ADOPTION OF E-LEARNING AND USABILITY CHALLENGES IN E-LEARNING APPLICATIONS IN KENYA:

CASE OF ELIMU DIGITAL E-LEARNING PROTOTYPE APPLICATION

BY

GLORIA MARGARET OBEL

UNITED STATES INTERNATIONAL UNIVERSITY

SUMMER 2018
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GLORIA MARGARET OBEL

A Project Report Submitted to the School of Science and Technology in Partial Fulfilment of the Requirement for the Degree of Master of Science in Information Systems and Technology (MSC IST)

UNITED STATES INTERNATIONAL UNIVERSITY

SUMMER 2018
STUDENT’S DECLARATION

I, the undersigned, declare that this is my original work and has not been submitted to any other college, institution or university other than the United States International University in Nairobi for academic credit.

Signed: ____________________ Date: ____________________

Gloria Margaret Obel (ID No. 649180)

This project has been presented for examination with my approval as the appointed supervisor.

Signed: ____________________ Date: ____________________

Dr. Paul M. Okanda

Signed: ____________________ Date: ____________________

Dean, School of Science and Technology
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ABSTRACT

The study aimed at establishing the factors promoting adoption of E-Learning and determining the usability challenges in E-Learning applications in Kenya. Consequently, an E-learning educational prototype application was developed to address the usability challenges. The prototype application dubbed “Elimu Digital” was designed to complement physical classroom teaching by providing an online representation of course content.

Both quantitative and qualitative analysis were employed in this study. For qualitative analysis a review and analysis of various literature was done. This enabled the research to collect information on factors that influence adoption of E-Learning in Kenya. For quantitative analysis the researcher used questionnaires as the instrument of data collection.

The study used a descriptive research design. The target population was made up of lecturers, students and technical administrators. Primary and secondary data was collected from a sample size of 68 respondents. The collected data was coded in Microsoft Excel and later imported into SPSS a software package used for statistical analysis. Descriptive statistics was used to show, describe and summarize the collected data into meaningful ways whereby patterns were identified and interpreted in relation to the research objectives.

Post analysis, it was found that growth in the use of smart devices and continuous growth of the telecommunication infrastructure promoted adoption of E-Learning. It was further noted that users of E-Learning applications encountered several challenges such as adding content was not an easy process with the current E-Learning platforms as majority of the lecturers needed assistance from a technical person in order to upload content, some platforms lacked the capability of multimedia integration, some lacked the feature to have collaborations between lecturers and students directly in the platform and some platforms had interoperability issues with the different platforms and devices as they were not compatible on all devices or with all browsers.

Factors that promoted the adoption of E-Learning in Kenya were; Kenya has more service providers offering internet services at affordable costs and users choose the package depending on their pocket, E-Learning has been viewed as the cheaper alternative to attending physical classes, there is an increase in the use of smart mobile devices due to their affordability and which easily access the internet making it possible for the users to access and growth of mobile
telecommunications infrastructure area coverage. The usability challenges in E-Learning applications were found to be more of technological issues and were greatly remedied by the study’s proposed solutions.
ACKNOWLEDGMENT

First and foremost, I would like to thank God for giving me the chance and capability to undertake this project. Secondly, I would like to offer my sincere gratitude to my supervisor Dr. Paul M Okanda for his never-ending guidance and support throughout this project. I would also like to thank my family and everyone else who offered their support while I was doing this project. Please accept my gratitude and sincere appreciation.

Thank you.
DEDICATION

I would like to dedicate my Master’s project to my parents, siblings and friends with a special show of thanks to my father, sister and boyfriend who continued to encourage, support and continually push me in my pursuit for my masters.

I also dedicate this dissertation to the Master’s in Information Systems and Technology USIU faculty especially Ruth N Mwai, Dr. Joshua Rumo and finally Dr. Paul M. Okanda who has always sacrificed his busy schedule to offer advice and expecting nothing less than perfection.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>STUDENT'S DECLARATION</td>
<td>iii</td>
</tr>
<tr>
<td>COPYRIGHT</td>
<td>iv</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>v</td>
</tr>
<tr>
<td>ACKNOWLEDGMENT</td>
<td>vi</td>
</tr>
<tr>
<td>DEDICATION</td>
<td>vii</td>
</tr>
<tr>
<td>TABLE OF CONTENTS</td>
<td>ix</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>xii</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xiv</td>
</tr>
<tr>
<td>Chapter 1: Introduction</td>
<td></td>
</tr>
<tr>
<td>1.1 Background of the Problem</td>
<td>1</td>
</tr>
<tr>
<td>1.2 Problem Statement</td>
<td>5</td>
</tr>
<tr>
<td>1.3 General Objectives</td>
<td>6</td>
</tr>
<tr>
<td>1.4 Specific Objectives</td>
<td>6</td>
</tr>
<tr>
<td>1.5 Justification of the Study</td>
<td>6</td>
</tr>
<tr>
<td>1.6 Scope of the Study</td>
<td>7</td>
</tr>
<tr>
<td>1.7 Definition of Terms</td>
<td>7</td>
</tr>
<tr>
<td>1.8 Chapter Summary</td>
<td>8</td>
</tr>
<tr>
<td>Chapter 2: Literature Review</td>
<td>9</td>
</tr>
<tr>
<td>2.1 Introduction</td>
<td>9</td>
</tr>
<tr>
<td>2.1.1 Factors Influencing Adoption of E-Learning in Kenya</td>
<td>9</td>
</tr>
<tr>
<td>2.2 Challenges in the Existing E-Learning Portals in Kenya</td>
<td>24</td>
</tr>
<tr>
<td>2.2.1 What is Driving Kenyan Students to Study Abroad</td>
<td>24</td>
</tr>
<tr>
<td>2.2.2 Kenyan universities Current Take on E learning</td>
<td>26</td>
</tr>
<tr>
<td>2.3 Theoretical Foundation</td>
<td>27</td>
</tr>
<tr>
<td>2.3.1 Technology Acceptance Model (TAM)</td>
<td>27</td>
</tr>
<tr>
<td>2.3.2 Theory of Reasoned Action (TRA)</td>
<td>28</td>
</tr>
<tr>
<td>2.3.3 Diffusion of Innovations Theory</td>
<td>29</td>
</tr>
<tr>
<td>2.4 Conceptual Framework</td>
<td>31</td>
</tr>
<tr>
<td>2.5 Literature and Gap Analysis</td>
<td>32</td>
</tr>
<tr>
<td>2.5.1 Benefits of E Learning</td>
<td>32</td>
</tr>
<tr>
<td>2.6 Chapter Summary</td>
<td>35</td>
</tr>
<tr>
<td>Chapter 3: Research Methodology</td>
<td>37</td>
</tr>
</tbody>
</table>
6.3.2 Challenges Encountered by Users Using E-Learning Applications in Kenya

6.3.3 Development and Testing of an E-Learning Prototype Application to Address Usability Challenges

6.4 Conclusions

6.5 Recommendations

   6.5.1 Suggestions for Improvements

   6.5.2 Suggestions for Further Research

References

Appendices

Appendix 1: Letter of introduction

Appendix 2: Questionnaire

Appendix 3: Source Code
LIST OF TABLES

Table 2.1 Usability Challenges in the Four LMSs.................................................................25
Table 4.1 Summary of Proposed Remedies to the Usability Challenges Identified...45
Table 5.1 Case Processing Summary..................................................................................65
Table 5.2 Reliability Co-efficient Output .............................................................................65
Table 5.3 Multivariate Normality Analysis .........................................................................66
Table 5.4 Respondents’ Gender..........................................................................................70
Table 5.5 Respondents’ Age .............................................................................................71
Table 5.6 Respondents Occupation Status ..........................................................................72
Table 5.7 Respondents’ Level of education..........................................................................73
Table 5.8 Respondents’ Device ..........................................................................................74
Table 5.9 Internet Affordability ...........................................................................................75
Table 5.10 Results of Question C1 ......................................................................................76
Table 5.11 Results of Question C2 ......................................................................................77
Table 5.12 Results of Question C3 ......................................................................................78
Table 5.13 Results of Question S1.......................................................................................79
Table 5.14 Results of Question S2.......................................................................................80
Table 5.15 Results of Question I1.......................................................................................81
Table 5.16 Results of Question I2.......................................................................................82
Table 5.17 Results of Question I3.......................................................................................83
Table 5.18 Results of Question US1....................................................................................84
Table 5.19 Results of Question US2....................................................................................85
Table 5.20 Results of Question US3....................................................................................86
Table 5.21 Results of Question US4....................................................................................87
Table 5.22 Results of Question PU1....................................................................................88
Table 5.23 Results of Question PU2....................................................................................89
Table 5.24 Results of Question PU3....................................................................................90
Table 5.25 Results of Question PU4....................................................................................91
Table 5.26 Results of Question PU5....................................................................................92
Table 5.27 Results of Question PE1 ...................................................................................93
Table 5.28 Results of Question PE2 ...................................................................................94
Table 5.29 Results of Question PE3 ...................................................................................95
Table 5.30 Results of Question PE5...................................................................................96
Table 5.31 Results of Question R2 .......................................................... 97
Table 6.1 Summary of Usability Challenges and Proposed Solutions .............. 105
LIST OF FIGURES

Figure 1.1 Student Enrolment in Public Universities between 2007 and 2013 ..........2
Figure 1.2 Student Enrolment in Private Universities between 2007 and 2013 ..........2
Figure 2.1 Blackboard Collaborate for USIU Students ..........................................10
Figure 2.2 Moodle Home Page .............................................................................15
Figure 2.3 Canvas Homepage for Students..............................................................18
Figure 2.4 Course Site Home Built on Sakai..............................................................22
Figure 2.5 Technology Acceptance Model .............................................................28
Figure 2.6 Theory of Reasoned Action ..................................................................29
Figure 2.7 Stages of New Technology Adoption ..................................................30
Figure 2.8 Stages in the Decision Innovation Process ........................................33
Figure 2.9 Conceptual Framework for E-Learning Adoption in Kenya ..............34
Figure 4.1 Context Diagram of Elimu Digital E-Learning application .............48
Figure 4.2 Data Flow Diagram for Elimu Digital prototype ..............................49
Figure 4.3 Use Case Diagram of Elimu Digital Prototype ...............................50
Figure 4.4 Functionality Layers in a Three-tier Web Based System .................52
Figure 4.5 Index Page of Elimu Digital E-Learning Application .......................54
Figure 4.6 Sign In and Sign Up Forms .................................................................55
Figure 4.7 Window Pop Up After Successful Registration ..............................56
Figure 4.8 Profile Set Up for Both Student and Lecturer .................................57
Figure 4.9 Lecturer’s View ..................................................................................58
Figure 4.10 A Student Can Enrol for a Course and View Related Course Content ....59
Figure 4.11 Export From the Database .................................................................60
Figure 4.12 Schema of the Elimu Digital E-Learning Application Database ....61
Chapter 1: Introduction

1.1 Background of the Problem

Research has shown that higher education institutions that offer traditional classes have not been able to fulfil their role in critical thinking, effective interpersonal/ reasoning skills which are the core competencies intended to be instilled in students (Arum, 2002). Students go to class highly unmotivated and are easily distracted (Abeyseker, 2015).

E-Learning is education using electronic devices and digital media (Christensson, 2015). It is interactive in that you can also communicate with your teachers, professors or other students in your class. Sometimes it is delivered live, where you can “electronically” raise your hand and interact in real time and sometimes it is a lecture that has been pre-recorded. There is always a teacher or professor interacting with you and grading your participation, your assignments and your tests.

Every year, Kenyan universities have an increase in the number of students enrolled. According to the Economic Survey 2014, enrolment by students to public universities increased by a whopping 41% while to private universities increased by 7.1% (Nganga, 2014). This number keeps increasing annually. There is also an increase in the number of satellite universities to enable students from all regions attain a certificate or degree. This shows that there has been an unprecedented demand for university education in Kenya and this continues to surpass the supply.

Figure 1.1 and 1.2 which are both extracts from the Kenya National Bureau of Statistics report of 2017 show the progressive growth of number of students who have been enrolling for both under and post graduate courses showing that there is indeed hunger for education but less resources to accommodate the same in public and private universities (KNBS, 2017).
Figure 1.1: Student Enrolment in Public Universities between 2007 and 2013

Source: Statistical Abstract 2013

Universities are looking for ways to manage the increase demand for education by changing the method delivery of content from the traditional class training to e-learning, which involves the use of computer and network-enabled transfer of skills and knowledge. E-Learning has come a long way and many Kenyan universities are incorporating it into their curriculum.
E-learning is preferred as it is flexible and enables long distance learning. E-learning characteristics have made it beneficial to universities. Firstly, it has enabled human development and bridged the digital divide hence students can fit in the global economy and be updated. Secondly, access to quality open and equitable education resources of information is made available. This has fostered information sharing and exchange. Thirdly, lecturers are readier to invest in innovative teaching ideas that improve on the traditional teaching methods. Fourthly and most notable characteristic is flexibility whereby learning can take place from any location in the country where there is internet connectivity. E-learning has also enables students and lecturers to engage in online teamwork for increased participation, collaboration, and information sharing using Email, the Web and other remote collaboration tools. In addition, e-learning has created an affordable and fast distribution of educational reference materials and knowledge within and outside national boundaries. Lastly, students can control their own learning process (Smith, 2016).

Despite the numerous benefits of e-learning, most graduate students are not fully benefiting from this advancement in the school system. A report by Jill Barshay presented during the annual American Educational Research Association conference stated that students are 11% less likely to pass an online version of the same class. As Kenyan universities proceed to adopt e-learning, it is imperative that they benefit from the lessons learnt from universities who have successfully implemented E-learning.

Universities that are planning to implement e-learning in their institutions should be prepared to respond to the challenges that are likely to arise during implementation. Kenyan universities are being compelled by the government within the framework of Kenya Vision 2030 to introduce e-learning and blended learning as an alternative delivery system to increase accessibility to higher education in Kenya (NESC, 2007). Full implementation of e-learning at university levels is considered as a long-term strategy in Kenya Vision 2030. Implementation of e-learning alongside other strategies for education in Kenya Vision 2030 is anticipated to address the strategic areas, namely, access, quality, equity, technology and innovation. The vision for the education sector for 2030 is “to have globally competitive quality education, training and research for sustainable development” (NESC, 2007).

Thus, e-learning initiatives have been introduced in Kenyan universities more so public universities in line with the government’s policy requiring universities to introduce e-learning as an alternative delivery system. A survey conducted revealed that several Kenyan universities
are already using e-learning but mostly in blended mode with face to face teaching. At the University of Nairobi for instance, implementation of e-learning started in 2004 with a well-tested e-learning platform called Wedusoft (a framework of Chisimba) (Tarus, 2015).

Kenyatta University launched the e-learning mode of teaching in 2005 and is currently using Moodle as an e-learning platform. E-learning programmes have also been in operation at Jomo Kenyatta University of Agriculture and Technology since 2006 with Moodle as an e-learning platform. Implementation of e-learning in Moi University started in 2007 with MUSOMI (customized from Chisimba framework) as an e-learning platform. However, a critical review of the tangible steps made reveals slow and small progress in utilization of E-learning approach in these public universities due to unforeseen challenges. Most of these universities are using e-learning in blended mode and have lagged in full implementation (Tarus, 2015).

