the success of adoption of e-learning. Induction of students on how to use e-learning platform should also be conducted. Training and sensitization will remove any form of resistance and fear of the new technology from the different stakeholders. Training will also enable the universities to reap maximum benefits from e-learning and exploit capabilities of the simpler open source learning management system as well as inculcate a positive culture towards e-learning among the stakeholders. Most teaching staff and students still lack the competences required to use e-learning in teaching and learning respectively, hence training is a critical determinant towards the successful adoption of e-learning.

(ii) Formulation of appropriate and operational ICT and e-learning policies

In developing the appropriate ICT and e-learning policies, the core business of the University as well as the main customers of the University must take the centre stage so as to ensure that e-learning puts the University on a competitive edge. A policy framework on ICT and e-learning is critical to the success of adoption of e-learning in any given institution. These policies should be geared towards adoption, regulation and implementation of e-learning.

Without appropriate and operational ICT and e-learning policies, adoption of e-learning in the University may not be realized.

This study therefore recommends the formulation of appropriate and operational ICT and e-learning policies to guide the University towards the adoption of e-learning. The approval of such policies should also be expedited where necessary.

(iii) Allocation of adequate funds for e-learning development

E-learning is reasonably expensive for an average Kenyan university at the initial startup stage. Training e-learning users is quite expensive.

This study recommends that Moi University should allocate adequate funds to finance the development and adoption of e-learning. Inadequate financing of e-learning can be a major barrier to its success. Moi University should therefore prioritize ICT and e-learning in their budgetary allocations. The most practical way to finance ICT and e-learning at the initial stages before it becomes self sustaining would be to charge university students computing and e-learning fee.

(iv) Expansion of ICT and e-learning infrastructure to facilitate access to e-learning

ICT and e-learning infrastructure needs to be put in place before adoption of e-learning as a prerequisite to its accessibility. Such ICT and e-learning infrastructure include computers, computer laboratories, LANs and Internet bandwidth.

This study therefore recommends that Moi University should expand its ICT and e-learning infrastructure to facilitate accessibility of e-learning by the students, staff and other stakeholders.

(v) Establishment of collaborations and partnerships in e-learning

Adoption of e-learning can easily be realized if Moi University could enter into collaborations and partnerships with other partners which can support e-learning or which have successfully implemented e-learning. Such partners include institutions of higher learning and development partners. Partnerships could be in the areas of development and sharing of e-content and online resources, funding, training of e-learning stakeholders and e-learning infrastructure development. According to Utsumi (2005), the advantages of partnerships include collaboratively addressing educational and developmental issues, strengthening technical and human capacity building for teaching, learning and research.

This study therefore recommends that Moi University should establish collaborations and partnerships with other successful e-learning partners in a bid to acquire best practices to accelerate the adoption of e-learning.

(vi) Provision of learner support to e-learning students

Without learner support for e-learners in any institution, the goal of e-learning may not be achieved. This support should be in form of both technical as well as pedagogical support to the student. Learner support in this area is critical as e-learning requires blending of technology with pedagogy. Beamish (2002) observes that success in e-learning requires focusing away from the technology and onto the learner.

This study therefore recommends the provision of learner support to the students in a bid to make the adoption of e-learning successful. This can be achieved if the instructors can make use of the collaboration tools available in most learning management systems which can enable instructors to interact with the learners online.

(vii) Using blended learning and piloting with few schools as a starting point

Since e-learning is still a new concept in Moi University, this study recommends that the University could use blended learning which combines both e-learning and conventional face to face teaching as a starting point before adoption of full scale e-learning. This is because blended learning can be implemented even with scarce resources and facilities. The study further recommends that e-learning should be implemented by piloting with a few schools before rolling it out to the rest of the schools.

This recommendation is supported by Awidi (2008) who advises that developing an e-learning environment that is trusted and sustainable for higher education requires pursuing a blended approach to educational delivery, at least initially. Research also shows that teachers and learners prefer the blended learning approach, which mixes the traditional face-to-face teaching with online collaboration (Motteram, 2006). Although blended learning is ideal for beginners, the eventual advantage of e-learning lies in its capacity to serve both on-campus and distance learning students concurrently.

(viii) Introduction of compulsory ICT and e-learning courses for students

This study recommends that compulsory ICT and e-learning courses be introduced for all university students at the first and second year of study. These courses will build the capacity of students in using ICT and taking courses using e-learning. Further, as a requirement, all students should be encouraged to have laptop computers when reporting to the University to enhance their usage of ICT and e-learning.

