OPTIMIZATION MODEL OF INTERNET USAGE AMONG KENYAN PUBLIC UNIVERSITIES: A CASE STUDY OF MOI UNIVERSITY NAIROBI CAMPUS

BY

BRIAN KIPRONO BIWOTT

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE IN MASTERS OF SCIENCE IN INFORMATION SYSTEMS MANAGEMENT

NOVEMBER 2017

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DECLARATION

(1) Declaration by the Student

This dissertation is my original work and has not been submitted or published elsewhere for award of master's degree. I also declare that this contains no material written or published by other people except where the reference is made and author duly acknowledged.

Student Name: ……………………………..   Reg.No ………………………….

Signature: ………………………………….   Date: ………………………………

(2) Declaration by the Supervisor

I do hereby confirm that I have examined the master's dissertation of **BRIAN KIPRONO BIWOTT** and have approved it for examination.

Signature: ………………………………….   Date: ………………………………

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Faculty of Computing and Information Management

KCA University

(3) Declaration by the Supervisor

I do hereby confirm that I have examined the master's dissertation of **BRIAN KIPRONO BIWOTT** and have approved it for examination.

Signature: ………………………………….   Date: ………………………………

Mrs. Rachael Kibuku

Faculty of Computing and Information Management

KCA University

ABSTRACT

The aim of this research is to investigate optimization of internet usage among Kenyan Public Universities- Moi University Nairobi Campus as a case study which is a necessity at this current information age where internet is the source of almost most searches compared to the traditional ways of searching through hard covered books and journals not forgetting audio-visuals majorly for educative purposes.

In this study, it will provide understanding on factors that influence Internet usage among Kenyan Public Universities in Kenya; it will highlight on the key factors that play a role in the optimization of Internet use. This study will contributes to the body of knowledge in the field of ICTs in education; it will yield to a model that Kenyan Public Universities can adopt to optimize Internet use for learning and research purposes.

Structured survey questionnaire will be administered to students while face-to-face interviews will be administered to ICT staffs to get insights on information search in relation to the internet usage. The study will employ a survey study that will include questionnaires to students and interviews to ICT Staffs during the data collections at Moi University Nairobi Campus.

Key terms: *Optimization, Kenyan Public Universities, Internet use*

ACKNOWLEDGEMENT

I would like to extend my gratitude to the entire fraternity of KCA University Faculty of Computing and Information Management and Academics department specifically to my course instructors, DVC Academic Affairs office and Graduate studies Department as a whole for encouragement and support they gave me all through my project period. Thank you for your dedicated assistance in availing to me the much needed support in the research. My supervisors: Prof. Joshua Bagaka and Mrs. Rachael Kibuku deserve special thank for their professional guidance during the research process. To all my friends and colleagues that either directly or indirectly helped me throughout this entire process of research, I thank you very much and God Bless you. Above all, praise goes to the almighty God for keeping me healthy during this process.

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DEDICATION

I would like to dedicate this research work and progress made in my academic life to my parents Mr. and Mrs. Biwott and siblings; without who all this would not have been accomplished. Thank you for all your sacrifices as well as inspirations you accorded me during the entire research. Your contribution in shaping and modeling me has made me what I am today.

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ACRONYMS AND ABBREVIATIONS

OIU: Optimization of Internet Usage

ICT: Information Communication Technology

KENET: Kenya Education Networks

E-Resources: Electronic Resources

LL: Literacy Level

A: Accessibility

ICTI: Information Communication Technology Infrastructure

ANOVA: Analysis of Variance

WiFi: Wireless Fidelity

LAN/WAN: Local/Wide Area Network

OPERATIONAL DEFINITION OF TERMS

Optimization: An act, process, or methodology of making design, system, or decision as fully perfect, functional, or effective as possible by finding the maximum of a function.

Acquisition: The learning or developing of a skill, habit, or quality for new idea.

Reliability: Measure of Internal Consistency

Intervening Variable: It explains the relationship between the dependent variable and the independent variable.

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

The Internet can be conceived as a rich, multi-layered, complex, ever-changing textual environment. It is a mechanism for information dissemination and a medium for collaborative interaction between individuals and their computers without regard for geographic limitation of space (Leiner et al., 2000; Singh, 2002). Content created on the Internet ranges from simple e-mail messages to sophisticated 'documents' incorporating sounds, images and words.(Evans, 1996) The Internet is a 'live', constantly 'moving', theoretically borderless, potentially infinite space for the production and circulation of information.

Lankshear (2013) asserted that while printed materials have a certain fixity and finitude, texts published via the Internet have a much more fluid character. With texts no longer housed between library or bookshop walls, it becomes impossible to 'pin down' all or even most of the available materials in given subject areas for archival and classification purposes. The Internet might thus be described as a 'sea of information', subject to the ebb and flow of various forces (political, corporate, institutional, etc.), creating an ever-shifting shoreline.