A study conducted on the status of E-Learning in Public Universities in Kenya noted that there is a low usage of Usage of E-learning Among Lecturers. It revealed that 68% of lecturers preferred conventional or traditional mode of pedagogy to e-learning. The reasons adduced for this preference included; ease of reference to hard copies, fear of technology failure especially during a lecture, and lack of ICT skills on how to change hard copies or hand-written teaching materials to technology enabled formats. In addition to this, lecturers mainly used e-learning to upload lecture notes and reference materials. The study also noted that most of the lecturers did not work with the IT staff to create and develop modules to be used hence opted for just uploading notes. The lecturers also lacked adequate time to devote to the development of interactive module (Makokha, 2016).

There is also low usage of e-learning amongst Kenyan students. Many of the students who adopted e-learning rarely used it to access lectures online and a sizeable number used it to download lecture notes, access and take CATs online, and submit assignments online (Mutisya, 2016).

It is also important to note that because most potential students were not getting what they required from various universities, they initially decided to enrol for courses abroad between the years 2000 to 2015. Studies show the numbers have since reduced due to the high cost of western education compared to the cheaper alternatives provided in neighbouring East African countries and the tightening of visa policies in the post 9/11 era as highlighted in figure 4 below (Clark, 2015).
However, students registering abroad for higher education has again peaked. This is due to the E-Learning opportunities that majority of these foreign universities have availed to them. These opportunities are better than what Kenyan Universities have to offer because they are seen to give more quality education than our Kenyan Universities and are seen to produce full graduates and not half baked as majority of the job providers call local university graduates (Clark, 2015).

United States International University – Africa has successfully implemented e-learning on the Blackboard platform. In the early days, it started as an experiment in 2003 using WebCT (by Dr. Meoli Kashorda) one faculty devoted one semester to develop graduate materials in accounting. Incentive Model: One course release per e-learning course developed (or cash equivalent payment). The uptake was slow to take off but it supplemented face-to-face meeting in classroom. Students could access class notes and assignments, performed group discussions, chats and submitted assignments online. Instructors marked contributions in discussions, number of accesses to notes + assignments (Chege, 2006).

Challenges USIU encountered as highlighted by Assistant Professor of IT in USIU Gerald Chege while implementing e-learning included ICT literacy in faculty especially in the Arts faculty, resistance to change and time needed to develop content. To mitigate these challenges, USIU developed “e-policies” by management and availability of books with ready teaching materials. The effect implementation of these policies was Email replaced memos (no more pigeon hole memo announcements), LCDs availability in classroom (all classrooms now have LCDs) - encourages faculty to have power points and a personal computer availed to each faculty member’s office (Chege, 2006).

1.2 Problem Statement

Kenya has seen an increase in the number of citizens who want to increase their qualifications because jobs nowadays need more than just a degree especially if you want to make a good amount of money with the current economic situation where a 2kg packet of maize flour is more expensive than one used for baking. This has seen a similar increase in the number of universities that have been set up in the country to provide the necessary content. However, we find that the working class and the new stay at home mothers would like to further their education but cannot because of their busy schedules.

Fortunately, there are online classes (distance learning) that have been provided by some universities but only for a few courses. This however has not proved to be utilized completely
as there are still a few challenges where not all courses are offered online especially by the old-school universities so students still must attend physically, students and lecturers should miss classes because of work or family commitments and the students end up missing very important submissions and must chase after lecturers for resubmissions. In addition to this, students don’t feel excited to go to class leave alone read the coursework provided by the lecturer and some even use this opportunity to catch a few snoozes as the lecturer is teaching.

Given the stated challenges, as much as there is an option of E-Learning there is still a gap whereby students still don’t feel motivated to read and similarly, lecturers also do not feel the need to use E-Learning as the options available for the course material to be available online are both expensive and complicated to use. An interactive prototype will be created to provide a convenient way of students getting content without having to physically attend classes, submit their assignments online and even participate in weekly exercises and group discussions online which are graded by the lecturers.

1.3 General Objectives

The general objective of this study was to identify factors promoting E-Learning and determine usability challenges in the existing E-Learning web portals in Kenya and thus develop a prototype that will address these challenges.

1.4 Specific Objectives

i. To establish the factors promoting adoption of E-Learning in Kenya.
ii. To determine the challenges in the existing E-Learning portals in Kenya.
iii. To develop and test a prototype that will address the challenges currently faced by the existing E-Learning portals in Kenya.

1.5 Justification of the Study

1.5.1 Kenyan Citizens

This study is very important as it will provide a convenient way for Kenyan citizens who would indeed want to obtain graduate level certifications but are constricted financially to study abroad & unable to attend face to face classes have an option that will indeed satisfy their knowledge thirst. It will also be easy to access and use regardless of their location at the time of learning. It
will more importantly ensure that students enjoy and internalize the content because it will be delivered in a much better interactive format and the E-Learning institutions get to be more tech savvy especially the lecturers who are not in the IT domain and at an affordable cost.

It is also important to note that the study allows us to not necessarily consider the complete face to face training in the world as there are some things that face to face is better for e.g. a physical skill that needs to be demonstrated and practiced on the go. However, learners will get much more out of the blend that combines both the face to face and the digital training to have a holistic experience that fits into the modern definition of learning.

1.5.2 University Fraternity

This study will provide an easier way for lecturers from all departments to pass on their tacit knowledge in an interactive way and get to also up their technical skills for personal development after availability of a user-friendly system.

1.6 Scope of the Study

The study focused on USIU students but more specifically Masters and PHD Students who were viewed as the main beneficiaries of this study as they are the ones most affected by the responsibilities and time constraints associated with their busy schedules and limited funds.

1.7 Definition of Terms

**Virtual Learning Environment (VLE):** an online system that allows teachers and trainers to share educational materials and communicate with their learners via the web. Usually with built in tools to create engaging learning content (Gallacher, 2015).

**Distance Learning:** a formalized teaching and learning system that is less expensive to support and is not constrained by geographic considerations specifically designed to be carried out remotely by using electronic communication (Rouse, 2005).

**Hyper Text Mark-up Language (HTML 5):** is a mark-up language used to create electronic documents (called pages) that are displayed on the World Wide Web. It is the fifth and current version of the HTML standard (Hope, 2017).
Learning Management System (LMS): is a software-based platform that facilitates the management, delivery, and measurement of an organization’s corporate eLearning programs (Hoffman, 2017).

1.8 Chapter Summary

In this chapter the problem statement has been well elaborated and the objectives of the study clearly outlined. The importance of the study has also been outlined, whereby the Kenyan Citizens and the University Fraternity as a whole are seen as the main beneficiaries of this study. The scope of the study outlines the extent of the study, the people that will be participating and the various academic institutions involved.
Chapter 2: Literature Review

2.1 Introduction

This section consists of a critical review of research work from journals, internet sources and other projects related to the subject area and an analysis of existing literature on the subject with the objective of revealing contributions, weaknesses and gaps in existing systems abroad.

The study also reviewed E-Learning initiatives implemented in Kenya and the usability challenges the respective systems faced.

2.1.1 Factors Influencing Adoption of E-Learning in Kenya

There are several factors that promote the use and growth of E-Learning in Kenya. Firstly, Kenya has more service providers offering internet services at affordable costs and users choose the package depending on what they can afford (Ischebeck, 2017). Secondly, E-Learning has been viewed as the cheaper alternative to attending physical classes as the costs are lower because you can attend class from the comfort of where you have internet connectivity, you do not need to pay for extra services that you will frankly not use and no need to set aside money for transportation to and from the university (Ischebeck, 2017). Thirdly, there is an increase in the use of smart mobile devices due to their affordability and which easily access the internet making it possible for the users to access Android, iOS or web based E-Learning applications. Fourth is the growth of mobile telecommunications infrastructure area coverage which is attributed to the emergence of mobile telecommunication companies and increased competition among them to cover new areas. This means a wider population is covered by the mobile network and this increase the population who can access and use E-Learning applications in Kenya (Oteri, 2015).

E-Learning Application Platforms Used Around the World

Blackboard Collaborate

Blackboard Collaborate is a real-time, multi-functional virtual classroom or web conferencing environment that gives the lecturer and his/her students the opportunity to meet online to learn, rather than in a classroom. Students log on at the same time for a live classroom session with the lecturer. The figure 2.1 below shows the Blackboard interface that USIU use in Kenya.
Features of Blackboard

1. **Live Instruction**

Blackboard enables an interactive environment either one to one or one to many where students are free to interject their own thoughts and ideas and not have to learn on their own isolation.

2. **Asynchronous Content Development**

With Blackboard Collaborate a lecturer can be able to create asynchronous content with interactive record and playback functionality. This simply means that you can be able to record a session that students who have missed the session can watch later at their own time or just the ones who want to reinforce the knowledge that they had already gained. With the voice authoring capability, the lecturer can add a voice component that facilitates vocal instruction, collaboration, personalized coaching and assessment. Easy podcasting allows lecturers to create instant notes while voice recordings provide thoughtful quick feedback to students.

3. **Tutoring Programs**

Sessions can be scheduled or students can drop into an existing virtual room to connect with a tutor to get questions answered or to receive help with their assignments.
4. Classroom Collaboration

Collaboration at a distance connects students from different locations and cultures to enhance E-Learning experience.

5. Remote Guest Speaker/ Virtual Field Trip

It enables you to bring in remote experts to the classroom or to send students on a virtual field trip. Without Blackboard, the travel time and logistical aspects of each intellectual exchange would be impossible.

6. Professional Development

Lecturers have a perfect environment to get access to better technological and emotional support.

7. Virtual Help Desk

Students can get access to experts on resources such as the research library without going to campus. Blackboard is also used for remote troubleshooting where the tool can be used to access students’ computers to solve problems rather than make them take the machines to campus or having technicians make home visits (Collaborate, 2011).

Benefits of Blackboard Collaborate

1. Increase Completion Rates and Retention

Traditional physical learning environment made students feel unmotivated and isolated working on their own with little contact with the teacher and other students. Research has shown that distance E-Learning has improved student attitude and motivation and building a sense of community; the result being increased coursework completion rates, higher test scores and improved retention.

2. Eliminate Geographical Barriers

Academic institutions extend the boundaries of the physical classroom, leveraging limited teaching resources, providing guest lecturers and remote experts, expanding geographical reach to increase enrolment and providing access for all, regardless of location.
3. **Build Online Communities**

With Blackboard, students can collaborate with each other across the globe, throughout a nation and across campus and build vibrant learning communities that encourage participation and stimulate innovation. With Blackboard institutions and instructors can even set up virtual student rooms for scheduled meetings or ad hoc collaboration with or without a teacher present.

4. **Save Travel Costs**

Synchronous online E-Learning is a cost-effective solution that provides universal access with lower total cost of ownership and strong ROI.

5. **Accommodate multiple E-Learning styles**

Blackboard Collaborate web conferencing provides two-way voice over the Internet, instant messaging, and a shared, interactive whiteboard to display educational content. These features create a rich and engaging learning environment that allows users to benefit fully from sessions regardless of their preferred learning styles.

6. **Incorporate Technology in the Classroom**

Students in traditional brick and mortar classrooms are changing the way they learn and interact. Often referred to as “digital natives,” today’s students have grown up in a digital world and demand that schools keep in step with their learning styles. At the same time, educators have realized that their teaching styles must change to keep students engaged and actively learning (Bradford, 2007).

**Disadvantages of Blackboard Collaborate**

1. **Outdated Technology**

According to Chris Carrillo who has more than 15 years of experience as an Academic Technologist, its platform is relatively outdated and lags behind some of their younger competition especially in the Software-as-a-service/cloud arena where blackboard’s cloud service offering is behind others such as Canvas and Schoology in their capability (Carrillo, 2015). He went on to say that Blackboard’s development is also slow because of their large and diverse base of product versions and variations and the burden of their legacy platform which
are now lacking in quality because of the many recent changes that have occurred in web/browser technology (Carrillo, 2015).

2. Blackboard System Inefficiencies

Chris Thomas who is a chief strategist for Intel at the time of his article claimed that there are significant costs and technological impacts of wasting bandwidth with portal based systems like blackboard particularly when materials need to be downloaded to view them. In addition to this, dependence on server portal solutions is always subject to network problems but if information is sent directly to mobile devices, there is no system to crash (Culatta, 2004).

3. Cost

Looking at America, the American Council on Education estimated costs associated with higher educational telecommunications to be 7 million dollars an amount that keeps increasing by 35% yearly if not more. These costs primarily reflect prices charged by outside internet service providers and course management system providers like Blackboard. Better options such as open source E-Learning management systems are becoming available and these are empowering students and teachers in today’s pedagogical arena (Olsen, 2001).

4. Blackboard is Difficult to Learn

Several surveys conducted by Peter Bradford, Margaret Porciello, Nancy Balkon and Debra Backus who are United University Professors for their journal showed that the students who used Blackboard felt as a course management system was hard to learn than was initially expected and were not proficient with the technology (Bradford, 2007).

Moodle (Modular Object-Oriented Dynamic Learning Environment)

It is a flexible open source and free to download learning management solution that was developed in 2002 by Martin Dougiamas originally as a platform to provide educators with the technology to provide online E-Learning in personalized environments that foster interaction, inquiry and collaboration. Trainers can create and deliver online courses so that their respective audiences can meet and exceed their learning goals (Solutions, 2017). Figure 2.2 shows the Moodle homepage.
Figure 2.2: Moodle Home Page

Source: Moodle Website 2018

Features of Moodle

1. **An Easy Way to Communicate with Students and Staff Wherever They Are**

The news form automatically emails messages to all students and staff on the course. Forums can also be used to answer commonly asked questions – and prevent repeats, to provide a space for informal peer to peer student discussion or even online tutorials.

2. **A Quick Way to Share Documents**

Moodle provides a place where you can easily create web pages with information about your course and provide links to word documents, slides, and other resources that your students will want to access.
3. **Easy Access to Relevant and Useful Online Resources**

The department and the university provide a wealth of materials and resources but catering for so many different types of students it can be hard for learners to find those that are most relevant to them. You can use your Moodle to provide links directly to the resources that will be most useful for your students whether e-library resources, skills courses.

4. **Online Assignment Handling**

Online assignment handling can save time and effort for everyone involved – whether it is just used for student submission with marking done on paper or the whole process is moved online saving time, postage and paper.

5. **Course Calendar**

Used to flag important events to everyone on your course.

6. **Profiles and Contact Information**

Help students and staff get to know each other at the start of the course, also hold information about course team and students in one place.

7. **Video and Audio**

Many academics find it easy to record lectures as podcasts or even arrange for videos of lectures or special events– posting these online and making it available to students is straight forward with Moodle.

8. **Group Tools for Students**

There are many tools that students can use for collaboration with each other e.g. forums, wiki and chat.

**Advantages of Moodle**

1. It is an open source software which you can download and customize to suit your needs and requirements.
2. You can have an unlimited number of users in the school.
3. Enormous number of add-ons and plug-ins.
4. More and more tutorials online which is a result of a vast online community of user groups.
5. Resources and guides all free.
6. You can host it on your server or on an outside server if you host on an outside server, many will install it ahead of time for you and have the experience in doing so.
7. APIs and mashups; availability of these can expand Moodle to the next level of learning.
8. Can save time and money in photocopying by making resources available online and use less paper as students will only print what they need.
9. A low risk way to incorporate new tools and ideas into your teaching.
10. Manage your materials as if all your course information is on Moodle this is easy access this year after year (Weiss, 2010).

**Disadvantages of Moodle**

1. One needs to have strong technical skills that would include programming – JavaScript, HTML, CSS, XML, perhaps Ruby on Rails, PHP, databases, .SQL., etc. or if you host it on your own servers, you will need a programmer to customize.

2. One has unlimited users, but with off the shelf courses, the same issue still applies with seat purchases. You still have to purchase seats for that content and that will cost. Unlimited seats will be very expensive to have (Weiss, 2010).