(ix) More support from Top University Management on adoption of e-learning

The role of top university management in the context of adoption of e-learning is to provide resources and leadership. Top university management support and involvement plays an important role towards the successful adoption of any information system including e-

learning. It is also instrumental in mobilizing the users to use e-learning as well as prioritizing ICT and e-learning issues. Management support and involvement also provides a sense of ownership of the system.

This study therefore recommends that the top university management should take the leading role in the adoption and implementation of e-learning.

(x) Adoption of a simpler open source learning management system

This study recommends that Moi University should adopt a simpler open source learning management systems such as the one customized by the researcher. The benefits of adopting such a system is its ease of use by the users as well as cutting the costs of adoption of e-learning in the institution since it is free software and no license fee is required. Adoption of e-learning using such a simpler open source LMS will facilitate wider accessibility to university education and alleviate the problem of shortage of teaching staff.

6.5 Implementation Plan of Action for the Study Recommendations

The above recommendations could be realized in two phases. The first phase comprises of short term implementation plan of action while the second phase comprises the long term implementation plan of action.

6.5.1 Short-term Implementation Plan of Action

The researcher suggests the following recommendations be implemented in the short term implementation plan. These recommendations should be implemented jointly by the University management, Directorate of Open and Distance Learning, Directorate of ICT and Deans of Schools.

i. Formulation of appropriate and operational ICT and e-learning policies.
ii. More support by Top University Management on implementation of e-learning.
iii. Allocation of adequate funds for e-learning development.
iv. Expansion of ICT and e-learning infrastructure to facilitate access to e-learning.
v. Adoption of a simpler open source learning management system.
vi. Creating comprehensive awareness, sensitization and training of all stakeholders on e-learning.
vii. Using blended learning and piloting with few schools as a starting point.

6.5.2 Long-term Implementation Plan of Action

The researcher further suggests that the following recommendations be implemented in the long term implementation plan. Implementation should be carried out jointly by the University management, Directorate of Open and Distance Learning, Directorate of ICT and Deans of Schools.

i. Introduction of compulsory ICT and e-learning courses for students.
ii. Establishments of collaborations and partnerships in e-learning.
iii. Provision of learner support to e-learning students.

6.6 Dissemination and Publication of Research Findings

As part of dissemination of research findings, the researcher has presented the preliminary findings through three research papers presented in three international conferences (see appendix 8). The researcher intends to disseminate the final results to Moi University management, Directorate of Open and Distance Learning, Directorate of ICT, Deans of Schools and other relevant e-learning stakeholders in the university. The researcher will further disseminate the findings through publishing in refereed journals.

6.7 Suggestions for Further Research

1. This study on adoption of e-learning was confined to Moi University. There is need therefore to carry out similar studies in other middle level colleges like teacher training colleges, polytechnics, technical training colleges and medical training colleges in Kenya.
2. Selecting an appropriate learning management system is a major problem facing many institutions of higher learning in Kenya. More research should be carried out with a view to developing a model or framework that can be used for selection of an appropriate learning management system for a given institution.

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APPENDICES

Appendix 1

Letter of Introduction

Dear respondent,

I am a student pursuing a Master of Philosophy degree in Information Technology at the School of Information Sciences, Moi University.

I am conducting a research study on **"Adoption of E-Learning to Support Teaching and Learning in Moi University".**

Electronic Learning **(**E-Learning) refers to learning facilitated and supported through the use of information and communications technology (ICT). Specifically, the study seeks to investigate and analyze the important components necessary for the adoption of e-learning in Moi University. The study is important in identifying and examining critical areas that require to be addressed so as to expand access to university education and integrate ICT technologies into teaching and learning in Moi University.

The following general instructions will guide your responses when filling the questionnaire.

- You are requested to give your opinion based on a 5-point scale: where a choice of 1 (one) means you strongly disagree and 5 (five) means you strongly agree with the given statement.
- For questions where there are no numbers to be circled, you are requested to write answers in your own words in the spaces provided.
- There is no right or wrong answer. The only correct answer is the one that mostly corresponds to your true feelings and experiences.
- Please do not indicate your name on the questionnaire.
- In answering the questions, you are assured that your responses will be kept confidential and answers are intended for research purposes only.
- Please read each question carefully and follow the given instructions.
- Try to answer all the questions. Those questions marked *(staff only)* should not be answered by students

Your assistance will be highly appreciated. For any queries/clarifications, do not hesitate to contact me on 0721 330170 or e-mail: jktarus@gmail.com.