The Internet is arguably one of the most significant technological developments or advancements at this 21st century. It has transformed all facets of human life since it became globally accessible to the public in the early 1990s. This transformation is characterized by the rising number of Internet users globally especially in the recent decade. According to the Internet World Statistics

(June, 2017), the worldwide number of internet users surpassed three billion in 2016 (up from 400 million in 1985 to 3.8 billion in 2017).

It has become a powerful means of information transmission and has been embraced by academic institutions to enhance research and academic work. As per (Luambano et.al, 2004) it confirms that the internet has become a relevant component in academic institutions as it plays a pivotal role in meeting the information needs of these institutions. They sum up the importance and benefits of the internet as: It increases access to information all over the world, It provides scholars and academic institutions with an avenue to disseminate information to a wider audience worldwide, It enables scholars and students at different locations on the globe to exchange ideas on various fields of study, It has enabled the growth via web-based learning, both within nations and across international borders, It provides students and lecturers with a communication system that they can use to communicate with each other irrespective of distance.

There are 35 public universities in Kenya, each one of them having several campuses and/or Constituent university colleges distributed in different parts of the country (Commission for University Education,2016).Moi University Nairobi Campus is among the listed campuses under the umbrella Moi University and it the second largest campus after main campus and houses major schools of the university. The campus is committed to providing quality education and services that meet the needs of its customers and stakeholders through quality and relevant teaching, research and community service and outreach. The University is committed to a quality work and learning environment that is grounded in intellectual and academic freedom, teamwork, quest for excellence, professionalism, discipline and continuous improvement of its products (programmes/activities) and services so as to achieve client/customer satisfaction. To be

able to realize this commitment, the University will continually review its products (programmes/activities) and services to conform to the Quality Management Systems based on the ISO 9001 - 2008 Standards.

Due to the need for technology supported services, ICT directorate was established to spearhead ICT projects and develop solutions that are vital to core functions of the University. Its major goal of the center is to provide efficient and effective service to the end-user community at the university. The main functions of the Directorate of Information Communication and Technology are as follows: Network design/Implementation, repair & maintenance, Database construction & management, Information system development and Technical trainings. The department is solely responsible for all online services offered by university through development and maintenance of the same systems that can be accessed through personal computers or mobile devices to enhance the goals of the education purposes and even through Internet while off-campus to enable continuity.

1.2 Problem Statement

Most of the institutions of higher learning are rapidly adopting ICTs due to the change of information flow and this is majorly facilitated by the provision of internet services to the students and institutions staff. Internet presence has opened and ignited new opportunities that have made learning easy through development of: online share groups, online classrooms, online group chats, online e-resource centers, sites and links of e-journals and e-papers. More of these services are both accessible via mobile devices and personal computers hence making it easy for students and staffs to have more interactivity.

After observing the internet graphs (attached at annex I) on usage of internet bandwidth at Moi University Nairobi Campus the fluctuation at Inbound (Data being received within the network

from outside networks) and Outbound (Data being sent from the network to the outside networks) initiated a cause of action to identify the factors leading to search fluctuations. The university has purchased maximum bandwidth 50 mbps but still the threshold of approximated 35 mbps is yet to be reached upon, with users using currently average of 6-7 mbps and hence the main reason to understand why such scenario occurs.

More improvements have been experienced on policy formulation that has led to waiving of taxes on ICT related equipment and mainly on reducing internet fee while allowing institutions of higher learning to collaborate with foreign bodies to aid ICT infrastructure in their institutions with an aim of boosting internet penetration and it's usage, for example KENET, VLIR-UoS. Despite all this efforts, it is a fact that Internet consumption in most Kenyan Public Universities is still low and users are still not fully utilizing Internet services. It is through this fact that this study is carried out to ascertain on the factors that has led to this situation.

1.3 Research Objectives

Main Objective

The main objective of the study is to establish a framework model that influence optimization of Internet Usage at Moi University Nairobi Campus, with a view of developing a working model to optimize Internet Usage at Kenya Public Universities.

Specific Objectives

(i)   To establish the extent to which Accessibility, ICT infrastructure on the internet use and Literacy Level of users can influence internet usage at Moi University Nairobi Campus.

(ii)   To develop a Model to be used to optimize internet usage at Moi University Nairobi Campus.

(iii)   Test and Evaluate the Model

Research Questions

i.   To what extend does Accessibility predict optimization of Internet Usage at Moi University Nairobi Campus?

ii.   To what extend does Literacy Level predict optimization of Internet Usage at Moi University Nairobi Campus?

iii.   To what extend does ICT Infrastructure predict optimization of Internet Usage at Moi University Nairobi Campus?

iv.   What type of a model can be used to optimize Internet Usage at Moi University Nairobi Campus?