**Canvas**

Canvas is a cloud based LMS that connects all the digital tools and resources teachers use in one simple place. It was built using Ruby on Rails as the web application framework backed by a PostgreSQL database. It operates as a SAAS using AWS in the Cloud. There are three mobile applications available such as Canvas Student Teacher and Parent on both iOS and Android whereby Canvas Parent allows parents to keep track of their child’s progress and assignments. Figure 2.3 shows how the Canvas homepage appears for students.
Features of Canvas

1. Canvas Data

It parses and aggregates more than 280 million of Canvas usage data generated daily.

2. Canvas Commons

This tool makes sharing easier.

3. Speed Grader Annotations

This feature allows for a preview of student submissions and provides the feedback in one frame. Speed grader also allows for lecturers to grade assignments in half the time.

4. Graphical Analytics Reporting Engine
This enables someone turn rich learner data into meaningful insights to improve teaching and learning.

5. **Automated Tasks**

Course management is fast and easy as most tasks have been automated.

6. **User Customizable Navigation**

This feature intelligently adds course navigation links as teachers create courses.

7. **RSS Support**

The user is able to pull feeds from external sites into courses and push out secure feeds for all course activities.

8. **iOS and Android**

Students can be engaged anytime, anywhere from any computer or mobile device with a standard Web browser (Canvas, 2018).

**Advantages of Canvas**

1. **Clean Interface**

The simple architecture lets instructor content be the focus as it is straightforward.

2. **Easier building experience**

It is easy to navigate and thus instructors are able to build courses easily and consistently.

3. **Speed Grader**

This tool makes grading assignments easier, enabling instructors to give students more thorough and efficient feedback. Students can include hypothetical grades and view their final grade percentage throughout the term.

4. **Mobile App**
A mobile application feature is available which has an advantage especially for students as they are able to access coursework on a smart phone or a tablet that has a compatible web browser, from anywhere and at whatever time is suitable for them.

5. **Simplified Collaboration**

Students can take a proactive approach to group work, sharing documents and hosting discussions all within the LMS.

6. **Calendar**

This tool helps students to stay organized, displaying assignments and due dates across all active courses (ODEE, 2018).

**Disadvantages of Canvas**

1. **Features**

Lack of blogs, wikis and journals features especially if a user was already used to them from other LMSs.

2. **Control**

Lack of direct control to the environment for updates and manipulation nor immediate access to the database. Therefore, making changes has to be done.

3. **Buggy**

The site can tend to be a bit buggy with need for security patches to be done severally.

4. **FAQs**

It is difficult to find instructional material on how to use the platform.

5. **Calendar**

There’s no simple way to add one sentence reading assignments to calendar (Littlefield, 2016).

**Sakai**
Sakai was built by a consortium of five large U.S. universities, including Michigan, Stanford, MIT, UC Berkeley and Indiana based on existing tools contributed by each of the founding institutions and released to the public in 2005. It is currently managed by the Sakai Foundation which oversees its development and project roadmap. The application is programmed in Java and designed to be a service-oriented application suite. Below is a screenshot of a course site’s home screen built on Sakai LMS. Figure 2.4 shows a course site home screen built on Sakai.

Figure 2.4: Course site home built on Sakai

Source: Sakai Website 2018

Features of Sakai

1. Responsive UI

The UI, Morpheus, has several features that make it powerful and modern in design and ensures that it is optimized for desktop, tablet and mobile screens. These include a mobile ready navigation, a breadcrumb navigation bar and simplified process form managing favourites sites, interface controlled by SASS (Syntactically Awesome Style Sheets) that also incorporate Bootstrap and Font Awesome libraries making it easier to develop new tools and customize them with well-known libraries (Sakai, 2018).

Advantages of Sakai
1. LMS Created for Educators by Educators

Instructors are availed to more than 30 tools for content delivery, assessment and collaboration that support a wide range of teaching methods and modes as Sakai is a flexible LMS and not rigid. It therefore empowers you to teach in your own style.

2. Open-source

As a content creator (developer), one can move their code, customization and course data with no vendor lock in in place. One also has complete access to source code, transparent development processes, an open API and support for open standards.

3. Secure, Private Cloud with 100% Uptime SLA.

One is able to know where precisely their data lives whereby the private cloud is monitored, load- balanced and secure 24/7/365 and not have to live by the vendor’s upgrade schedules- they get system updates on their schedule.

4. Available Support

All Longsight support staff and developers have worked in higher education and thus understand the environment better than any other service provider. Immediate access to the highest level of expertise and support to assist with any question or issue whatsoever is guaranteed.

5. Campus-wide Integration

Sakai offers streamlined services to any faculty and students including single sign-on, automated course creation, enrolment updates, direct access to library resources and more (Longsight, 2018).

Disadvantages of Sakai

1. Need full time in house support

There is need for technical instructional developers who are familiar with Sakai from an advanced perspective to be present to assist instructors as is it very technical and in need for routine maintenance to fix bugs that keep cropping up (Dooley, 2016).
2. FAQs

Help documentation is generally focused more on the course constructor than the student needs. Therefore, commonly asked student questions have not been factored in (Golightly, 2016).

3. Upgrades

Importing past lessons into newer versions is a cut and paste task which is tedious unlike having an option to import and edit from a backup (Sciacca, 2015).

4. Lack of Multimedia Features

Sakai is not good for recording audio or more sophisticated multimedia integration as it lacks video integration with no options for uploading or chat based video into the interface and shell (Uzwyshyn, 2015).

5. Compatibility

Sakai is only officially supported in Mozilla Firefox therefore users using other browsers suffer from compatibility issues. In addition to this, the desktop version relies on HTML frames to display content which is archaic in nature. Some course site designers employ this by porting in a web page or other content into this frame through insecure means that Firefox will block by default, leaving the end-user with the top navigation, left sidebar of buttons, and a blank main content area. An end-user must dismiss Firefox's security warning and have it "stop blocking" what it deems "insecure content" (Smith, 2015).

Table 2.1 highlights the various challenges identified from the E-Learning Platforms that are being used around the world and that have been adopted by Kenyan Universities.
<table>
<thead>
<tr>
<th>Challenges Identified</th>
<th>Description</th>
<th>Name of LMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>Expensive to deploy due to licensing and indirect charges for upkeep and evolution of the system. There is also a cost implication for adding infrastructure and data migration to a new LMS as you are not in control of your data.</td>
<td>Blackboard, Moodle</td>
</tr>
<tr>
<td>Customizability</td>
<td>Adding content is a learning curve.</td>
<td>Blackboard, Moodle</td>
</tr>
<tr>
<td></td>
<td>Customization requires a lot of coding work and has a cost implication</td>
<td>Canvas</td>
</tr>
<tr>
<td>Lack of multimedia features</td>
<td>Lack of options for uploading videos or live streaming.</td>
<td>Sakai</td>
</tr>
<tr>
<td></td>
<td>Lack of sophisticated multimedia integration.</td>
<td></td>
</tr>
<tr>
<td>Support</td>
<td>There is need to have a fully technical person with advanced knowledge in both customizations and coding for day to day support. To also assist lecturers with uploading content and students with downloading material.</td>
<td>Blackboard, Moodle, Sakai</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moodle, Sakai</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sakai</td>
</tr>
<tr>
<td>Compatibility</td>
<td>Information is distorted when using different accessibility methods e.g. mobile phone, tablet and PC.</td>
<td>Sakai</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Canvas</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moodle</td>
</tr>
<tr>
<td>Online Community</td>
<td>Lack of blogs, wikis and journal features</td>
<td>No option to pin discussions</td>
</tr>
<tr>
<td>------------------</td>
<td>------------------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Upgrades</td>
<td>Once customizations are done, migration to the new version can be a nightmare</td>
<td>Moodle, Sakai</td>
</tr>
<tr>
<td>Ease of Use</td>
<td>Lack of instructional material on how to use the platform</td>
<td>Canvas, Sakai, Blackboard, Moodle</td>
</tr>
<tr>
<td></td>
<td>Cannot drag and drop content thus have to tediously cut and paste especially after updates</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Switching views isn’t always visible.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No option to customize course menu</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Initial look and feel always needs to be customized</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018

2.2 Challenges in the Existing E-Learning Portals in Kenya

2.2.1 What is Driving Kenyan Students to Study Abroad

An article written for the University World News website showed that perceived poor quality of university education in Kenya could be pushing students out of the country (Nganga, 2011).

A recent survey by Synovate, a consumer research firm, revealed that most Kenyans would prefer to study abroad, where they believe universities guarantee quality learning and are prestigious. Of 1,044 students polled in the survey, 57% of them said they would prefer to study...
in a foreign university than a local one. "The findings show that there is still much to be done to boost confidence in Kenya's universities," said Synovate Managing Director George Waititu. Educationalists said the findings indicate that problems facing universities, especially public institutions - such as over-flowing classes, strained facilities, high fees and shortages of lecturers - are turning students away from local study (Nganga, 2011).

Government statistics show that the number of Kenyans issued with study visas has been rising in recent years. Three top destination countries - the US, Britain and Australia - issued more than 7,000 visas to students last year compared to just over 6,000 in 2008. Kenya's universities are also said to be more expensive than their regional counterparts. More than 20,000 Kenyan students are estimated to be studying in Ugandan universities and slightly below a quarter of that number are in other neighbouring countries such as Tanzania. But experts pointed out the most students travelling overseas for study are from rich families, and most parents cannot afford the high fees charged by many foreign universities (Nganga, 2011).

Official statistics show that Kenyan households already spend as much as half on their earnings on education, much of it on higher education as the state substantially subsidises schooling (Nganga, 2011).

A recent survey by Spain's Webometrics, which ranks universities according to their web presence, showed Kenya's top universities slipping several places in January compared to July last year. It indicates that local universities have been slow to adapt to new technologies. No Kenyan university made it into the top 1,000 list of the 2010 Academic Ranking of World Universities, produced by Shanghai Jao Tong University in China, reflecting the low standing of the country's institutions. This also inhibits partnerships with top international universities and donor funding (Nganga, 2011).

Demand for higher education has soared in Kenya, as more and more school-leavers qualify for university study and seek to increase their opportunities in the labour market. However, local universities do not have nearly enough places to meet the demand, further fuelling the exodus of students to foreign universities (Nganga, 2011).

Educationists maintain this has also opened loopholes for rogue institutions offering degrees and diplomas to thrive, dealing a further blow to the reputation of higher education in the country. The government admits the challenge. "The quality of learning in some universities has
been declining," said the country's new National Strategy for University Education. "There is a shortage of doctoral level lecturers because of rapid expansion and brain drain" (Nganga, 2011).

### 2.2.2 Kenyan universities Current Take on E learning

Kenyan Universities are increasingly turning to e-learning as a tool to facilitate improved education. They also want to rope in more students through better access to facilities, hoping to reach a wider base in a cost-effective way. The efficiency accruing from e-learning is among the advantages gained by local universities that have adopted the use of technology. Using different platforms, students are able follow lectures online, interact with lecturers, submit assignments and check on their grades. Lecturers are also able to upload course materials, post assignments and generate discussions online using blogs. However, these institutions must train both students and lecturers on how to use the platforms (Mugwe, 2012).

At Strathmore University, United States International University (USIU) and University of Nairobi (UoN), all students are enrolled in e-learning courses when they first join. Strathmore University has adopted the use of e-learning in many of its courses via the Moodle platform. The university uses this as a way of facilitating lectures. Mr Patrick Shabana, the Director of Strategy and Performance Improvement said that the university applies a blend of direct lectures and e-learning techniques in many courses as technology gains acceptability among lecturers and students. "One area in which the university has utilized e-learning is using video conferencing for visiting professors, this is done especially in partnership with other business schools." Strathmore has a tie-up with the IESE Business School which is under the University of Navarra in Barcelona Spain. Prof John Odhiambo, the Vice Chancellor of the university said the platform is already in use, but it takes time for lecturers and students to be fully comfortable with the approach. He said that the Moodle program allows university professors to give lectures remotely, on top of enabling access to more students (Mugwe, 2012).

Regina Mutuku, the Director of IT at USIU said e-learning is just another way of delivering services which works together with face-to-face teaching. "It gives you the ability to manage work more effectively ... It is not replacing the contact hours but it is being more responsive to the modern student", added Regina Mutuku said that USIU had recently adopted a new platform, Blackboard 9.1 which will go into use in the coming semester. She added that formerly the University has been using Webcity which had over 400 courses and half of the faculty using it in interacting with students (Mugwe, 2012).
Daystar University has also adopted a blended version of e-learning. Deputy Vice-chancellor Jon Masso said that this enables a fully electronic relationship between lecturers and students. "In distance-learning, students work and do assignments online. We have been working in that direction and probably next year we will have a whole degree taught on that kind of platform" he added. However, he said that there are various challenges being faced, "The technical infrastructure relies completely on local networks and the internet which may be slow (Mugwe, 2012).

Public universities such as Moi, Maseno, Jomo Kenyatta University of Agriculture and Technology and Kenyatta all have e-learning portals where students can log in and perform various tasks while interacting with lecturers. Dr Elijah Omwenga, the Director of ICT at UoN said the institution uses technology to enhance distant learning education and has the necessary facilities to do this in all its campuses. "Lecturers have flexible access and student hostels have a wireless network. There is curriculum training for staff on how to facilitate content online and the student's information systems network has been integrated into the e-learning system to enhance and allow fast uptake of e-learning. There is also an awareness campaign using brochures, flyers and open days to increase interest among students and staff." Kenyatta University has an institute of Open Distance and e-learning using the Moodle platform. According to its website, over 100 courses are fully offered using the platform (Mugwe, 2012).

2.3 Theoretical Foundation

2.3.1 Technology Acceptance Model (TAM)

TAM (Technology Acceptance Model) Theory states that perceived usefulness and perceived ease of use determine an individual's intention to use a system with intention to use serving as a mediator of actual system use. Perceived usefulness is also seen as being directly impacted by perceived ease of use (Davis, Bagozzi, & Warshaw, 1989).

Perceived usefulness – This is described as the degree to which the user of a particular technology believes that, by using the technology it will enhance their job performance (Davis, Bagozzi, & Warshaw, 1989).

Perceived ease-of-use – This is described as the degree to which users of a particular technology believe that by using the technology they would be free from effort (Davis, Bagozzi, & Warshaw, 1989).
Figure 2.5 demonstrates this theory pictorially.

![Technology Acceptance Model](image)

Figure 2.5: Technology Acceptance Model

Source: User Acceptance of Computer Technology 2018

### 2.3.2 Theory of Reasoned Action (TRA)

This theory was formulated by Icek Ajzen and Martin Fishbein in 1980 from various researches including the theory of attitude. It suggests that a person’s intention to perform a behaviour is the main predictor of if they actually perform the behaviour. According to the theory, intention to perform a certain behaviour precedes the actual behaviour. This intention is known as behavioural intention and comes because of a belief that performing the behaviour will lead to a specific outcome. Behavioural intention is important to the theory because these intentions "are determined by attitudes to behaviours and subjective norms”. The theory of reasoned action suggests that stronger intentions lead to increased effort to perform the behaviour, which also increases the likelihood for the behaviour to be performed (Ajzen & Fishbein, 1980).

This theory can be summarized into both a formula and figure 2.6 as shown.

**Formula**

\[ BI = (AB)W_1 + (SN)W_2 \]

where:
- \( BI \) = behavioral intention
- \( AB \) = one’s attitude toward performing the behavior
- \( W \) = empirically derived weights
- \( SN \) = one’s subjective norm related to performing the behavior
Figure 2.6: Theory of Reasoned Action

Source: Understanding Attitudes and Predicting Social Behaviour 2018

2.3.3 Diffusion of Innovations Theory

This theory seeks to explain how, why and at what rate new ideas and technologies are spread. It was developed by Everett Rogers a professor of communication studies who proposes that the four main elements that influence the spread of a new idea are the innovation itself, communication channels, time and a social system. This process relies heavily on human capital. The innovation must be widely adopted to self-sustain. Within the rate of adoption, there is a point at which an innovation reaches critical mass (Everett, 2003).