Yours faithfully,

John K. Tarus
M.Phil Student
School of Information Sciences
Moi University

Appendix 2

Questionnaire for Teaching Staff, ICT Staff and Students

Section A: Complete this section by ticking (√) or checking (x) what is relevant to you

1. Demographic Information:

Please **tick (√)** or **check (x)** only one answer

i) Age: 15 - 30 ☐ 31 - 40 ☐

41 - 50 ☐ 51 and above ☐

ii) Gender: Female ☐

Male ☐

(iii) Category

Teaching Staff ☐ ICT Staff ☐ Student ☐

iv) Designation (Staff only): ……

v) Campus: ……

vi) School: ……..……....…….

vii) Study Level - Undergraduate or Postgraduate (Students only): ……

2. Are you aware of the existence of E-Learning in Moi University? **Yes** ☐ **No** ☐

Section B:

Please read each item carefully and using a 5 point scale below, rate each item by circling the point that in your opinion you believe best describes adoption of e-learning in Moi University.

Key:	**1 = Strongly disagree;**	**2 = Disagree;**	**3 = Undecided;**
	4 = Agree;	**5 = Strongly agree;**	

1. To what extent do you agree that each of the following measures has been undertaken by Moi University towards the adoption of e-learning?

(i) Formulation of appropriate and operational e-learning policies 1 2 3 4 5

(ii) Adequate financial allocation to support the adoption of e-learning *(Staff only).* 1 2 3 4 5

(iii) Creating awareness and sensitization of staff on e-learning *(Staff only).* 1 2 3 4 5

(iv) Creating awareness and sensitization of students on e-learning. 1 2 3 4 5

(v) Integration of ICT technologies into teaching. 1 2 3 4 5

(vi) Other measures (specify) _____ 1 2 3 4 5

2. Considering the ICT and e-learning infrastructure currently in place in Moi University, to what extent do you agree that each of the following issues on infrastructure has been achieved to support e-learning in Moi University?

(i) Adequate number of computers and ICT equipment to support e-learning. 1 2 3 4 5

(ii) Adequate Internet bandwidth to support adoption of e-learning *(Staff only)* 1 2 3 4 5

(iii) Adequate network connectivity to support e-learning. 1 2 3 4 5

(iv) Reliable internet connectivity to support the adoption of e-learning. 1 2 3 4 5

3. To what extent do you agree with the following statements concerning e-learning skills of staff and students of Moi University?

(i) Moi University teaching staff have the relevant e-learning skills to offer e-learning courses *(Staff only).* 1 2 3 4 5

(ii) Moi University students have the relevant e-learning skills to take e-learning courses. 1 2 3 4 5

(iii) The University has adequate qualified e-learning personnel to support the adoption of e-learning *(Staff only).* 1 2 3 4 5

(iv) Moi University teaching staff will require training on e-learning to enable them offer courses through e-learning *(Staff only).* 1 2 3 4 5

(v) Moi University students will require training on e-learning to enable them take courses through e-learning. 1 2 3 4 5

(vi) Moi University teaching staff have the necessary skills in e-content course development *(Staff only).* 1 2 3 4 5

4. In your opinion, to what extent do you agree that the following are constraints hindering the adoption of e-learning in Moi University?

(i)	Financial constraints *(Staff only).*	1 2 3 4 5
(ii)	Inadequate qualified e-learning staff to support e-learning *(Staff only).*	1 2 3 4 5
(iii)	Lack of interest among the teaching staff to use e-learning *(Staff only).*	1 2 3 4 5
(iv)	Lack of technical skills on e-content development by staff *(Staff only).*	1 2 3 4 5
(v)	Amount of time required to develop an e-learning course *(Staff only).*	1 2 3 4 5
(vi)	Inadequate ICT and e-learning infrastructure.	1 2 3 4 5
(vii)	Lack of affordable and adequate internet bandwidth *(Staff only).*	1 2 3 4 5
(viii)	Lack of appropriate and operational e-learning policy *(Staff only).*	1 2 3 4 5
(ix)	Technophobia (fear of new technologies) by the students.	1 2 3 4 5

In your opinion, are there other constraints that may have hindered the University from adopting e-learning?