1.4 Significance of the Study

The findings of this study will provide understanding on factors that influence Internet usage in Kenyan Public Universities; it will highlight on the key factors that play a role in the optimization of Internet use. This study will contributes to the body of knowledge in the field of ICTs in education; it will yield to a model that Public Universities can adopt to optimize Internet use for learning and research purposes.

The Institutions of higher learning will use the findings emanating from this study to formulate policies that are geared towards adoption of ICTs in core functions. The study will also be useful to other research institutions, as a basis of formulating policies, which can be effectively adopted for better and effective use of Internet to support learning and research.

Kenya Education Network (KENET) as a National Research and Education Network will benefit from this study, in formulation of their operational strategies and in planning for future

expansions. Other researchers and academic community will use this study as a basis for further studies on Internet use optimization in the Universities.

1.5 Scope

The scope of this study is to develop a model for optimization of internet usage at Moi University Nairobi Campus and time will be limited due to presence of students during the last short semester (October-December).

I will delimit my study to Moi University Nairobi Campus students as they will serve a representation of Kenyan Public Universities students who are the main users of the internet and due to proximity advantage of my study and data collection purposes.

1.6 Limitation

Major limitation for this study is that the focus was directed to students while excluding teaching staffs and other staffs who form the entire body. Time of collecting data was limited and also the disruption of the academic calendar due to the lecturers strike during the time of collections contributed to low number of students present during the study. Graduate students were off campus due to the said strike hence could only trace a number of them for the research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter entails various research studies on Internet Usage at Universities. The chapter

focuses on theories and arguments that are meant to support this research. The issues

range from literacy levels of internets users, availability of ICT Infrastructure and other factors

(User satisfaction) at Kenyan Universities. Sub topics include relevance of Internet to students,

E-learning in Kenyan Public Universities, Awareness of Internet services, Availability of E-

resources and online services, ICT Infrastructure at Kenyan Public Universities, Challenges

experience by university students, Skills in using the internet. Finally, this chapter forms a basis

for conceptual framework that is used in this research study.

2.2 Theoretical Framework Models for Technology and Internet Use

2.2.1 Diffusion of Innovation Theory (DOI)

The purpose of the diffusion of innovation theory is "to provide individuals from any discipline

interested in the diffusion of an innovation with a conceptual paradigm for understanding the

process of diffusion and social change" (Brown, 1999). Diffusion of innovation theory provides

well developed concepts and a large body of empirical results applicable to the study of

technology evaluation, adoption and implementation, as well as tools, both quantitative and

qualitative, for assessing the likely rate of diffusion of a technology, and identifies numerous

factors that facilitate or hinder technology adoption and implementation (Fichman, 1992). These

factors include the innovation–decision process, attributions of the innovation and innovators'

characteristics.

Rogers (2003) pointed out that diffusion research has focused on "people" differences in innovativeness while less effort have been devoted to analyzing "innovation" differences.' Researchers in the past tended to regard all innovations as equivalent units from the viewpoint of their analyses'. Innovation attributes can explain the rate of innovation adoption. Most of the variance in the rate of adoption (49-87 per cent) is explained by the five perceived attributes of an innovation. These attributes are interrelated empirically but each is conceptually distinct, and the selection of these attributes is based on past research as well as a desire for maximum generality and succinctness:

- **Relative Advantage:** is the degree to which an innovation is perceived as better than the idea it supersedes.

- *Compatibility:* is the degree to which an innovation is perceived as consistent with existing values, past experiences, and needs of potential adopters.

- *Complexity:* is the degree to which an innovation is perceived as relatively difficult to understand and use.

- **Trialability:** is the degree to which an innovation may be experimented with on a limited basis.

- *Observability:* is the degree to which the results of an innovation are visible to others.
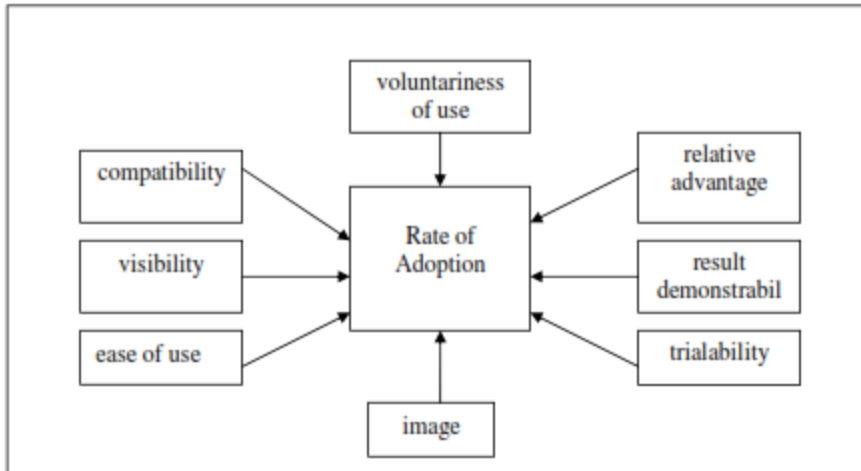
This study will adopt Relative Advantage that will play a role in determining user satisfaction as a factor at conceptual framework model.