The users who adopted the technology were termed as adopters and further categorized as innovators, early adopters, early majority, late majority, and laggards as shown in figure 2.7.
Diffusion manifests itself in different ways and is highly subject to the type of adopters and innovation-decision process. The diffusion innovation process of the adoption process is divided into 5 stages, which are knowledge, persuasion, decision, implementation and confirmation. The stages are shown in figure 2.8.
2.4 Conceptual Framework

After analysis of the above theories, TAM is selected as the best theory for this paper due to its constructs to determine if a solution is indeed useful and performing to its intended use to increase interactivity within the class program and be easy to use and therefore focuses on technology acceptance behaviour. It’s however clear that there are also additional constructs that can be borrowed from the other theories to provide a well-rounded analysis of the intended solution which will also include human behaviour.

So as to come up with a new framework the researcher uses performance expectancy, efforts expectancy, social influence, facilitating conditions and threat appraisals as constructs from the mentioned theories as the determinants of E-Learning technology acceptance.

The framework shown in figure 2.9 was used to come up with the criteria used to analyse the developed prototype using the questionnaires distributed to various respondents after fully testing of the system was complete.

It was important to analyse if indeed the prototype would have any use to the respondents and be easy to use. Additionally, if it was accessible using various smart devices and if the cost was indeed low to maintain it from a user’s perspective. Finally, it was important to also analyse if the prototype was reliable, effective, if the users understood its importance and were overall
satisfied with its use and would be motivated to use it again. These results will be reviewed in chapter 5 and 6.

Figure 2.9: Conceptual Framework for E-Learning Adoption in Kenya

Source: Author’s Data 2018

2.5 Literature and Gap Analysis

2.5.1 Benefits of E Learning

1. It is What Learners Want

A recent report was done on the gap between corporate E-Learning and what learners actually want highlighted that when given a choice, learners actually want mobile, relevant, personalised and self-paced content at a point of need (Maturity, 2016). This was seen to be preferred instead of what they have been getting which puts too much emphasis on face-to-face and long courses
instead of following suit with the digital revolution which has triggered huge changes in how we access, consume, discuss and share content and leaves us in sync with modern learners who deliver the content needed when needed (Maturity, 2016).

2. Faster Delivery

It has quicker delivery cycle times than a traditional classroom-based instruction since it does not take as long to start and wrap up a learning session, learners set their own pace than the pace of the group, learners can focus on elements of a program they need to learn and skip what they already know. Additionally, there’s a practical limitation on how quickly learning can be rolled out with classroom-based instruction as the capacity to deliver is limited by the number of available classrooms and trainers (Rosenberg, 2001).

3. Lower Costs

E-Learning is delivered with speed and ease which thus drastically reduces the costs of learning and development for an institution. This is due to reduced training time, trainers, course materials, travel and accommodation in terms of housing costs for students (Rosenberg, 2001).

4. More effective eLearning

Various case studies conducted have shown that eLearning courses can have a positive and direct impact on an organisation’s profitability by making it easy to learn and distill information as there is a better attitude towards the eLearning format and training in general, improved scores on tests and other evaluations, increase in number of learners who achieve best honours, greater ability to apply the knowledge or processes on the job and better long-term retention of information (Rosenberg, 2001).

5. Lower Environmental Impact

By providing an alternative to the paper-based learning and testing of traditional classrooms, eLearning is an effective way for organisations to significantly reduce their carbon footprint by cutting down on the travel and accommodation costs associated with undertaking a course, reduces the costs of maintaining the facility and equipment and eliminates the need for paper thus saving trees (Rosenberg, 2001).
2.5.2 Challenges in E-Learning Adoption in Kenya

A paper called Status of E-learning in public universities published in the International Review of Research in Open and Distributed Learning Journal found that the challenges in E-Learning in Kenya are as follows:

- **There is a lack of National and University E-Learning Policy** which is formulated to guide in the structured utilization of online pedagogical methods in universities to make its adoption as systematic as possible. This notwithstanding, most African universities do not have a clearly defined national policy on e-learning, which is impeding the adoption and utilization of e-education in the continent.

- **There is a low usage of E-Learning among lecturers** whereby only 32% of the lecturers used e-learning as a mode of pedagogy while 68% did not. The latter group of lecturers preferred conventional or traditional mode of pedagogy to e-learning. The reasons adduced for this preference included the following:
  - Ease of reference to hard copies,
  - Fear of technology failure especially during a lecture, and
  - Lack of ICT skills on how to change hard copies or hand-written teaching materials to technology enabled formats.

The reason why most lectures opted to only upload notes was that they did not work closely with technical staff in the development and uploading of the modules on the universities’ LMS. Additionally, they lacked adequate time to devote to the development of interactive modules. These challenges were compounded by the fact that most universities lacked appropriate and adequate e-learning infrastructure to support the development of interactive e-learning content.

- **Low Usage of E-Learning among students** whereby the results of their interviews showed that 90% of the students knew about E-Learning but only 35% used it. Many of the students who adopted e-learning rarely used it to access lectures online but a sizeable number used it to download lecture notes, access and take CATs online, and submit assignments online.

- **Low Number of Units Offered Online** whereby findings of the study taken at the time revealed that the number of courses offered per semester varied from university to university, ranging from 6 to 10. EU, on average, offered the lowest number of course units per semester while MU offered the highest. Interestingly, study findings revealed
that an overwhelming majority of course units on offer during the time of this study were not offered online, but F2F. Except for KU, over 50% of the students in the other universities reported not to have taken any units online. Most students who took online units registered for one to two units with KU leading at 60% followed by MAU at 40.7%. The number of students taking more than two units was reduced drastically in all universities.

- **Insufficient Internet Connectivity** whereby as much as the public universities had both fibre and wireless connectivity, the bandwidth and the number of hotspots in the school are not sufficient.

- **Limited ICT Skills** whereby most of the lecturers are not trained on E-Learning and thus incompetent to handle online courses.

They thus concluded that public universities have not yet fully adopted e-learning as a mode of pedagogy and have not made significant strides in that direction. This was evidenced by lack of senate approved e-learning policies which hindered a uniform and structured implementation of e-learning in most public universities. Additionally, the low percentage of lecturers and students using e-learning to date alludes to the fact that e-learning in public universities is still at its infancy stage. Where modules have been uploaded on the E-Learning management systems, they are of low quality and lacking in interactivity (Makokha, 2016).

However now in 2018 two years later, it is sad to say that the same still applies although there has been a slight addition to the courses offered online but still F2F is still mostly applied which is thus a big challenge for graduate students who have a busy and tight schedule.

### 2.6 Chapter Summary

There have been various implementations of E-Learning platforms in Kenya which are licenses purchases from existing international LMSs that have been highlighted in the Literature Review. There are several aspects that can be included to enable the implementation of successful E-Learning platform solutions.

First, a feasibility study should be conducted by all universities to develop a platform tailor made to suit their students, lecturers and the type of courses that they offer. Also, this will prevent platforms being developed for the sake of just having a platform and not solving the digital needs
of the institution thus increasing competitive advantage as universities will strive to have the most interactive and user-friendly E-Learning system.

Secondly, the approach taken in the system design of an E-Learning platform is considered critical with a recommendation to follow a bottom up approach whereby the system end users; i.e. students and lecturers are well engaged in the design and the development process to achieve a user inclusive system implementation. Engagement of the end user ensures that the system design included both the functionality and usability accustomed to users hence ensuring a long-term E-Learning program. The system should also be based on well proven scientific principles such as behavioural change theory; user adoption theories r tested economic trends regarding use of user incentives for example free internet bundles for users who register for units on time and lecturers who post content early enough and have high ratings from digital students, free e-vouchers for student school events, the user adoption will ensure the E-Learning system success hence the focus of the aspects that encourage and spur user adoption are key in the design and development stage.

Third, to create a solid foundation for E-Learning innovation and adoption, there is a need for enabling regulatory, technical and commercial environment. Governments should formulate the needed policy to guide the development of E-Learning systems so as to curb the proliferation of non-interoperable innovations. It’s recommended in some instances open source, common or similar architectures can be identified as much as possible to encourage interoperability and compatibility.
Chapter 3: Research Methodology

3.1 Introduction

Methodology is the systematic, theoretical analysis of the methods applied to a field of study (Creswell, 2002). This chapter shall look at the summary of the literature review as well as what can be drawn from the research objectives that were earlier posed in the initial parts of this paper. This chapter lays out the research planning of this study. This research plan shall spell out the methods which will be used, with a clear justification for why the methods were chosen for the study. Secondly, the participants involved in the study will be clearly described with a clear justification as to how and why they were chosen. Any factors included in the study shall be clearly outlined and their estimated effects to the study shall be well explained. Thirdly, details of how the data collection shall be conducted will be well laid out with the chapter highlighting on the importance and limitations of the data collection. The proposed methods of data analysis will be well outlined with clear justification of how and why the mode of data analysis has been chosen for this study. Finally, a summary of the chapter will be given briefly highlighting the importance of the research design, planning and data analysis.

3.2 The Research Design

Research is a systematic inquiry to describe, explain, predict and control the observed phenomenon while a research design is the overall strategy that one chooses to integrate the different components of the study in a coherent and logical way, thereby, ensuring one will effectively address the research problem. The research design constitutes the blueprint for the collection, measurement and analysis of data (Creswell, 2002).

The research design used was survey research in particular, questionnaires that were issued randomly to various respondents on a face to face basis. This was an advantage as the researcher was able to get higher response rates and give the respondents better understanding on the system and the intent of the research.

3.3 Population and Sampling

A research population can be described as a large collection of individuals or objects that is the focus of a scientific query (Hassan, 2018). For this research project the population identified were the beneficiaries of E-Learning platforms who can be categorized in two categories;
potential graduate students and lecturers of learning institutions. The researcher identified institutions related to E-Learning and settled for USIU.

Probability sampling technique was used in this research project so as to ensure there were fair representation and a generalization of the findings to the general population. In specific terms, here was the use of random sampling in which the study was carried out where the participants were approached in their natural setting.

Sample size is the number of units that were chosen from which data were gathered (Lavrakas, 2008). The determination of a sample size is dependent on the following parameters (Araoye, 2004);

- Population size: The total number of people who fit the demographics in the question, in this case the users of the E-Learning applications and the solutions in Kenya.
- Margin of error (Confidence Interval): Given that no sample will be perfect, there must be room left for error. In most cases it’s a margin of error of +/- 5%.
- Confidence level: this is the level of reality reflected on the survey, common confidence levels are 90% confident, 95% confident and 99% confident.
- Standard of deviation: this is the rate of variance expected in the survey response, the common safe variance used is 0.5. It is considered the most forgiving and ensures a large enough sample size.

The parameters result to the following equation;

**Necessary Sample size = (Z-Score)^2 * StdDev*(1-StdDev) / (Margin of error)** (Araoye, 2004)

= (1.645)^2 * 0.5(1-0.5) / (0.1)^2 = 68 respondents.

Assumption is a 90% confidence level with a Z-Score of 1.645

The above formula includes a confidence level of 90% confident, margin of error of +/- 5% and a standard deviation of 0.5.
3.4 Data Collection Methods

The data collection stage consisted of a few activities which were carried out chronologically. These were; designing of the questionnaire, pilot testing of the E-Learning prototype application by the respondent and filling in a questionnaire by the respondent.

The questionnaire used in the survey was developed by the researcher and was used to collect data on the perceived usefulness, perceived ease of use, effectiveness, reliability, mobility, cost, motivation, awareness, user satisfaction and fear of using E-Learning applications.

To enhance the response rate of the targeted individuals, the following format was used in designing the questionnaire:

i. Simple and easy questions would be posed in the first section to encourage participation and cultivate the participant’s curiosity.

ii. Personal questions would be introduced at the last section to give room for the participant to feel like answering the personal questions.

3.5 Research Procedures

In order to achieve the objectives of the study, problem definition and literature review was done which informed the development of the prototype. The researcher conducted a pilot study to find out from students in various universities to confirm if indeed the prototype was ready. This was to test if the prototype was reliable and if indeed it was a valid solution.

It was further reviewed by lecturers from various universities which with the assistance of the pilot study, constituted the review of the content, strengths and weaknesses of the questionnaire in terms of the question formats, wording and order. Data collection and analysis provided the final model of the prototype after review of their responses in the survey carried out after they had tested the prototype.

3.6 Data Analysis Methods

Data analysis was done by use of an application known as Statistical Package for Social Scientist (SPSS). To simplify and arrange data in an orderly manner, the data was captured in Microsoft Excel. All the data was coded ad verified at the point of capture and then scrutinized about the objectives of the study to achieve an accurate conclusion and avoid irrelevant summaries. SPSS
Syntax was used to check for inconsistencies, missing values, anomalies and outliers. Editing data comprised of correction of illogical data, illegal data, inconsistent data and omissions.

Missing data and checking that all questions were filled in the right way was done by use of univariate statistics. The kurtosis and measure of skewness were used to ensure that the data was distributed in a normal way. The Cronbach’s Alpha coefficient was used to check the reliability of the data, while conducting construct validity was used to measure the goodness of fit. All tests where confirmed using loading factor for the respective questions.

### 3.7 Ethical Consideration

Ethical principles were considered prior to conducting the primary research and the appropriate actions were taken. The research instruments were submitted to faculty for review prior to being administered. Anonymity and privacy of all respondents was respected and no personal information of the participants was shared.

### 3.8 Chapter Summary

In conclusion this chapter simply runs through how the data collection and analysis for this study was conducted. The chapter seeks to link the aspects identified in the literature review with the research questions which leads to the study conducting a quantitative research approach via the use of a questionnaire to collect the data. The questionnaires were administered to respondents who were interested in furthering their studies on a graduate level. The questionnaires were based on an E-Learning prototype application which incorporated solutions that would address the usability challenges in the four E-Learning applications highlighted in the literature review. The data collected was coded using MS Excel in a spreadsheet and later imported into SPSS software for data analysis. In the data analysis the study sought to identify patterns and frequencies in the data which would conform if the solution incorporated in the E-Learning prototype application addressed the identified usability challenges.
Chapter 4: Implementation

4.1 Introduction

This chapter is based on the study’s third objective which was about the development of an E-Learning prototype to address the usability challenges identified in the literature review. A summary of the usability challenges identified in the literature review from the various E-Learning initiatives reviewed and how the proposed solutions incorporated in the E-Learning prototype sought to address them will be outlined. The design and the modelling of the E-Learning prototype, screenshots of the actual prototype as the proof of concept and the test criteria used on the E-Learning prototype.

4.2 Analysis

Table 4.1 below provides a summary of the usability challenges identified in the literature review and proposed remedies incorporated in the E-Learning prototype.

Table 4.1: Summary of Proposed Remedies to the Usability Challenges Identified.