(a) _____

_____

(b) _____

_____

(c) _____

_____

(d) _____

_____

(e) _____

_____

Section C:

Please read each question carefully and write answers in your own words in the spaces provided.

5. What strategies would you <u>recommend</u> the University to undertake to make the adoption of e-learning successful?

(a) _____

_____

(b) _____

_____

(c) _____

_____

(d) _____

_____

6. In your opinion, do you think Moi University needs a simpler open source learning management system to support teaching and learning? **Yes** ☐ **No** ☐

If your response is **Yes,** what feature(s) should such a system have?

Thank you very much for finding time to complete this questionnaire.

Appendix 3

Interview Schedule for University Management, Deans, Directors and HODs

1. Are you aware of the existence of E-Learning in Moi University? **Yes/No**

2. Measures being undertaken to adopt e-learning in Moi University.

(a) Are there appropriate and operational policies in place to guide the University towards the adoption of e-learning?

(b) To what extent has the University made financial allocations to support e-learning?

(c) What measures have been undertaken by the University to create awareness and sensitization among the staff on e-learning?

(d) What measures have been undertaken by the University to create awareness and sensitization among the students on e-learning?

(e) In your opinion, to what extent has the Moi University management supported the efforts towards the adoption of e-learning in the University.

(f) Does the University integrate ICT technologies in teaching as a way of promoting e-learning? If yes, explain how.

3. ICT and e-learning infrastructure to support adoption of e-learning.

(a) Does the University have adequate number of computers to support the adoption of e-learning? How many computers in total are there in the University?

(b) Does the University have adequate network connectivity (e.g LANs, WANs etc) to support the adoption of e-learning? How are the data points distributed?

(c) Does the University have reliable Internet connectivity and bandwidth to support the adoption of e-learning? If No, how have you addressed this problem?

4. Skills of Teaching Staff and Students to support the adoption of e-learning.

(a) Do you think Moi University teaching staff have the relevant technical and e-learning skills to offer e-learning courses?

In your opinion, do you think Moi University teaching staff will require training on delivery of course content through e-learning?

(b) Do you think Moi University students have the relevant technical and e-learning skills to take e-learning courses?
In your opinion, do you think Moi University students will require training to enable them take e-learning courses?

(c) Does the University have adequate e-learning technical staff to support the adoption of e-learning? If No, how should the University address this problem?

(d) In your opinion, do you think Moi University teaching staff have the relevant e-learning skills to develop e-content? If No, what should the University do to address this problem?

5. Constraints hindering the adoption of e-learning.

(a) What constraints does the University face that hinder the adoption of e-learning?

(b) What are your suggestions/recommendations for addressing these constraints?

6. What strategies should the University undertake to make adoption of e-learning successful in Moi University?

7. Do you think Moi University requires a simpler open source learning management system to support teaching and learning?
If your response is **Yes,** what feature(s) should such a system have?

Appendix 4

Moi University Demographics of Student Respondents (April 2009)

Undergraduate Students

School	Target Student Population	Sample Size
School of Information Sciences	1744	35
School of Business and Economics	3284	65
School of Environmental Studies	41	1
School of Engineering	1593	3
School of Education	1875	37
School of Arts and Social Sciences	2633	52
School of Agriculture and Biotechnology	624	12
School of Science	1713	34
School of Natural Res. Management	771	15
School of Human Resource Development	885	18
School of Law	1783	35
School of Medicine	602	12
School of Public Health	223	4
School of Dentistry	-	-
TOTAL	**17,773 (93%)**	**351**

Number of Undergraduate Student Respondents (Sample Size): 351

Postgraduate Students

School	Target Student Population	Sample Size
School of Information Sciences	28	1
School of Business and Economics	323	5
School of Environmental Studies	30	1
School of Engineering	6	1
School of Education	341	5
School of Arts and Social Sciences	81	2
School of Agriculture and Biotechnology	16	1
School of Science	50	1
School of Natural Res. Management	100	2
School of Human Resource Development	239	4
School of Law	-	-
School of Medicine	120	2
School of Public Health	20	1
School of Dentistry	-	-
TOTAL	**1,354 (7%)**	**26**

Number of Postgraduate Student Respondents (Sample Size): 26

(Source: Moi University Student Admissions)