2.2.2 Technology Acceptance Model (TAM)

Davis (1986) introduced the technology acceptance model, which described an individuals' acceptance of information technology. The goal of TAM is to provide an explanation of the determinants of computer acceptance among users. TAM replaced TRA's attitude beliefs with the two technology acceptance measures:

1. Perceived usefulness (PU) referring to the degree to which a person believes that using a particular system would enhance his/her job performance; and

2. Perceived ease of use (PEOU) referring to the degree to which a person believes that using a particular system would be free from effort (Davis, 1989).

The original theoretical conceptualization of TAM includes the attitude construct. However, based on empirical evidence, the final model excluded the attitude construct because it did not fully mediate the effect of PEOU on intention and the PU→BI link seemed more significant

(Davis et al., 1989). TAM posits that PU is influenced by PEOU because, other things being equal, the easier a technology to use, the more useful it can be.

The external variables in the model refer to a set of variables such as objective system design characteristics, training, computer self-efficacy, user involvement in design, and the nature of the implementation process (Davis, 1996). However, as TAM continued to evolve, new variables were introduced as external variables affecting PU, PEOU, BI, and actual use or behavior. Among the most frequently referenced are: system quality, compatibility, computer anxiety, enjoyment, computing support, and experience (Lee et al., 2003). The relationship between TAM's four major variables (PU, PEOU, BI and B) is hypothesized to use PU as both: a dependent variable affecting BI directly; and as an independent since it is predicted by PEOU. Actual Use or Behavior is usually measured by: amount of time using, frequency of use, actual number of usages and diversity of usage.
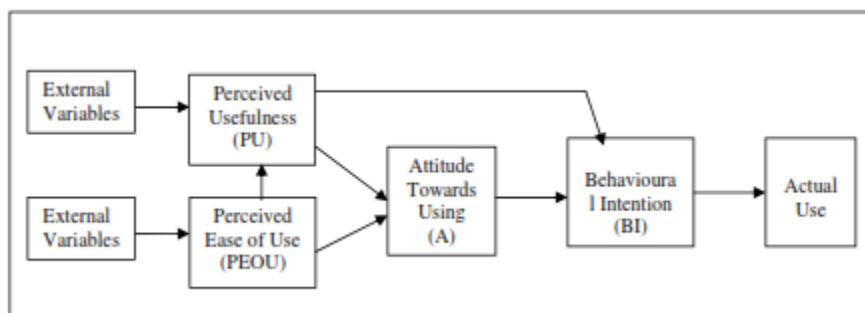
Figure 2.2: Technology Acceptance Model (TAM) Based on Davis et.al (1989)

Perceived ease of use will be used to ascertain user satisfaction as a factor and will form basis of the conceptual framework model.

2.2.3 DeLone and McLean of IS Success

DeLone and McLean (2003) put emphasis on the importance of measuring the success of

information systems and its implementation as this will contribute towards the understanding of

what value IS management actions and IS investments bring. The theory is made up of six

dimensions of success: information quality, system quality, use, user satisfaction, individual

impact and organizational impact. The six dimensions of success are interrelated as opposed to

being independent.

As per Urbach and Muller (2012) study, they supported this theory by citing a paper done

before by Lowry et al. (2007) which says that a 1992 article done by DeLone and McLean turned

out to be the most cited article in IS research. There is an updated version of the original IS

success model, (Urbach and Muller, 2012) who say that what makes the updated model different

from the original model is the incorporation of service quality.

Gichoya (2005) supports the DeLone and McLean model through a research framework

which shows a causal relationship of how ICT facilities quality and IS quality are affected by

successful ICT implementation thereby the perceived benefits being affected by the quality of

ICT facilities and IS. Perceived benefits are used to evaluate and assess the success of ICT