<table>
<thead>
<tr>
<th>Usability Challenge</th>
<th>Name of LMS</th>
<th>Remedy applied via the implemented E-Learning prototype</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expensive to deploy due to licensing and indirect charges for upkeep and evolution of the system. There is also a cost implication for adding infrastructure and data migration to a new LMS as you are not in control of your data.</td>
<td>Blackboard</td>
<td>Hosting done on Microsoft Azure which offers SaaS depending on how you use it. Therefore, you can pay as you go and only pay for what one use as opposed to what one will not utilize. This was cheaper than individualized licenses.</td>
</tr>
<tr>
<td>Adding content is a learning curve.</td>
<td>Blackboard</td>
<td>The implementation of a simple web based application that has all important tabs in a place that can be seen thus reducing the number of clicks and</td>
</tr>
<tr>
<td>Customization requires a lot of coding work and has a cost implication</td>
<td>Canvas</td>
<td></td>
</tr>
</tbody>
</table>
Lack of options for uploading videos or live streaming. Lack of sophisticated multimedia integration.

There is need to have a fully technical person with advanced knowledge in both customizations and coding for day to day support. To also assist lecturers with uploading content and students with downloading material.

Information is distorted when using different accessibility methods e.g. mobile phone, tablet and PC.

Lack of blogs, wikis and journal features

No option to pin discussions

<table>
<thead>
<tr>
<th>Lack</th>
<th>Tool</th>
<th>Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>manoeuvres. The views were also simpler.</td>
<td>Sakai</td>
<td>Implementation of a functionality that enables video upload that was quick and easy to use.</td>
</tr>
<tr>
<td>Sakai</td>
<td>Blackboard, Moodle, Sakai</td>
<td>The web application prototype is fairly simple to use and lecturers are able to easily upload content and students are able to easily download material.</td>
</tr>
<tr>
<td>Sakai, Canvas, Moodle</td>
<td>Implementation of a web based application with the use of HTML5 which easily adopts to the mobile device screen size.</td>
<td></td>
</tr>
<tr>
<td>Canvas, Moodle</td>
<td>Implementation of a discussion board that allows for collaboration between lecturers and students.</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018

**What is Elimu Digital?**

To address the challenges that appear in Table 2, the researcher developed an E-Learning prototype named “Elimu Digital” which means “Digital Education” in Swahili slang. This prototype was not developed to discontinue classroom attendance but to complement it and provide a means in which aspiring graduate students can attend classes and download course content regardless of where they are. The prototype offers additional features such as a discussion board where students can interact directly with each other and the lecturer who is teaching that unit and discuss points candidly especially if they are afraid to do so face to face,
get real time email notifications when lecturers add course content, sign for attendance digitally and sit for timed online CATs and exams during which they are unable to access course content.

**Objectives of Elimu Digital Prototype**

- Provision of real-time interaction between student and lecturer via E-Learning discussion boards and comments section after every unit.
- Provision of email notifications to a student’s email immediately a lecturer posts content into the unit they are taking.
- Provision of a progress bar to enable a student to know how far they have reached in the course work and how much more they have to go. A lecturer can also view the progress of their students and get to know who needs further assistance, who is lagging behind greatly or who is making great progress.
- Provision for a lecturer to add online cats to test students as they progress with course content to test their understanding.
- Provision of a social feature where students can like a particular unit and add comments to enable lecturers to see how many students enjoyed particular content or how many did not and the reasons for each respectively. This will also assist with analysis of the delivered course content and the impact to the student.

**4.3 Modelling and Design**

**4.3.1 Context Diagram**

A context diagram shows the system under consideration as a single high-level process and then shows the relationship the system has with external entities (Wiegers, 2017). This tool shows the system boundary and outlines the main system objects. The context diagram in figure 4.1 shows all the external entities that interact with Elimu Digital.
4.3.2 Data Flow Diagram

A data flow diagram (DFD) is a graphical visualization of the movement of data through an information system and shows the flow of data from external entities into the system. It shows the external entities which are sources or destinations of data, processes which take data as input do something and output it, data flows which can be electronic data or physical items and data stores such as databases or XML files and physical stores (Wiegers, 2017). The prototype data flow diagram is as shown in figure 4.2.

Figure 4.1: Context Diagram of Elimu Digital E-Learning Application

Source: Author’s Data 2018
4.3.3 Use Case Diagram

A use case diagram shows the relationship among actors and the use cases within a system, whereby the actors are people who play a role in one or more interactions with the system while a use case is a sequence of actions that provide a measurable value to an actor (Wiegers, 2017). The Elimu Digital use case diagram is as modelled in figure 4.3.
4.3.4 Tools Used

The E-Learning prototype application system was developed with the use of several languages namely Hypertext Mark-up Language 5 (HTML5), Cascading Style Sheets (CSS), JavaScript (JS) so as to achieve an interactive and responsive web application which is light to load on the client side and to enable a captivating user experience. It is also built on top of .Net core web framework.

**HTML5** – Was used to design and come up with the overall layout of the web application. This language was chosen for the E-Learning web application because it easily adapts to the user’s screen size hence giving the captivating and readable interface for users to navigate.

**CSS** – This language was used to describe the general layout of the web application in the HTML5 hence resulting in a well-arranged interface.
**JAVASCRIPT (JS)** - JavaScript is the programming language of the web, used to make a site dynamic.

**C# (C-SHARP)** - A simple, modern, general-purpose, object-oriented programming language developed by Microsoft within its .NET initiative. This is the framework's scripting language, delivering commands to the database to retrieve client requests and serve them up via the frontend (HTML, CSS, JS).

**Database:**

.Net core being a Microsoft product, relies on Microsoft's SQL implementation known as MSQl / SQL Server. This is another relational database management system (RDBMS).

The cloud-based version is usually hosted on AZURE, Microsoft's cloud engine for web applications.

**4.3.5 Architecture of Elimu Digital Prototype**

Figure 4.4 illustrates the functionality layers in a three-tier web-based system.

Figure 4.4: Functionality Layers in a Three-tier Web Based System

Source: Author’s Data 2018

**Presentation Services:** These services appear in the form of input facilities such as text boxes and display. For example, user login entails the collection of the username and password information using HTML forms (Tarhini, 2011).
**Functional logic:** The E-Learning application conducts some data processing which happens in this layer whereby it involved interacting with the databases. For example, after a user registers for the web login, so as to login the user authentication requires the logic unit to read password and username from the database and compare it to the one typed in by the user. If they are similar the user is given access to the web application, if not similar the user is given another chance to input the username and the password (Tarhini, 2011).

**Data management:** This simply refers to the storage, retrieval, insertion of data and the alteration and management of data by a relational database management system. In this case, the E-Learning web application uses MySQL which is hosted by a cloud based web server Azure (Tarhini, 2011).

**4.4 Proof of Concept**

The design and modelling of the Elimu Digital prototype application was done by use of the context diagram, data flow diagram, use case diagram and the tier architecture. After rigorous testing on the local set-up the application was uploaded to a cloud-based web server where it was subjected to more user testing. The Uniform Resource Locator (URL) link for the Elimu Digital prototype is; (https://elimu-digital.com/Account/Login?Return.Url=%2F). The following are the screenshots of the various modules of the E-Learning prototype application.
Screenshots of the various modules

Figure 4.5 is a screenshot of the index page of Elimu Digital E-Learning application.

Figure 4.5: Index page of Elimu Digital E-Learning application

Source: Author’s Website 2018
Figure 4.6 are screenshots of the sign in and sign up forms.

Figure 4.6: Sign In and Sign Up Forms

Source: Author’s Website 2018

If the user is not registered, they proceed to click on the link “Sign up” which directs them to a sign-up form where they fill in their details and click on the sign up button to complete the sign-up process. A window pop up notification appears to confirm successful registration for the web log in as shown below. Additionally, the user receives an email notification to confirm their registration to the email address they specified.
Figure 4.7 contains screenshots of a window pop up a user sees once they register (sign up for access) to the website & the email they receive immediately after.

The user then proceeds to confirm registration and logs in with the email address and password and proceeds to complete their profile registration with a picture and ID details.
Figure 4.8 contains screenshots of the lecturer and student registration forms upon successful sign up.

**Figure 4.8: Profile Set Up for Both Student and Lecturer**

Source: Author’s Website 2018
Once registered, the lecturer can view the units that have been assigned to him and the students who are taking that unit. The lecturer can also view the progress of each student taking each unit as in figure 4.9.

Figure 4.9: Lecturer’s View

Source: Author’s Website 2018
Once registered, a student can also see the units they have enrolled for plus their progress in each unit and have a discussion with the lecturer and fellow students about the unit content as shown in figure 4.10.

Figure 4.10: A Student can Enrol for a Course and View Related Course Content

Source: Author’s Website 2018
Figure 4.11 contains a screenshot of an export from the database to show the users who have accessed the system.

![Figure 4.11: Export from the Database](image)

Source: Author’s Website Database 2018
Figure 4.12 contains a screenshot of the schema of the Elimu Digital E-Learning application database.

**Schema of the Database**

![Database Schema Diagram]

Figure 4.12: Schema of the Elimu Digital E-Learning Application Database

Source: Author’s Website Database 2018
4.4.1 Testing Criteria Used on the System

This is usually the process in which a web application is checked for potential error in its code. Elimu Digital was subjected to several tests namely:

1. Functionality Testing:

Test whether the system developed was as per the technical requirements.

From the sign up process up to course registration.

Test content upload to see whether the system could handle any file size, determine upload times and afterwards confirm whether uploaded content work as expected.

2. Usability Testing:

A group of beta tester was created with each one of them assigned roles in the system; student, lecturer and administrator.

This was to test how the 3 main players in the system linked and worked across the system.

3. Database Testing

The normal integrity checks were carried out on the data being entered into and retrieved from the database.

4. Compatibility Testing:

The system was tested across different devices from pcs [small displays - large displays], tablets, and phones.

This was to make sure the system remained responsive to any change in screen real estate.

A browser compatibility test was carried to ensure the all components worked uniform across all the browsers.

5. Performance Testing

Response times, amount of load the system can handle were all checked.
These were through certain stress testing on the server such as submitting multiple requests at once.

To cut on response times, the system does not heavily rely on third party libraries.

6. Security Testing

Security is a major concern for most web applications.

To work on making the system more secure, the system user access levels were employed.

A given user can only access content relevant to his/her account.

To protect the data from unwanted access, the database is hosted on Azure, a very secure cloud hosting platform.
Chapter 5: Results and Findings

5.1 Introduction

In this chapter an analysis of the data collected shall be presented in the form of tables, charts and graphs with a brief explanation of what the data means in relation to the study. The calculated sample size for this study was 68 people and hence 68 questionnaires were administered to random respondents in the particular target population. All the respondents filled the questionnaires correctly translating to a 100% response rate to the study. General information on the data test and demographics details of the respondents are shown both in tables and charts. Statistical analysis of the data will be presented as per the study’s objective whereby each data presented is explained and the meaning clearly interpreted.

5.2 General Information

5.2.1 Testing Data

The data was tested with two aspects of statistics which were Cronbach alpha to check for relative consistency and skewness and kurtosis to check for normal distribution of data collected.

Cronbach Alpha

Cronbach alpha is the best test for liker scale, whereby it is used as a measure of consistency. It measures how closely related a set of items are when handled as a group. In other cases, it is considered to be a good measure of scale reliability in data analysis (Mallery, 2003).

Table 5.1 shows the data validity which was calculated to be 95 percent. The alpha co-efficient of the analysed data was 0.793 as seen in table 5.2 which suggested that the items have a high internal consistency noting that a reliability co-efficient of 0.70 or above is generally acceptable in most research situations (Mallery, 2003).
Reliability

**Table 5.1: Case Processing Summary**

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases</td>
<td>65</td>
<td>95.6</td>
</tr>
<tr>
<td>Valid</td>
<td>62</td>
<td>94.0</td>
</tr>
<tr>
<td>Excluded</td>
<td>3</td>
<td>4.4</td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>100.0</td>
</tr>
</tbody>
</table>

a. List wise deletion based on all variables in the procedure

Source: Author’s Data 2018

**Table 5.2: Reliability Co-efficient Output**

<table>
<thead>
<tr>
<th>Cronbach’s Alpha</th>
<th>Cronbach’s Alpha Based on Standardized Items</th>
<th>N of items</th>
</tr>
</thead>
<tbody>
<tr>
<td>.793</td>
<td>.683</td>
<td>33</td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018

**Skewness and Kurtosis**

Skewness is defined as a measure of symmetry; mostly it looks for the lack of symmetry. A data set is termed symmetric if the left and right of its histogram are the same from the centre point. Kurtosis is defined as a measure of whether the data in question is light-tailed or heavy-tailed relative to a normally distributed data set (Mallery, 2003). The data collected was tested for skewness and kurtosis.
Table 5.3 shows the multivariate normality analysis.

**Table 5.3: Multivariate Normality Analysis**

<table>
<thead>
<tr>
<th>Code</th>
<th>Questions</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Statistic</td>
<td>Std. Error</td>
<td>Statistic</td>
<td>Std. Error</td>
</tr>
<tr>
<td></td>
<td><strong>User Satisfaction</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>US1</td>
<td>I am able to get most of the information I would need related to my coursework using the E-learning application</td>
<td>1.181</td>
<td>.291</td>
<td>-.625</td>
<td>.574</td>
</tr>
<tr>
<td>US2</td>
<td>Using Elimu Digital is enjoyable to me</td>
<td>.614</td>
<td>.291</td>
<td>-.579</td>
<td>.574</td>
</tr>
<tr>
<td>US3</td>
<td>I prefer getting my coursework material from Elimu Digital as compared to any other source</td>
<td>-.121</td>
<td>.291</td>
<td>-2.047</td>
<td>.574</td>
</tr>
<tr>
<td>US4</td>
<td>I have used a form of E-Learning before</td>
<td>-.608</td>
<td>.291</td>
<td>-.781</td>
<td>.574</td>
</tr>
<tr>
<td></td>
<td><strong>Perceived Usefulness</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PU1</td>
<td>I believe having access to the Elimu Digital E-Learning application will improve my knowledge in various courses taken.</td>
<td>1.736</td>
<td>.291</td>
<td>1.043</td>
<td>.574</td>
</tr>
<tr>
<td>PU2</td>
<td>I believe Elimu Digital will complement the course content I am getting when I attend classes physically. Blended Learning.</td>
<td>2.269</td>
<td>.291</td>
<td>5.039</td>
<td>.574</td>
</tr>
<tr>
<td>PU3</td>
<td>I intend to continue to use Elimu Digital E-Learning application now and in the future.</td>
<td>1.263</td>
<td>.291</td>
<td>.180</td>
<td>.574</td>
</tr>
<tr>
<td>PU4</td>
<td>I would strongly recommend the Elimu Digital application to someone.</td>
<td>0.924</td>
<td>0.291</td>
<td>-1.181</td>
<td>0.574</td>
</tr>
<tr>
<td>-----------</td>
<td>---------------------------------------------------------------------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>-------</td>
</tr>
<tr>
<td>PU5</td>
<td>The use of E-Learning has greatly improved my educational skill and knowledge.</td>
<td>0.212</td>
<td>0.291</td>
<td>-1.572</td>
<td>0.574</td>
</tr>
</tbody>
</table>

**Perceived Ease of Use**

| PE1       | I am able to navigate through the application easily. | 2.038  | 0.291  | 2.219  | 0.574 |
| PE2       | I am able to download and upload content easily. | 0.699  | 0.291  | -1.558 | 0.574 |
| PE3       | I usually do not encounter any problem when I want to access the Elimu Digital E-Learning web application. | 0.629  | 0.291  | -1.194 | 0.574 |
| PE4       | I find the application design and layout simple and easy to understand. | 0.699  | 0.297  | -1.560 | 0.586 |
| PE5       | I like that I get email notifications once a lecturer uploads content into a course unit. | 2.673  | 0.291  | 5.298  | 0.574 |

**Reliability**

| R1        | I am able to access any module of the E-Learning application whenever I need it. | 2.339  | 0.291  | 5.980  | 0.574 |
| R2        | I am able to access the E-Learning application on any of my devices without information getting distorted. | 2.976  | 0.291  | 9.073  | 0.574 |

**Cost**

| C1        | I find it not expensive to access Elimu Digital web application in terms of internet bundle usage. | 0.629  | 0.291  | -1.653 | 0.574 |
## 5.2.2 Demographic Information of the Respondents

The first section of the questionnaire focused on collecting demographic information about the respondents. The demographic information was as follows;

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>C2</td>
<td>I find it cheaper to use the Elimu Digital E-Learning application as opposed to going to class physically.</td>
<td>.430</td>
<td>.291</td>
<td>-1.653</td>
</tr>
<tr>
<td>C3</td>
<td>I will not use the E-Learning application if it had a subscription fee.</td>
<td>.205</td>
<td>.291</td>
<td>-1.642</td>
</tr>
<tr>
<td></td>
<td><strong>Security</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S1</td>
<td>I believe the information I disclose on the E-Learning portal is private and confidential.</td>
<td>.101</td>
<td>.291</td>
<td>-.521</td>
</tr>
<tr>
<td>S2</td>
<td>I believe the information sent to me via the E-Learning application is private and confidential.</td>
<td>-0.33</td>
<td>.291</td>
<td>-.318</td>
</tr>
<tr>
<td></td>
<td><strong>Interactivity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I1</td>
<td>I like that I am able to discuss with my lecturer and fellow students about the courses on the discussion board.</td>
<td>.758</td>
<td>.291</td>
<td>-.502</td>
</tr>
<tr>
<td>I2</td>
<td>I do not need assistance navigating the Elimu Digital platform.</td>
<td>.915</td>
<td>.291</td>
<td>-.005</td>
</tr>
<tr>
<td>I3</td>
<td>Collaboration within the system has increased my interest in using the application now and in the future.</td>
<td>.934</td>
<td>.291</td>
<td>-.084</td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018
This demographic information assisted the researcher identify whether the proposed solution usability challenges in E-Learning application were addressed by the proposed solutions incorporated in the E-Learning prototype application.