Appendix 5

Research Budget

ITEM & DESCRIPTION	**ESTIMATED AMOUNT (KSHS)**
Stationery	25,000
Laptop Computer	70,000
Pilot Survey	10,000
Typing, Printing, Photocopying and Binding	20,000
Transport and Accommodation	20,000
Research Assistants	30,000
Telephone Charges	10,000
Data Processing, Analysis and Final Report Writing	15,000
TOTALS	**200,000**

Appendix 6

Sample PHP Source Code

```
<?php
/*$Id: index.php 2010-07-20 $
 * MUWEBCAMPUS
*******************************************************************************
*
 * MUWEBCAMPUS Home Page
 * @version 1.0
 * @copyright (c) 2010 Moi University and/or John K. Tarus
 * @license: GENERAL PUBLIC LICENSE (GPL)
  * @author <jktarus@gmail.com>
 */

unset($includePath); // prevent hacking
// Flag forcing the 'current course' reset, as we're not anymore inside a course
$cidReset = TRUE;
$tidReset = TRUE;

// Include Library and configuration file
require './muwebcampus/inc/claro_init_global.inc.php'; // main init
include claro_get_conf_repository() . 'CLHOME.conf.php'; // conf file

// logout request : delete session data
if (isset($_REQUEST['logout']))
{
   // notify that a user has just loggued out
   if (isset($logout_uid)) // Set  by local_init
   {
      $eventNotifier->notifyEvent('user_logout', array('uid' => $logout_uid));
   }
   if( get_conf('claro_CasEnabled', false) && ( get_conf('claro_CasGlobalLogout') &&
!phpCAS::checkAuthentication() ) )
   {
      phpCAS::logout((isset( $_SERVER['HTTPS']) &&
($_SERVER['HTTPS']=='on'||$_SERVER['HTTPS']==1) ? 'https://' : 'http://')
                  . $_SERVER['HTTP_HOST'].get_conf('urlAppend').'/index.php');
   }
   session_destroy();
}
// $muwebcampus->display->banner->hideBreadcrumbLine();
$template = new CoreTemplate('platform_index.tpl.php');
$muwebcampus->display->body->setContent($template->render());
echo $muwebcampus->display->render();
?>
```

```
<?php // $Id: claro_main.lib.php 2010-07-20 $
/**
 * SECTION :  Get kernel
 * SUBSECTION datas for courses
/**
 * Get unique keys of a course.
 * @param string $course_id (optionnal)  If not set, use the current course.
* @author John k. Tarus <jktarus@gmail.com>
*/

function claro_get_course_data($courseId = NULL, $force = false )
      {
         $tbl =  claro_sql_get_tbl(array('cours','faculte',));

      $sql =  "SELECT
               c.code                    AS sysCode,
               c.cours_id                AS courseId,
               c.intitule                AS name,
               c.administrativeNumber AS officialCode,
               c.directory               AS path,
               c.dbName                  AS dbName,
               c.email                   AS email  ,
               c.visibility              AS visibility,
               c.registration            AS registration,
               c.registrationKey         AS registrationKey ,
               cat.code                  AS categoryCode,
               cat.name                  AS categoryName,
               UNIX_TIMESTAMP(c.creationDate)   AS publicationDate,
               UNIX_TIMESTAMP(c.expirationDate) AS expirationDate,
               c.status                  AS status

               FROM     `" . $tbl['cours'] . "`   AS c
               LEFT JOIN `" . $tbl['faculte'] . "` AS cat
                     ON c.faculte =  cat.code
               WHERE c.code = '" . claro_sql_escape($courseId) . "'";

         $courseDataList = claro_sql_query_get_single_row($sql);

         if ( ! $courseDataList ) return claro_failure::set_failure('course_not_found');

$courseDataList['registration'] );
         $courseDataList['dbNameGlu'       ]       =       get_conf('courseTablePrefix')       .
$courseDataList['dbName'] . get_conf('dbGlu'); // use in all queries?>
```

Appendix 7

Research Permit

MOI UNIVERSITY
DEPARTMENT OF INFORMATION TECHNOLOGY

Tel. 053-43720,43620,43231
Fax No. 053-43047,43360
Telex No. MOIVERSITY 35047
Email: dit@mu.ac.ke

P.O. Box 3900
Eldoret
Kenya

Our Ref: IS/MPHIL/036/07

27th November 2008

Dr. J.K. Sang,
The Chief Administrative Officer,
Moi University,
P.O. Box 3900,
Eldoret.