projects.
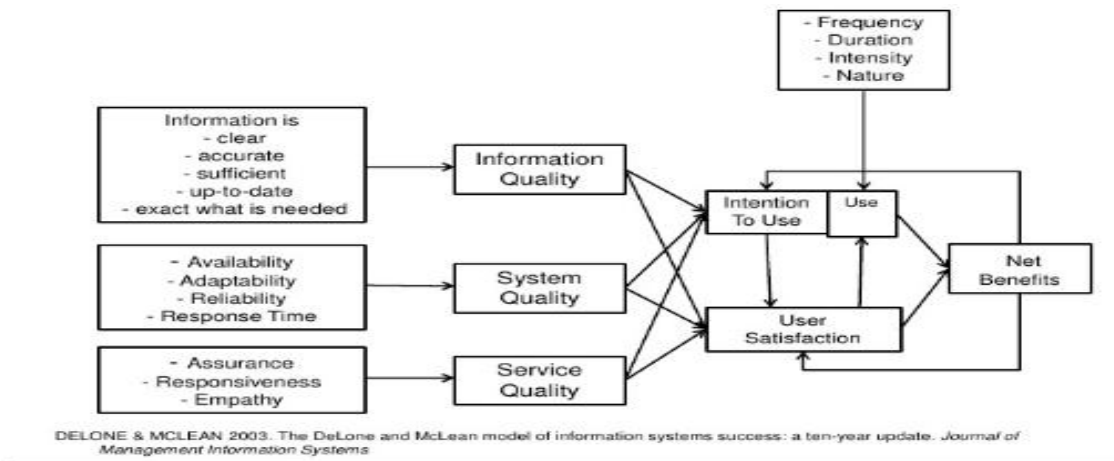
Figure 2.3: DeLone & McLean IS Success Model 2003

This study will adopt User Satisfaction as Other factors on determining optimization of internet use at conceptual framework model.

2.2.4 The Unified Theory of Acceptance and Use of Technology (UTAUT)

Venkatesh et al. (2003) noticed that IS or IT researchers were confronted with a choice among a multitude of models and were bound to choose constructs across models or choose a favored model, thus ignoring the contribution from alternative ones. They felt the need for a synthesis in order to reach a unified view of users' technology acceptance.

Venkatesh et al. reviewed and compared the eight dominant models that have been used to explain technology acceptance behavior. These models included TRA, TPB, TAM, combined TAM - TPB, DOI, SCT, MM, and MPCU .Upon review, the authors reported five limitations of prior model tests and comparisons and addressed them in their work; they included:

   a. The technologies studied were simple and individual-oriented as opposed to complex and sophisticated organizational technology.

   b. Most participants in these studies were students except for a few studies.

c. Time of measurement was general and in most studies well after acceptance or rejection of the usage decisions so individuals' reactions were retrospective.

d. The nature of measurement was in general cross-sectional

e. Most of the studies were conducted in voluntary usage contexts making it rather difficult to generalize results to mandatory settings.

The authors then empirically compared the eight models in longitudinal field studies conducted in four different organizations among individuals that were introduced to a new technology in the workplace. The data was divided into two samples for the eight models according to the mandatory and voluntary settings. The authors also studied the effect of some moderating variables that have been reported in previous research to effect the usage decision. These were experience, voluntariness, age, and gender. Results showed that, with exception to MM and SCT, the predictive validity of the models increased after including the moderators. The authors then examined commonalities among models and found seven constructs to be significant direct determinants of intention or usage in one or more of the individual models. They hypothesized that four of them to play a significant role as direct determinants of user acceptance and usage behavior. Based on user acceptance literature and results of models' comparison, attitude, computer self-efficacy, and anxiety were hypothesized not to have a direct effect on behavioral intention. The constructs that do have a direct effect on behavioral intentions and usage are: *performance expectancy, effort expectancy, social influences, and facilitating conditions*:

Performance Expectancy (PE) *is the degree to which an individual believes that using the system and services will help him/her to attain gains in job or study performance.* The constructs in the other models that pertain to performance expectancy are: perceived usefulness (TAM, and

combined TAM-TPB), extrinsic motivation (MM), job-fit (MPCU), relative advantage (DOI), and outcome expectancy (SCT).

Effort Expectancy (EE) *is the degree of ease associated with the use of system and internet services.* The constructs in the other models that capture the same concept are: perceived ease of use (TAM), and complexity (DOI and MPCU).

Social Influence (SI) *is the degree to which an individual or student perceives that it is important for others to believe he/she should use the new system and services.* Similar constructs are represented in existing models: subjective norms (TRA, TAM2, TPB/DTPB, and combined TAM-TPB), social factors (MPCU), and image (DOI).

Facilitating Conditions (FC) *is the degree to which an individual or student believes that an institutional and technical infrastructure exists to support use of the system and services.* This definition captures three different constructs in existing models: perceived behavioral control (TPB/DTPB and combined TAM-TPB), facilitating conditions (MPCU), and compatibility (DOI).
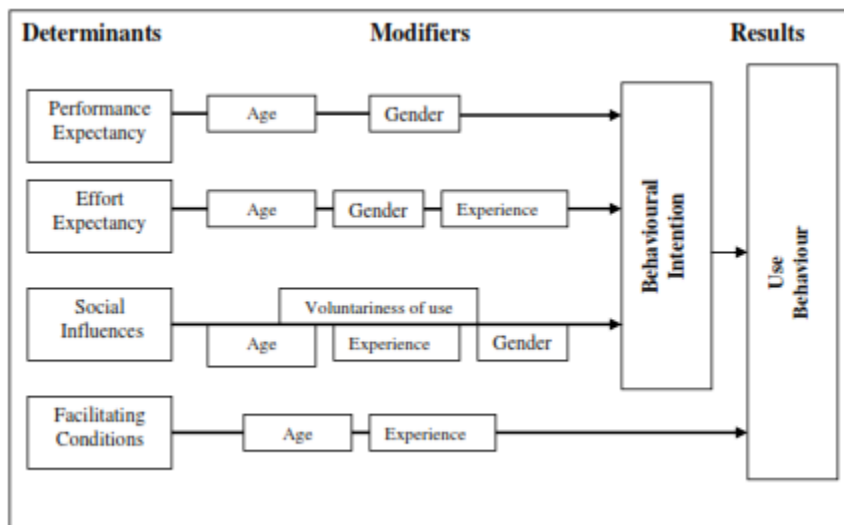
Source: Venkatesh (2003)