**Respondents’ Gender**

Table 5.4 shows the distribution of respondents by gender. The findings indicate that of the 68 respondents 22.1% were male and 77.9% were female. Majority of the respondents were female, but this shows that both genders were involved in the study hence indicating there was no bias on any gender.

**Table 5.4: Respondents’ Gender**

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Male</td>
<td>15</td>
<td>22.1</td>
<td>22.1</td>
<td>22.1</td>
</tr>
<tr>
<td>Female</td>
<td>53</td>
<td>77.9</td>
<td>77.9</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018
Respondents’ Age

Table 5.5 below shows distribution of the respondents by age. The findings indicate that 51.5% of them were between the ages of 30-35, 35.3% were between the ages of 24-29 and 13.2% were between the ages of 36 and above. Majority of the respondents were between the ages of 30-35 of the 68 respondents who took part in the study.

Table 5.5: Respondents’ Age

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid 24-29</td>
<td>24</td>
<td>35.3</td>
<td>35.3</td>
<td>35.3</td>
</tr>
<tr>
<td>30-35</td>
<td>35</td>
<td>51.2</td>
<td>51.2</td>
<td>86.8</td>
</tr>
<tr>
<td>36</td>
<td>9</td>
<td>13.2</td>
<td>13.2</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018
Respondents’ Occupation Status

Table 5.6 show the distribution of respondents by their occupation. The findings indicate 76.5% of the respondents are employed of the remaining 23.5% of the respondents, 17.6% of them are self-employed and 5.9% are unemployed.

Table 5.6: Respondents Occupation Status

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td>Self-employed</td>
<td>12</td>
<td>17.6</td>
<td>17.6</td>
</tr>
<tr>
<td></td>
<td>Employed</td>
<td>52</td>
<td>76.5</td>
<td>94.1</td>
</tr>
<tr>
<td></td>
<td>Unemployed</td>
<td>4</td>
<td>5.9</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>68</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018

Respondents’ Level of Education

Table 5.7 show the distribution of respondents by level of education. The findings indicate that a majority of the respondents had tertiary education which results to about 85.3% of them while the remaining 14.7% of the respondents had secondary school education.

Table 5.7: Respondents’ Level of Education

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td>Secondary</td>
<td>10</td>
<td>14.7</td>
<td>14.7</td>
</tr>
<tr>
<td></td>
<td>Tertiary</td>
<td>58</td>
<td>85.3</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>68</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Author’s Data, 2018
Respondents’ Device

Table 5.8 shows the distribution of respondents by whether they own smart devices that can access the internet or not. The findings indicate that the majority of the respondents were found to own smart devices at 79.4% of the total number of the respondents. The remaining 20.6% were found not to own smart devices that would enable them to access the internet.

Table 5.8 Respondents’ Device

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td>Yes</td>
<td>54</td>
<td>79.4</td>
<td>79.4</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>14</td>
<td>20.6</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>68</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018

Internet Affordability

Table 5.9 show the distribution of respondents whether the internet service provider they use at home has indeed become more affordable over the years. The findings indicate that 95.6% of the respondents feel that the internet provided has become more affordable while only a minority of 4.4% feel that they have not.

Table 5.9: Internet Affordability

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td>Yes</td>
<td>65</td>
<td>95.6</td>
<td>95.6</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>3</td>
<td>4.4</td>
<td>4.4</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>68</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>
5.3 Factors Promoting Adoption of E-Learning in Kenya

Cost

C1. I find it not expensive to access Elimu Digital web application in terms of internet bundle usage.

Table 5.10 shows the distribution of respondents whether they did not find it expensive to access Elimu Digital in terms of internet bundle usage. The findings indicate that 100% of the respondents did not find it expensive to access Elimu Digital in terms of bundle usage.

Table 5.10: Results of Question C1

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>44</td>
<td>64.7</td>
<td>64.7</td>
<td>64.7</td>
</tr>
<tr>
<td>Agree</td>
<td>24</td>
<td>35.3</td>
<td>35.3</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018

C2. I find it cheaper to use the Elimu Digital E-Learning application as opposed to going to class physically.
Table 5.11 shows the distribution of respondents whether they find it cheaper to access Elimu Digital as opposed to going to class physically. The findings indicate that 100% of the respondents found it cheaper to access Elimu Digital as opposed to going to class physically.

**Table 5.11: Results of Question C2**

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Strongly Agree</td>
<td>41</td>
<td>60.3</td>
<td>60.3</td>
<td>60.3</td>
</tr>
<tr>
<td>Agree</td>
<td>27</td>
<td>39.7</td>
<td>39.7</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018

**C3. I will not use the E-Learning application if it had a subscription fee.**

Table 5.12 shows the distribution of respondents whether they would use the E-Learning application if it had a subscription fee. The findings indicate that 55.8% of the respondents wouldn’t use it if it had a subscription fee, 14.7% were undecided and 29.4% would still use the application even if it had a subscription fee.

**Table 5.12: Results of Question C3**

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Strongly Agree</td>
<td>26</td>
<td>38.2</td>
<td>38.2</td>
<td>38.2</td>
</tr>
<tr>
<td>Agree</td>
<td>12</td>
<td>17.6</td>
<td>17.6</td>
<td>55.9</td>
</tr>
<tr>
<td>Undecided</td>
<td>10</td>
<td>14.7</td>
<td>14.7</td>
<td>70.6</td>
</tr>
<tr>
<td>Disagree</td>
<td>20</td>
<td>29.4</td>
<td>29.4</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018
Security

S1. I believe the information I disclose on the E-Learning portal is private and confidential.

Table 5.13 shows the distribution of respondents whether they believe the information they disclose on the E-Learning portal is private and confidential. A cumulative percentage of 94.1% believed the data was private and confidential. Only 5.9% were undecided if it was or not liable to access by other people.

Table 5.13: Results of question S1

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>24</td>
<td>35.3</td>
<td>35.3</td>
<td>35.3</td>
</tr>
<tr>
<td>Agree</td>
<td>40</td>
<td>58.8</td>
<td>58.8</td>
<td>94.1</td>
</tr>
<tr>
<td>Undecided</td>
<td>4</td>
<td>5.9</td>
<td>5.9</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018
S2. I believe the information sent to me via the E-Learning application is private and confidential.

Table 5.14 shows the distribution of respondents whether they believe the information they disclose on the E-Learning portal is private and confidential. A cumulative percentage of 94.1% believed the data was private and confidential. Only 5.9% were undecided if it was or not liable to access by other people.

Table 5.14: Results of Question S2

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>21</td>
<td>30.9</td>
<td>30.9</td>
<td>30.9</td>
</tr>
<tr>
<td>Agree</td>
<td>43</td>
<td>63.2</td>
<td>63.2</td>
<td>94.1</td>
</tr>
<tr>
<td>Undecided</td>
<td>4</td>
<td>5.9</td>
<td>5.9</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018

S2 was used to find out if the data that was sent via E-Learning application was private and confidential. A cumulative percentage of 94.1% believed the data was private and confidential and only 5.9% were undecided if it was or not liable to access by other people. This then confirms that security was not a usability challenge of E-Learning applications in Kenya. This was further confirmed by the fact that the respondents had no concern that their data would be secured and only accessed by authorized users.
**Interactivity**

**I1.** I like that I am able to discuss with my lecturer and fellow students about the courses on the discussion board.

Table 5.15 shows the distribution of respondents whether they like that they were able to discuss with their lecturers and fellow students about the courses on the discussion board. A cumulative percentage of 75% agreed that they like the fact that they are able to discuss with the lecturer and fellow students about the courses on the discussion board while 14.7% of the respondents disagreed.

**Table 5.15: Results of Question I1**

<table>
<thead>
<tr>
<th></th>
<th>Valid Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Strongly Agree</td>
<td>24</td>
<td>35.3</td>
<td>35.3</td>
<td>35.3</td>
</tr>
<tr>
<td>Agree</td>
<td>27</td>
<td>39.7</td>
<td>39.7</td>
<td>75.0</td>
</tr>
<tr>
<td>Undecided</td>
<td>7</td>
<td>10.3</td>
<td>10.3</td>
<td>85.3</td>
</tr>
<tr>
<td>Disagree</td>
<td>10</td>
<td>14.7</td>
<td>14.7</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018
I2. I do not need assistance navigating the Elimu Digital platform.

Table 5.16 shows the distribution of respondents whether they did not need assistance navigating the Elimu Digital platform. A cumulative of 79.4% of the respondents agreed that they do not need assistance navigating the E-Learning prototype application while a minority of 10.3% felt that they still needed assistance navigating the application.

**Table 5.16: Results of Question I2**

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Strongly Agree</td>
<td>24</td>
<td>35.3</td>
<td>35.3</td>
<td>35.3</td>
</tr>
<tr>
<td>Agree</td>
<td>27</td>
<td>39.7</td>
<td>39.7</td>
<td>75.0</td>
</tr>
<tr>
<td>Undecided</td>
<td>7</td>
<td>10.3</td>
<td>10.3</td>
<td>85.3</td>
</tr>
<tr>
<td>Disagree</td>
<td>10</td>
<td>14.7</td>
<td>14.7</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018
**Q3.** Collaboration within the system has increased my interest in using the application now and in the future.

Table 5.17 shows the distribution of respondents whether the collaboration within the system had increased their interest in using the application. A cumulative 95.6% of the respondents agreed that their interest in the application was peaked due to the collaboration between lecturers and students evident within the system while 4.4% were undecided if they were happy about the collaboration features or not.

**Table 5.17: Results of Question Q3**

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td>68</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>41</td>
<td>60.3</td>
<td>60.3</td>
<td>60.3</td>
</tr>
<tr>
<td>Agree</td>
<td>24</td>
<td>35.3</td>
<td>35.3</td>
<td>95.6</td>
</tr>
<tr>
<td>Undecided</td>
<td>3</td>
<td>4.4</td>
<td>4.4</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018
5.4 Usability Challenges in E-Learning Applications in Kenya

User Satisfaction

US1. I am able to get most of the information I would need related to my coursework using the E-learning application.

Table 5.18 shows the distribution of respondents whether they were able to get most of the information they needed related to their coursework using the E-learning application. Results showed that 75% of the respondents strongly agreed while 25% agreed that the prototype provided adequate information.

Table 5.18: Results of question US1

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Strongly Agree</td>
<td>51</td>
<td>75.0</td>
<td>75.0</td>
<td>75.0</td>
</tr>
<tr>
<td>Agree</td>
<td>17</td>
<td>25.0</td>
<td>25.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018
US2. Using Elimu Digital is enjoyable to me.

Table 5.19 shows the distribution of respondents whether they found using Elimu Digital was enjoyable to them. Results showed that 75% of the respondents strongly agreed while 25% agreed that the prototype provided adequate information. The results showed that 48.5% of the respondents strongly agreed that it was easy to use, 42.6% agreed and 8.8% of the respondents were undecided.

This indicates a cumulative percentage of 91.2% of the respondents found the prototype enjoyable and easy to use.

**Table 5.19: Results of question US2**

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>33</td>
<td>48.5</td>
<td>48.5</td>
<td>48.5</td>
</tr>
<tr>
<td>Agree</td>
<td>29</td>
<td>42.6</td>
<td>42.6</td>
<td>91.2</td>
</tr>
<tr>
<td>Undecided</td>
<td>6</td>
<td>8.8</td>
<td>8.8</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018
US3. I prefer getting my coursework material from Elimu Digital as compared to any other source.

Table 5.20 shows the distribution of respondents whether they preferred using Elimu Digital as opposed to any other source. 47.1% of the respondents strongly agreed while 52.9% agreed. This resulted to a cumulative percentage of 100% of the respondents agreed that they would rather use the E-Learning prototype application to get coursework relevant to them than any other source.

Table 5.20: Results of question US3

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Strongly Agree</td>
<td>32</td>
<td>47.1</td>
<td>47.1</td>
<td>47.1</td>
</tr>
<tr>
<td>Agree</td>
<td>36</td>
<td>52.9</td>
<td>52.9</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018
US4. I have used a form of E-Learning before

Table 5.21 shows the distribution of respondents whether they have ever used any form of E-Learning before. 66.2% of the respondents had never used any form of E-Learning while only 25% of the respondents had used a form of E-Learning.

**Table 5.21: Results of Question US4**

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Strongly Agree</td>
<td>24</td>
<td>35.3</td>
<td>35.3</td>
<td>35.3</td>
</tr>
<tr>
<td>Agree</td>
<td>27</td>
<td>39.7</td>
<td>39.7</td>
<td>75.0</td>
</tr>
<tr>
<td>Undecided</td>
<td>7</td>
<td>10.3</td>
<td>10.3</td>
<td>85.3</td>
</tr>
<tr>
<td>Disagree</td>
<td>10</td>
<td>14.7</td>
<td>14.7</td>
<td>100.0</td>
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<tr>
<td>Total</td>
<td>68</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018
Perceived Usefulness

PU1. I believe having access to the Elimu Digital E-Learning application will improve my knowledge in various courses taken.

Table 5.22 shows the distribution of respondents whether they believed having access to the Elimu Digital E-Learning application would improve their knowledge in various courses taken. A cumulative percentage of 100% of the respondents agreed that they believed it would.

Table 5.22: Results of Question PU1

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Strongly Agree</td>
<td>56</td>
<td>82.4</td>
<td>82.4</td>
<td>82.4</td>
</tr>
<tr>
<td>Agree</td>
<td>12</td>
<td>17.6</td>
<td>17.6</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018
**PU2.** I believe Elimu Digital will complement the course content I am getting when I attend classes physically. Blended Learning.

Table 5.23 shows the distribution of respondents whether they believed the Elimu Digital E-Learning application complement the course content they are getting when they attend classes physically. A cumulative 94.1% of the respondents agreed that it would complement the current system while 5.9% disagreed.