Dear Sir,

RE: JOHN K. TARUS (IS/MPHIL/036/07)

The above named is a member of staff of Moi University. Currently, he is pursuing an MPhil in Information Sciences (Information Technology) Degree at our Information Technology Department

As a partial fulfillment of this degree, he will be required to conduct a research study. The title of his research is "***Adoption of E-Learning to support teaching and learning in Kenya public universities: A case of Moi University***"

We would be grateful if you could be kind enough to allow him to conduct his research study in your institution. Any assistance accorded to him will be highly appreciated.

Please do not hesitate to contact the undersigned for any further information.

Thank you.

Yours sincerely,

HEAD
DEPT. OF INFORMATION TECHNOLOGY

DR. D. GICHOYA
HEAD,
DEPARTMENT OF INFORMATION TECHNOLOGY

DC/cam

Appendix 8

Conference Papers

Tarus, J. K., Gichoya, D., Muumbo, A., and **Agalo, J.** (2010), Implementation of E-Learning in Kenyan Public Universities: Challenges and Best Practice Recommendations based on the Experience of Moi University. *Paper presented at the Moi University 6th Annual International Conference: Knowledge Management and Applied Technological Innovations for Sustainable Development,* September 7 – 11, 2010, Eldoret, Kenya.

Tarus, J. K., Muumbo, A. and **Wanyembi, G.** (2010), The Role of Open Source Software in bridging the Digital Divide in Kenyan Public Universities: A Case of Moi University. *Paper presented at the 11th Annual ICT Conference 2010 at Strathmore University: ICT Trends - Progress towards an Information Society,* September 3 – 4, 2010, Nairobi, Kenya.

Tarus, J. K., Muumbo, A. and **Gichoya, D.** (2010), Adoption of Open Source to support E-Learning in Kenyan Public Universities: A case of Moi University. *Paper presented at the* 5th *International Conference on ICT for Development, Education and Training,* May 26 – 28, 2010, Lusaka, Zambia.

Appendix 9

How to Install, Run and Access MUWEBCAMPUS LMS

MUWEBCAMPUS is a simpler open source LMS that will facilitate efficient and effective delivery of e-learning content to students by enabling the teaching staff to easily upload e-content and students to access e-content online. MUWEBCAMPUS is written in PHP and it is installed on the server-side, along with MySQL database and Apache web server software.

Installation

a) To install MUWEBCAMPUS learning management system, Apache webserver, MySQL database and PHP are required and should be installed prior to installing MUWEBCAMPUS. Make sure that Apache and MySQL are running.
b) Copy and paste the contents of muwebcampus folder from the CD and paste to the document root of your web server either in Linux or Windows. The document root is */var/www/html/* most Linux distributions and c:/wamp/www/ in Windows.
c) Open the Web Browser and go to http://localhost/muwebcampus/claroline/install/
d) Follow the instructions.

Running MUWEBCAMPUS from your computer

a) Open your web browser and go to http://localhost/muwebcampus/
b) Click on **Create user account** to create your username and password
c) Login with a username and password

Accessing MUWEBCAMPUS from the web

a) Currently, MUWEBCAMPUS is installed and accessible through the internet. You can access by visiting the URL http://mis.muk.ac.ke/muwebcampus/
b) Click on **Create user account** to create your user account. MUWEBCAMPUS currently allows both self registration and creation of users by the systems administrator.
c) Fill in the **"Create user account form"** which includes username and password.
d) Click **"OK"** button.
e) Login with your username and password.

Creating Courses by Course Creators

a) To be able to create a course website click the link "**create a course site**".
b) Provide the necessary details of the courses and add the content.
c) Click the button "**OK**" to create the course site.

Courses can be created with the following security options:

- Access allowed to anybody (even without login)
- Access allowed only to platform members (user registered to the platform)
- Access allowed only to course members (people on the user list)

Enrolling for a Course by Students

Enrolling to a new course will mean adding yourself or registering your account to a new course if the course where you are registering allows self enrolment or registration.

Appendix 10

Table for Determining Sample Size from a Given Population

ROBERT V. KREJCIE
University of Minnesota, Duluth
DARYLE W. MORGAN
Texas A. & M. University

Table for Determining Sample Size from a Given Population

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note:-
N is population size.
S is sample size.

EDUCATIONAL AND PSYCHOLOGICAL MEASUREMENT
1970, 30, 607-610.