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Moderating variables (Age, Gender,) will be adopted and used as User factor at the Conceptual

Framework Model for the study.

Table 2.1: Factors in Technology and Internet use models

Model	Factors Summing up the Model
TAM	Perceived Use + Perceived Ease Of Use
DOI	Innovation Attributes + Innovators' Characteristics
UTAUT	Effort Expectancy + Performance Expectancy + Social Influence + Facilitating
D & Mc	Effectiveness + Quality Of Services + Information Quality +User Satisfaction

2.3 Relevance of the internet to students

The internet is one of the most important and complex innovations of mankind. It is a powerful

tool of communication, and is used for the dissemination and retrieval of information. The

internet is also increasingly being used for educational course delivery and its related purposes

(Sinha 2004).

The progressive increase in the use of ICTs has drastically changed research, teaching and

learning. A great deal of research has proven the importance of ICTs in education, among these

ICTs the internet has been a major force of change in higher education.

It is an educational tool with a great potential. It may or is being used to replace traditional

classroom lectures or to supplement traditional instructional methods. The internet enables

students to communicate with other students (even oversees) and to share ideas, knowledge,

experiences, ideologies and cultural practices. It enhances the skills and capabilities of students,

and assists them in their studies and professional lives afterwards (Khan, Khan & Bhatti 2011).

The internet plays a pivotal role in meeting the information and communication needs of academic institutions since it makes it possible to access a wide range of information, such as up-to-date reports, from anywhere in the world. It also enables scholars and academic institutions to disseminate information to a wider audience around the globe through websites and as a way to search for information and organize output (Luambano & Nawe 2004).

2.4 Internet as an information resource

The emergence of the internet has meant that vast amounts of information resources that were previously mostly limited and confined to libraries and bookstores can be made available to a much wider community and audience. Restrictions created by distance, availability and access to information have to a large extent been scrapped off. More information continues to become available in electronic format as this medium is embraced by publishers, museums and archives (Schmidt 2003:3). The internet is also considered a reservoir of information. On the internet, users are able to access e-resources freely or at a fee depending at the source. Some of the material resources found on the internet are e-books, e- newspapers, e-databases, e-journals and online subject-encyclopedias.

Internet always allow access of data specifically for education purposes among others through online databases which is restricted to institutional subscribers that are licensed to make the services available to authorized users in accordance with the terms and conditions of the service license agreement per the organization or institution. Licensed databases have increased rapidly in number, size and use in recent years and their services are continuously revised and improved in order to keep up with competitors in the field. Improvements include enhanced search ability

and navigation of interfaces, more customization and the continued provision of multiple formats for the current demands (Kuzyk 2007:8).

2.5 Benefits of the internet in education

A major academic benefit of the internet is free, easy and immediate access to large amounts of information on almost any topic. They (Luambano & Nawe 2004:13-17) point out that the internet:

- increases access to information all over the world

- provides scholars and academic institutions with an avenue to disseminate information to a wider audience worldwide

- enables students and scholars at different locations on the globe to exchange ideas on various study fields

- has enabled the growth of web-based learning within nations and across international borders

- provides students and lecturers with a communication system to communicate irrespective of distance

- helps students to achieve their academic goals

The Web 2.0 platform also has educational benefits (Duffy 2008). The new Web 2.0 technologies and websites such as blogs, wikis and youtube make new demands on learning and they provide new learning support even as they dismantle some of the learning support upon which education depended in the past. Some of the benefits of using blogs in education are (Richardson 2006):

- It promotes critical and analytical thinking.

- It promotes creative, intuitive and associational thinking.

- It promotes analogical thinking.

- It offers potential for increased access and exposure to quality information.

- It provides a combination of solitary communication and social interaction.