**Table 5.23: Results of Question PU2**

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Strongly Agree</td>
<td>48</td>
<td>70.6</td>
<td>70.6</td>
<td>47.1</td>
</tr>
<tr>
<td>Agree</td>
<td>16</td>
<td>23.5</td>
<td>23.5</td>
<td>100.0</td>
</tr>
<tr>
<td>Disagree</td>
<td>4</td>
<td>5.9</td>
<td>5.9</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>68</strong></td>
<td><strong>100.0</strong></td>
<td><strong>100.0</strong></td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018
PU3. I intend to continue to use Elimu Digital E-Learning application now and in the future.

Table 5.24 shows the distribution of respondents whether they intended to continue using Elimu Digital E-Learning application. A cumulative percentage of 77.9% of the respondents agreed that they would use an E-Learning application after sensitization while a minority of 4.4% disagreed.

Table 5.24: Results of Question PU3

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Strongly Agree</td>
<td>46</td>
<td>67.6</td>
<td>67.6</td>
<td>67.6</td>
</tr>
<tr>
<td>Agree</td>
<td>7</td>
<td>10.3</td>
<td>10.3</td>
<td>77.9</td>
</tr>
<tr>
<td>Undecided</td>
<td>12</td>
<td>17.6</td>
<td>17.6</td>
<td>95.6</td>
</tr>
<tr>
<td>Disagree</td>
<td>3</td>
<td>4.4</td>
<td>4.4</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018
**PU4.** I would strongly recommend the Elimu Digital application to someone.

Table 5.25 shows the distribution of respondents whether they would recommend the Elimu Digital E-Learning application to someone else. The results show that a cumulative percentage of 100% of the respondents agreed that after using the E-Learning prototype application they would recommend the technology to other people.

**Table 5.25 Results of Question PU4**

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Strongly Agree</td>
<td>48</td>
<td>70.6</td>
<td>70.6</td>
<td>70.6</td>
</tr>
<tr>
<td>Agree</td>
<td>20</td>
<td>29.4</td>
<td>29.4</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018
The use of E-Learning has greatly improved my educational skill and knowledge.

Table 5.26 shows the distribution of respondents whether they felt that the use of E-Learning greatly improved their educational skill and knowledge. The results indicated that a cumulative 51.5% of the respondents agree that it would, 33.8% of the respondents thought that it would not.

**Table 5.2 Results of Question PU5**

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Strongly Agree</td>
<td>28</td>
<td>41.2</td>
<td>41.2</td>
<td>41.2</td>
</tr>
<tr>
<td>Agree</td>
<td>7</td>
<td>10.3</td>
<td>10.3</td>
<td>51.5</td>
</tr>
<tr>
<td>Undecided</td>
<td>10</td>
<td>14.7</td>
<td>14.7</td>
<td>66.2</td>
</tr>
<tr>
<td>Disagree</td>
<td>20</td>
<td>29.4</td>
<td>29.4</td>
<td>95.6</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>3</td>
<td>4.4</td>
<td>4.4</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018
Perceived Ease of Use

PE1. I am able to navigate through the application easily.

Table 5.27 shows the distribution of respondents whether they were able to navigate through the application easily. A cumulative 100% of the respondents agreed that the application was easy to navigate.

Table 5.27 Results of Question PE1

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Strongly Agree</td>
<td>58</td>
<td>85.3</td>
<td>85.3</td>
<td>85.3</td>
</tr>
<tr>
<td>Agree</td>
<td>10</td>
<td>14.7</td>
<td>14.7</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018
PE2. I am able to download and upload content easily.

Table 5.28 shows the distribution of respondents whether they were able to upload content (lecturers) and download content (students) easily without having to perform many clicks looking for the tabs that would assist them to do so. The results showed that a cumulative 100% of the respondents found it easy to do so.

Table 5.28 Results of question PE2

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Strongly Agree</td>
<td>45</td>
<td>66.2</td>
<td>66.2</td>
<td>66.2</td>
</tr>
<tr>
<td>Agree</td>
<td>23</td>
<td>33.8</td>
<td>33.8</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018
PE3. I usually do not encounter any problem when I want to access the Elimu Digital E-Learning web application.

Table 5.29 shows the distribution of respondents whether regardless of the device or browser used, they accessed the E-Learning application. The results showed that a cumulative 66.2% of the respondents were able to access the E-Learning prototype application anytime they desired while only a minority of 29.4% were not able to access the E-Learning application.

Table 5.29 Results of Question PE3

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Strongly Agree</td>
<td>31</td>
<td>45.6</td>
<td>45.6</td>
<td>45.6</td>
</tr>
<tr>
<td>Agree</td>
<td>14</td>
<td>20.6</td>
<td>20.6</td>
<td>66.2</td>
</tr>
<tr>
<td>Undecided</td>
<td>3</td>
<td>4.4</td>
<td>4.4</td>
<td>70.6</td>
</tr>
<tr>
<td>Disagree</td>
<td>17</td>
<td>25.0</td>
<td>25.0</td>
<td>95.6</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>3</td>
<td>4.4</td>
<td>4.4</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s Data, 2018
PE5. I like that I get email notifications once a lecturer uploads content into a course unit.

Table 5.30 shows the distribution of respondents whether they enjoyed the fact that got email notifications once a lecturer uploaded content into a course unit and did not have to necessarily log into the system to do so. The results showed that a cumulative 100% of the respondents liked this option.

**Table 5.30 Results of Question PE5**

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Strongly Agree</td>
<td>61</td>
<td>89.7</td>
<td>89.7</td>
<td>89.7</td>
</tr>
<tr>
<td>Agree</td>
<td>7</td>
<td>10.3</td>
<td>10.3</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018

PE5 was used to find out if indeed the respondents enjoyed the fact that got email notifications once a lecturer uploaded content into a course unit and did not have to necessarily log into the system to do so. Aside from saving on time, this also ensured the student got a reminder and had no excuse for not viewing course content. The results showed that a cumulative 100% of the respondents liked this option.
Reliability

R2. I am able to access the E-Learning application on any of my devices without information getting distorted.

Table 5.31 shows the distribution of respondents whether they were able to access the application on any of their devices without the information getting distorted. The results showed that 95.6% of the respondents were able to access the E-Learning application from different devices and various screen sizes without the information getting distorted.

Table 5.31 Results of Question R2

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Strongly Agree</td>
<td>55</td>
<td>80.9</td>
<td>80.9</td>
<td>80.9</td>
</tr>
<tr>
<td>Agree</td>
<td>10</td>
<td>14.7</td>
<td>14.7</td>
<td>95.6</td>
</tr>
<tr>
<td>Disagree</td>
<td>3</td>
<td>4.4</td>
<td>4.4</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018
5.5 Chapter Summary

The findings of the data collection indicated that 79.4% were found to own smart phones and that 95.6% of the respondents feel that the internet provided has become more affordable.

It was also noted that 25% of the respondents have never used an E-Learning application. Despite the respondents not having prior experience using an E-Learning application, they believed E-Learning applications will improve knowledge retention and were ready to recommend the use of E-Learning applications to other people. The respondents also believed that the use of E-Learning applications would complement the current mode of physical attendance teaching and would enhance blended learning in Kenya.

All respondents liked the idea of getting email notifications once lecturers uploaded content. It is noted that the cost of accessing the E-Learning application would be a concern to the user, 55.9% of the respondents noted that they would not bother to use it if it had charges. All the respondents were confident that the personal information relayed to them on the E-Learning application was private and confidential. They assumed this data was secured by the application and could not be accessed by any unauthorized user.

All the respondents found the application easy and enjoyable to use and would recommend the technology to other people.
Chapter 6: Discussion, Conclusions and Recommendations

6.1 Introduction

This chapter strives to put together all aspects of the study on the challenges encountered by students and lecturers using the E-Learning applications in Kenya and the proposed solutions and the development of the Elimu Digital prototype application. This chapter will look at the purpose, objective of the study and the research objectives that were stated at the initial point of the study. By the use of the literature review, data collection and analysis of the latter in the summary section of this chapter, it will seek to validate the research objectives by highlighting the findings and the results that emerge from this study in the discussion section. Lastly, the final conclusion on the subject matter will be outlined in the conclusion section giving the researcher’s recommendations about the study in the recommendation section.

6.2 Summary

From Chapter 5 results from the survey taken, the following summary can be drawn up.

A cumulative percentage of 100% of the respondents agreed that access to the E-Learning application was not expensive and they would use the application at will. This is attributed to the application being developed using HTML5 and CSS which enabled fast transmission of data from the web server to the user’s mobile device.

The results show that a cumulative percentage of 100% of the respondents found it convenient to use E-Learning. This therefore goes to show that the incorporated proposed solution to the usability challenges in E-Learning applications positively affected the usability of the E-Learning application. This would both lessen the burden on the learning institutions as well as improve the rate at which Kenyans get home grown content.

The results showed that a cumulative 55.9% of the respondents agreed that they would not use the E-Learning prototype application if it had access charges while only a minority of 29.4% of the respondents disagreed. This goes to show that cost implications discourage use of E-Learning applications. E-Learning solution providers should use a business model that doesn’t charge the user but the learning institution.
A cumulative percentage of 94.1% believed the data was private and confidential. Only 5.9% were undecided if it was or not liable to access by other people. This then confirms that security was not a usability challenge of E-Learning applications in Kenya. This was further confirmed by the fact that the respondents had no concern that their data would be secured and only accessed by authorized users.

A cumulative percentage of 75% agreed that they like the fact that they are able to discuss with the lecturer and fellow students about the courses on the discussion board while 14.7% of the respondents disagreed. This goes to show that most users were willing to collaborate with their lecturers and their fellow students transparently on the same platform to exchange ideas and discuss further about the coursework.

A cumulative of 79.4% of the respondents agreed that they do not need assistance navigating the E-Learning prototype application while a minority of 10.3% felt that they still needed assistance navigating the application.

A cumulative 95.6% of the respondents agreed that their interest in the application was peaked due to the collaboration between lecturers and students evident within the system while 4.4% were undecided if they were happy about the collaboration features or not.

A cumulative percentage of 91.2% of the respondents found the prototype enjoyable and easy to use, which indicates the proposed solutions addressed the challenges in E-Learning applications and positively affected the usability of the E-Learning prototype application.

A cumulative percentage of 100% of the respondents agreed that they would rather use the E-Learning prototype application to get coursework relevant to them than any other source. This indicated that if the usability challenges were eliminated, it would increase the use of E-Learning applications in Kenya.

66.2% of the respondents had never used any form of E-Learning while only 25% of the respondents had used a form of E-Learning. This shows that E-Learning applications were not popular among the sample size surveyed and this could be attributed to the various usability challenges in E-Learning applications.

A cumulative 94.1% of the respondents agreed that it would complement the current system while 5.9% disagreed that E-Learning would complement the traditional physical classroom
learning system. This means that the best way to implement and enhance the use of E-Learning applications is to align it to the current learning system.

A cumulative percentage of 77.9% of the respondents agreed that they would use an E-Learning application after sensitization while a minority of 4.4% disagreed. This result hence supported the notion that adoption rate of E-Learning would greatly increase if there was user education and sensitization done by both the government and the E-Learning solution providers.

A cumulative percentage of 100% of the respondents agreed that after using the E-Learning prototype application they would recommend the technology to other people indicating that user education and sensitization can increase the use of E-Learning in Kenya than it is at present.

The results indicated that a cumulative 51.5% of the respondents agree that it would, 33.8% of the respondents thought that it would not improve their knowledge. This shows that a majority of the respondents believe that E-Learning would enable them to get more educated.

Going by the aspects of the proposed solutions, a cumulative 100% of the respondents agreed that the application was easy to navigate. This then indicates that the study’s proposed solutions would address the usability challenges identified in E-Learning applications.

The results showed that a cumulative 100% of the respondents found it easy to upload content (lecturers) and download content (students) without having to perform many clicks looking for the tabs that would assist them to do so. This therefore indicates that the study’s proposed solutions to the usability challenges in E-Learning positively affected the usability of the application.

The results showed that a cumulative 66.2% of the respondents were able to access the E-Learning prototype application anytime they desired while only a minority of 29.4% were not able to access the E-Learning application. This therefore means that the use of HTML5 greatly enhanced the use of the E-Learning prototype application since the application was able to load faster and also showed that the mobile telecommunication infrastructure had the capacity to transmit data when required hence enabling access to the E-Learning prototype application which was hosted on the cloud.

The results showed that a cumulative 100% of the respondents liked the fact that they got email notifications once a lecturer uploaded content into a course unit and did not have to necessarily
log into the system to do so. Aside from saving on time, this also ensured the student got a reminder and had no excuse for not viewing course content.

Results showed that 95.6% of the respondents were able to access the E-Learning application from different devices and various screen sizes without the information getting distorted. This shows that the web application did not have platform compatibility issues as with the Android and iOS operating systems. It also shows that developing the E-Learning application on HTML 5 gave it the ability to adapt to any screen size which made it easier for the user to use the E-Learning application with any device regardless of the screen size.

6.3 Discussion

This section will look at some of the major findings of the study as per the three research objectives the study was built around.

6.3.1 Factors That Promote and Hinder the Use and Growth of E-Learning in Kenya.

There are several factors that promote the use and growth of E-Learning in Kenya. Firstly, Kenya has more service providers offering internet services at affordable costs and users choose the package depending on what they can be able to afford (Ischebeck, 2017). Secondly, E-Learning has been viewed as the cheaper alternative to attending physical classes as the costs are lower because you can attend class from the comfort of where you have internet connectivity, you do not need to pay for extra services that you will frankly not use and no need to set aside money for transportation to and from the university (Ischebeck, 2017). Thirdly, there is an increase in the use of smart mobile devices due to their affordability and which easily access the internet making it possible for the users to access Android, iOS or web based E-Learning applications. Fourth is the growth of mobile telecommunications infrastructure area coverage which is attributed to the emergence of mobile telecommunication companies and increased competition among them to cover new areas. This means a wider population is covered by the mobile network and this increase the population who can access and use E-Learning applications in Kenya (Oteri, 2015). These are some of the key factors that were identified from the literature review.

From the survey section the study found out 60% of the respondents had mobile phones which will enhance the use of E-Learning as most E-Learning applications are web based, Android or iOS applications.
The study also identified factors that hinder the use and growth of E-Learning in Kenya are lack of standardization and a clear regulatory framework to guide E-Learning initiatives scale up. Secondly there is inadequate evaluation and monitoring which includes the use of consistent and meaningful indicators and thorough evaluation methods to enhance cost effective processes. Thirdly, some parts of Kenya did not have network coverage and hence the mobile devices could not communicate with the E-Learning application server. Fourth some parts of Kenya are extremely remote and do not have access to any power and were unable to charge their smart devices and hence cannot access E-Learning applications (Ischebeck, 2017).

### 6.3.2 Challenges Encountered by Users Using E-Learning Applications in Kenya

There are several challenges identified from the E-Learning applications highlighted in the literature review, the first one was the expense involved in deploying the existing E-Learning platforms was high due to the licensing and other indirect charges as the platforms are international (Bradford, 2007). Secondly, adding content was not an easy process with the current E-Learning platforms as majority of the lecturers needed assistance from a technical person in order to upload content (Bradford, 2007). Thirdly, some platforms lacked the capability of multimedia integration and thus lacked the option of uploading videos and thus the sessions lacking the much needed interactivity (Uzwyshyn, 2015). Fourth, some platforms lacked the feature to have collaborations between lecturers and students directly in the platform and forced the two parties to separately do so via email. The platform therefore remains official and served only the purpose of a downloading material tool and not an all rounded interactive platform (Littlefield, 2016). The fifth challenge was that some of the E-Learning platforms had interoperability issues with the different platforms and devices as they were not compatible on all devices or they were not compatible with all browsers (Smith, 2015).
### 6.3.3 Development and Testing of an E-Learning Prototype Application to Address Usability Challenges

After clearly outlining the usability challenges in the E-Learning applications currently in Kenya, the study proposed solutions that would address the identified challenges. These proposed solutions were integrated in the E-Learning prototype and tested at length with the students and lecturers. The proposed solutions have been summarized in table 6.1 as shown.