The use of wikis in education is also becoming popular and is of great benefit in education. A wiki is a group of web pages that allow users to add content, similar to a group discussion forum or blog, but also permits others to edit the content (Arregiun 2004). Wikis provide an online space for collaborative authorship and writing. They are available online for all web users or members of specific communities and include version control tools that allow authors to track the history of specific pages and the history of their personal contributions (Duffy 2008). By using wikis, students can easily create simple websites without prior programming knowledge or skills in hypertext mark-up language (HTML) or use current software for website authoring. Internet has also developed and increased the accessibility of data and information that were perceived inaccessible but now at reach at a click of a button from any place while connected. Connectivity factor has tremendously grown the networks of users after new emergence of mobile devices and has really improved the level of awareness than before.

2.6 Status of E-learning in Kenyan Public Universities

The national ICT policy for Kenya lays the framework for e-learning considered crucial to its development and utilization (Waema, 2005). Similarly, according to Kenya's Ministry of Education Policy Framework for Education and Training (2012), ICT is identified as a major

vehicle for teaching and learning. The policy framework therefore has identified open and distance learning (ODL) and e-learning among the priority areas. One of the strategies is to establish an Open University of Kenya and expand ODL and e-learning in existing universities by leveraging ICT to take advantage of ICT infrastructure within the country.

E-learning initiatives have been introduced in most of the public universities in Kenya though on a limited scale and are using e-learning in blended mode due to implementation challenges at this early stages.

Among the universities that have started implementation of e-learning include University of Nairobi, Kenyatta University, Moi University, Jomo Kenyatta University of Agriculture & Technology and Egerton University. However, according to E-Readiness Survey of Kenyan Universities (2013) Report, only 11% of students in Kenyan universities are taking their courses using e-learning in blended mode (Kashorda & Waema, 2014). Among the key strategies of the Kenya Vision 2030 on education is introducing e-learning and blended learning as a way of improving both access and quality of education in Kenyan Universities (NESC, 2007).

According to Gichoya (2005), few studies have revealed on challenges of implementation of e-learning have been carried out in Kenya especially in the context of public universities. More studies therefore need bridge the gap that exists in the current knowledge on challenges on implementation of e-learning in the Kenyan context by adding onto the pool of knowledge on the subject.

2.7 Awareness of the internet services

According to the Oxford English dictionary (2014), "awareness" means concern about and well-informed interest in a particular situation or development. It follows then that awareness of internet services means having knowledge of the services and resources that are available on the

internet and being conversant with what institutions offer in terms of these services. When the user is aware of a resource or a service, it will lead to more use of the service or resource (Asemi & Riyahiniya 2007).

According to Parameshwar and Patil (2009) they studied the use of the internet by faculty and research scholars at Gulbarga University's library in India. The study showed that the faculty members had longer experience of using the internet than the research scholars. The use of technical reports and electronic theses and dissertations was limited due to a lack of awareness by research scholars and students. Despite the fact that all the respondents indicated that they were aware of the internet services, the results revealed that not all were aware of the different resources that are available on the internet nor of the internet techniques and related applications of the internet.

The literature review on internet awareness revealed gaps that this research intends to fulfill. Most of the research under this topic was done more than ten years ago. The internet is dynamic and a lot of innovations and discoveries (such as Web 2.0 technologies and social media and networks) are available today. This means that the current situation and how these new innovations have been adopted by university students are not known, especially in Kenya. The earlier studies concentrated on the Western world and limited studies focused on the African nations with view of it being under-developed in matters appertaining internet use. Although the above studies do not reveal a big problem of awareness of internet services and resources among university students, it is clear that this study will be carried and concentrates on the situation of Moi University Nairobi Campus under Kenyan Public Universities.

2.8 Skills in using the internet

Acquiring internet skills is essential in a technology-driven or non-technological environment and they can be enhanced tremendously through initiatives either through learning strategies available online or even offline via classroom for education purposes (Dawson 2005).

To increase the growing range of internet resources, students must acquire and practice the skills that are necessary to exploit them while using internet at any given time (Okello-Obura & Magara 2008). These skills include:

•   Knowledge of the structure of the databases

•   Knowledge of the instructions they must enter into the computer

•   Understanding the ways in which these instructions are linked to one another

Several studies have been done on students' skills in using the internet. According to Muniandy (2010), a study on the academic use of the internet among undergraduate students at a Malaysian university revealed that their level of internet usage skills was fair: 70% of the respondents reported that their skills were fair, only 2% reported a very high level of internet usage skills and 27% reported a high level of internet usage skills.

According to Shuling (2006) he investigated and analyzed the use of e-resources in university libraries. The study revealed that the students' ability to use e-resources was lacking, with 55% of the respondents only knowing the "keyword" search method and only 16% using high-level search methods. This shows that a considerable amount of the students had not really mastered the information search techniques and their techniques and skills need to be improved.