**Table 6.1 Summary of Usability Challenges and Proposed Solutions**

<table>
<thead>
<tr>
<th>Usability Challenge</th>
<th>Remedy applied via the implemented E-Learning prototype</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Expensive to deploy due to licensing and indirect charges for upkeep and evolution of the system. There is also a cost implication for adding infrastructure and data migration to a new LMS as you are not in control of your data.</td>
<td>Hosting done on Microsoft Azure which offers SaaS depending on how you use it. Therefore, you can pay as you go and only pay for what one use as opposed to what one will not utilize. This was cheaper than individualized licenses.</td>
</tr>
<tr>
<td>2 Adding content is a learning curve. Customization requires a lot of coding work and has a cost implication</td>
<td>The implementation of a simple web based application that has all important tabs in a place that can be seen thus reducing the number of clicks and manoeuvres. The views were also simpler.</td>
</tr>
<tr>
<td>3 Lack of options for uploading videos or live streaming. Lack of sophisticated multimedia integration.</td>
<td>Implementation of a plug in that enables video upload that was quick and easy to use.</td>
</tr>
<tr>
<td>4 There is need to have a fully technical person with advanced knowledge in both customizations</td>
<td>The web application prototype is fairly simple to use and lecturers are able to easily upload content and</td>
</tr>
</tbody>
</table>
and coding for day to day support. To also assist lecturers with uploading content and students with downloading material. students are able to easily download material.

<table>
<thead>
<tr>
<th>5</th>
<th>Information is distorted when using different accessibility methods e.g. mobile phone, tablet and PC.</th>
<th>Implementation of a web based application with the use of HTML5 which easily adopts to the mobile device screen size.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Lack of blogs, wikis and journal features No option to pin discussions</td>
<td>Implementation of a discussion board that allows for collaboration between lecturers and students.</td>
</tr>
</tbody>
</table>

Source: Author’s Data 2018

### 6.4 Conclusions

Kenya is well positioned as the melting point of technology in East Africa and from this it enjoys high mobile penetration, wide telecommunication infrastructure, low internet charges due to underground fibre cable connection and a robust community of software developers (Oteri, 2015). All these create a conducive environment for development of an E-Learning framework and E-Learning application that would integrate and collaborate with public and private learning institutions to develop a national education database system which would provide know how of the country’s education status, its expenditure on education dissemination and much more about education in Kenya.

There are several factors that promote the use and growth of E-Learning in Kenya. Firstly, Kenya has more service providers offering internet services at affordable costs and users choose the package depending on their pocket (Ischebeck, 2017). Secondly, E-Learning has been viewed as the cheaper alternative to attending physical classes as the costs are lower because you can attend class from the comfort of where you have internet connectivity, you do not need to pay for extra services that you will frankly not use and no need to set aside money for transportation to and from the university (Ischebeck, 2017). Thirdly, there is an increase in the use of smart mobile devices due to their affordability and which easily access the internet making it possible for the users to access Android, iOS or web based E-Learning applications. Fourth is the growth of
mobile telecommunications infrastructure area coverage which is attributed to the emergence of mobile telecommunication companies and increased competition among them to cover new areas. This means a wider population is covered by the mobile network and this increase the population who can access and use E-Learning applications in Kenya (Oteri, 2015).

From the usability challenges identified in the E-Learning applications it can be noted that most of them are technical issues which can be corrected by technical solutions for example the use of HTML5 and CSS to enable the E-Learning applications to easily adapt to the various screen sizes of mobile devices. It can also be noted that some of the usability challenges arise from the initial design overlaps for example E-Learning applications were designed without the involvement of the user which led to usability issues since the applications were not user need based nor problem based. This particular problem could be solved by the involvement of all the shareholders such as lecturers, graduate students and solution providers during the development and testing stages of E-Learning applications. This kind of approach will enable the development of a holistic E-Learning application with good usability factors and this will encourage the access of education via E-Learning.

Results from the study show that the incorporation of the proposed solutions into the E-Learning prototype application greatly solved the identified usability challenges in the other E-Learning applications. Findings from the analysed data indicated the following;

All respondents found the E-Learning prototype easy to use and highly interactive, after sensitization the respondents agreed that they would recommend it to someone to also use. Respondents agreed that the prototype would greatly complement the current classroom scenario and create a blended need. From these observations it would then be noted that the proposed solutions were a clear remedy to the usability challenges and hence users found that the E-Learning prototype application easy and enjoyable to use.

Only 25% of the respondents agreed to having used any form of E-Learning and this goes to show, E-Learning adoption is still very low in Kenya. Despite this low popularity of E-Learning applications, once the respondent was shown how to use the E-Learning prototype application and they used it, 82.3% of them agreed that they would continue to use it and would prefer getting their education via the E-Learning application. This then confirms with user awareness and sensitization on E-Learning applications, users would willingly take up the services.
All the respondents agreed that they liked the fact that no matter which device they accessed the application from, the information was not distorted and was also compatible with their browsers of choice. This issue was encountered with Sakai, Canvas and Moodle LMSs and goes to show that if these LMSs had sorted the distortion issue it would make it easy to use.

Respondents also agreed that they liked the fact that there were discussion boards especially under each unit so that they can get to voice to the lecturer what in particular they liked or disliked about a particular topic or get more information and also open a forum for discussion with colleagues on the same platform.

User behaviour which is based on a theoretical background based in the Technology Acceptance Model whereby the user looks at two major aspects that is perceived usefulness and perceived ease of use. It’s seen with the sensitization and the user education conducted during the survey and data collection, the respondents found the E-Learning application a valuable technology which could help them. User awareness was a major issue in all the LMSs that were covered in the literature review that is Blackboard, Moodle, Canvas and Sakai. This issue could be solved by increased user education and training and also inclusion of users in the development stages of the E-Learning solution, so that the users could develop a sense of ownership.
6.5 Recommendations

6.5.1 Suggestions for Improvements

Looking at the various E-Learning initiatives launched in Kenya and the other countries there is a lack of establishment of best practices which enable replication of E-Learning and also create room for scaling up of E-Learning initiatives from pilot phase to a fully-fledged national health program. From the literature review there are common elements which could be recommended by the study to be upheld as best practice so as to achieve a successful implementation of E-Learning initiatives. These include:

1. Study of the existing challenges in a population before implementation of an E-Learning initiative to solve the said challenges.
2. The inclusion of the student in the E-learning solution project from the beginning to the end. This includes the idea conception, design, solution development, testing and deployment of the E-Learning initiative.
3. The inclusion of the lecturer in the various phases of E-Learning initiative implementation.
4. Setting up parameters that would enable collection of measurable results which would then facilitate monitoring and accurate evaluation.
5. Public private ownership whereby the private sector heavily contributes in supporting the public sector in the implementation of E-Learning initiatives.

6.5.2 Suggestions for Further Research

The following are recommendations for further research work on adoption of E-Learning in Kenya:

1. To conduct research on the adoption of E-Learning by the lecturers and how this technology would enhance their work and the quality of the education they provide.
2. To conduct a study that will come up with a framework that will allow the integration of E-Learning with other systems such as school Enterprise Resource Planning (ERP) so as to allow seamless data synchronization.
3. To conduct a study on suitable frameworks for the development of a national education data repository which would then be connected to big data and find out what would be
the implications to the public and learning institutions of having such a resource in the country.

4. To conduct a research in the establishment of a suitable business model to be used by E-Learning solution providers so as to provide E-Learning solutions at a highly subsidized cost to the subscriber.

5. To conduct a research on a suitable framework that would enable civic education and user training and awareness campaigns for the adoption of E-Learning in Kenya, both for the students and the lecturers.

6. To conduct a study which would enable an alternative E-Learning offline system which would allow access to local data within the device and allow input of data locally which would synchronize with the centralized E-Learning system once it re-joined an area with internet connectivity.
References


Bergmann, J. &. (2012). Flip your classroom: Reach every student in every class every day. International Society for Technology in Education. In Bergmann, Flip your classroom: Reach every student in every class every day. International Society for Technology in Education.


Bretzmann, J. (2013). Flipping 2.0: Practical strategies for flipping your class. Bretzmann Group LLC. In J. Bretzmann, Flipping 2.0: Practical strategies for flipping your class. Bretzmann Group LLC.


https://www.jamasoftware.com/blog/defining-project-scope-context-use-case-diagrams/

Appendices

Appendix 1: Letter of introduction

TO WHOM IT MAY CONCERN.

16th March, 2018

Dear Sir/Madam,

REF: PERMISSION TO CONDUCT RESEARCH – GLORIA M OBEI
STUDENT ID. NO. 649180

The bearer of this letter is a student of United States International University (USIU) -Africa
pursuing a Master of Science in Information Systems and Technology.

As part of the program, the student is required to undertake a dissertation on the “Adoption of E-
Learning in Kenya” which requires her to collect data.

Please note that information provided will be treated with utmost confidentiality and will only be
used for academic purposes.

Kindly assist the student get the appropriate data and should you have any queries contact the
undersigned.

Yours Sincerely,

[Signature]

Prof. Amos Njeguna,
Dean – School of Graduate Studies, Research and Extension
Tel: 730 116 442
Email: amnjeguna@usiu.ac.ke
Appendix 2: Questionnaire

Section I: Demographics

1. Age

☐ 24-29    ☐ 30-35    ☐ 36 and Above

2. Gender

☐ Male    ☐ Female

3. Occupation

☐ Employed    ☐ Self Employed    ☐ Unemployed

4. Level of education

☐ High School    ☐ Certificate    ☐ Bachelors    ☐ Masters    ☐ PhD

5. Do you own a device that can access the internet? (Smart device)

☐ Yes    ☐ No

6. Is the internet provided by service providers more affordable and accessible?

☐ Yes    ☐ No
Section II: Feedback on the use of prototype and use of E-Learning

Score respondents answers as per the key below

1  Strongly agree
2  Agree
3  Undecided
4  Disagree
5  Strongly disagree

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<tr>
<th>Code</th>
<th>Questions</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>US1</td>
<td>I am able to get most of the information I would need related to my coursework using the E-learning application</td>
<td></td>
<td></td>
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<tr>
<td>US2</td>
<td>Using Elimu Digital is enjoyable to me</td>
<td></td>
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<tr>
<td>US3</td>
<td>I prefer getting my coursework material from Elimu Digital as compared to any other source</td>
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<tr>
<td>US4</td>
<td>I have used a form of E-Learning before</td>
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**Perceived Usefulness**

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<th>4</th>
<th>5</th>
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<tbody>
<tr>
<td>PU1</td>
<td>I believe having access to the Elimu Digital E-Learning application will improve my knowledge in various courses taken.</td>
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<td>PU2</td>
<td>I believe Elimu Digital will complement the course content I am getting when I attend classes physically. Blended Learning.</td>
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<td>PU3</td>
<td>I intend to continue to use Elimu Digital E-Learning application now and in the future.</td>
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<td>PU4</td>
<td>I would strongly recommend the Elimu Digital application to someone.</td>
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<tr>
<td>5</td>
<td>PU5</td>
<td>The use of E-Learning has greatly improved my educational skill and knowledge.</td>
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<tr>
<td></td>
<td><strong>Perceived Ease of Use</strong></td>
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<tr>
<td>1</td>
<td>PE1</td>
<td>I am able to navigate through the application easily.</td>
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<td>2</td>
<td>PE2</td>
<td>I am able to download and upload content easily.</td>
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<td>3</td>
<td>PE3</td>
<td>I usually do not encounter any problem when I want to access the Elimu Digital E-Learning web application.</td>
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<tr>
<td>4</td>
<td>PE4</td>
<td>I find the application design and layout simple and easy to understand.</td>
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<td>5</td>
<td>PE5</td>
<td>I like that I get email notifications once a lecturer uploads content into a course unit.</td>
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<td></td>
<td><strong>Reliability</strong></td>
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<td>R1</td>
<td>I am able to access any module of the E-Learning application whenever I need it.</td>
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<td>2</td>
<td>R2</td>
<td>I am able to access the E-Learning application on any of my devices without information getting distorted.</td>
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<td></td>
<td><strong>Cost</strong></td>
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<tr>
<td>1</td>
<td>C1</td>
<td>I find it not expensive to access Elimu Digital web application in terms of internet bundle usage.</td>
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<tr>
<td>2</td>
<td>C2</td>
<td>I find it cheaper to use the Elimu Digital E-Learning application as opposed to going to class physically.</td>
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<tr>
<td>3</td>
<td>C3</td>
<td>I will not use the E-Learning application if it had a subscription fee.</td>
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<td><strong>Security</strong></td>
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<tr>
<td>1</td>
<td>S1</td>
<td>I believe the information I disclose on the E-Learning portal is private and confidential.</td>
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<td>S2</td>
<td>I believe the information sent to me via the E-Learning application is private and confidential.</td>
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**Interactivity**

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<th>I like that I am able to discuss with my lecturer and fellow students about the courses on the discussion board.</th>
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<td>2</td>
<td>I2</td>
<td>I do not need assistance navigating the Elimu Digital platform.</td>
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<td>3</td>
<td>I3</td>
<td>Collaboration within the system has increased my interest in using the application now and in the future.</td>
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Appendix 3: Source Code

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<StartupObject>web.Program</StartupObject>

<PackageId>Elimu Digital</PackageId>

<Authors>Timothy Macharia, Victor Stevens</Authors>

<Company>Neon Clouds</Company>

<Product>Elimu Digital</Product>

<Description>e-learning application to support students &amp; lecturers in campuses collaborate virtually on learning materials, unit registrations, exam scheduling &amp; progress tracking.</Description>

<PackageLicenseUrl>https://github.com/devTimmy/elimu-digital/blob/master/LICENSE</PackageLicenseUrl>

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public class AutoMappingProfile : AutoMapper.Profile
{
    public AutoMappingProfile()
    {
        CreateMap<School, SchoolViewModel>();
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        CreateMap<Unit, UnitViewModel>();
        CreateMap<UnitViewModel, Unit>();
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using System;

using System.Collections.Generic;

using System.Text;
	namespace Services
{
    public interface ISettingsManager
    {
        /// <summary>
        /// Notify you by email everytime an exception is thrown by system immediately as it happens.
        /// </summary>
        bool SendEmailOnException { get; }

        /// <summary>
        /// Save error messages either in the server machine or in the database for every exception the system throws.
        /// </summary>
        bool LogError { get; }
    }
}
/// <summary>
/// Developer email setting to use when sending developer related emails by
/// the system.
/// </summary>

string DevEmail { get; }

namespace Services
{

    // This class is used by the application to send Email and SMS
    // when you turn on two-factor authentication in ASP.NET Identity.
// For more details see this link https://go.microsoft.com/fwlink/?LinkID=532713

public class AuthMessageSender : IEmailSender, ISmsSender
{

    private readonly SMTPServerSettings settings = new SMTPServerSettings();

    private readonly string Title;

    private readonly string mail;

    private readonly string _password;

    public string Footer
    {
        get
        {
            return $"<br/>Cheers!<br/>{Title} Team.";
        }
    }
}