2.9 Availability of E-resources and Online Services

Electronic Resource (E-Resources) information is available in different formats or file types while offline or online. A format is the arrangement of data within a document file that typically permits the document to be ready or written by a certain application (Microsoft Press computer users' dictionary 1998:149). ASCII format is the plain text or text only file. Web documents are presented in HTML. Images on the Web are available as GIF or PEG GIF (graphics interchange format), which allows for compressing small or medium-sized files and can store up to 256 colors. JPEG (Joint Photographic Experts Group) is a newer format that stores more than 16 million colors. The MIDI (musical instrument digital interface) format is used in controlling devices that create and read musical information. Streaming transmission is a new technique that is used to transmit both sound and video files.

We have various avenues that make it available to access E-resources through the following:

- **Internet Services:** The internet provides a variety of services that enable communication and access to electronic information for many different purposes. Avenues present include telnet (Telnet is an internet service that allows users to connect from their system to a remote electronic system (Diaz 1994:7) and file transfer protocol (FTP is one of several services built into and supported by internet suite protocols. It is a program to transfer files from one computer that is connected to the internet to another computer that is connected to the internet (Gauntlet 2000)

- **World Wide Web (WWW):** The World Wide Web is an important and major application of the internet that was developed by one by Tim Berners-Lee at the

European Organization for Nuclear Research (CERN) (Poulter 2003). It is a multimedia, hyper textual collection of information and entertainment resources that is available to users who are connected to the internet.

- **Web 2.0 Technologies:** These are Web applications that facilitate interactive information sharing, user- centered designs and collaboration on the internet (Selwyn 2008) The current and latest generation of Web 2.0 technologies include blogs, wikis and rich site summary(RSS) are quickly becoming ubiquitous, offering unique and powerful information sharing and collaboration. These technologies provide students with limitless opportunities to expand their knowledge and the knowledge of others, and they require dynamic and active involvement by the student. Blake (2009) states that Web 2.0 tools allow students to transform from passive consumers of authentic source materials to active author/owners of the material; they synthesize the material and contribute to the evolution of knowledge.

- **Online Communication:** This is synchronous or asynchronous electronic communication computer conferencing whereby a sender encodes text messages that are relayed from the sender's computer to the receiver's computer (Gaunlett 2009).They include E-mail is a mediated communication technology that enables users to send messages in the form of electronic letters to other users in asynchronous time and Instant Messaging is a form of mediated communication technology that enables users to communicate with other users in real time. A user sends a message and it appears on the receiver's computer screen among many examples.

2.10 Status of ICT Infrastructure in Kenyan Universities

The Government of Kenya has over the years improved the regulatory environment to promote growth of the ICT sector and increase availability of broadband Internet in the country. In 1999, the government established the Kenya Education Network Trust (KENET), a National Research and Education Network that promotes the use of ICT in Teaching, Learning and Research in Higher Education Institutions in Kenya. The main aim of KENET is to interconnect all the universities, tertiary and research Institutions in Kenya by setting up a cost effective and sustainable private network with high speed access to the global Internet. KENET currently provides Internet bandwidth to 90 member institutions and 150 campuses, including all large research institutions in Kenya.

According to (Kashorda and Waema, 2014) in their E-Readiness Survey of Kenyan Universities (2013) Report, the networked PCs available per 100 students ratio was 3.8 in Kenyan universities, which was considered quite low. The e-readiness survey also indicated that 16,174 student lab computers were available for 423,664 students at the 30 universities and only 17% of students accessed computers from their campuses. On the other hand, 53% of students owned over 200,000 laptop computers in the 30 universities. It was therefore recommended in the report that universities should invest in student computer labs to serve the students who are unable to purchase laptop computers or those who may not wish to carry their laptop computers to university campuses. The e-readiness survey further revealed that universities in 2013 achieved Internet bandwidth of 4.0 Mb/s per 1,000 students compared to only 0.431Mb/s per 1,000 students in 2008.

The E-Readiness Survey (2013) Report however pointed out that although all universities are

inter-connected to the national fiber backbone network, universities are not investing sufficiently in their internal campus backbone and wireless network infrastructure that will make it easier for students to use their own laptops and smartphones on campus to access learning materials and other student services. Equally, apart from the low PC ratio, the students considered the campus networks slow and unstable (Kashorda and Waema, 2014).

2.11 Challenges experienced by university students while using Internet

A study conducted by Oyadonghan and Eke (2011) on factors affecting student' use of information technology in Nigeria showed that the availability of resources and materials, management and administration, and students' attitudes and dispositions but a few of these challenges. Adding up the list of inhibitors of students' use of the internet as insufficient availability of IT resources, inadequate training on how to use the internet, the uncooperative attitude of staff, time constraints, cost of utilization, obsolete equipment, space constraints, irregular power supply and systems failure.

Another study, which was conducted by Talja and Maula (2003) at the University of Tampere in Finland, reported findings similar to the above studies on challenges that students faced when using the internet. The findings included lack of access, lack of knowledge of what is available, conservative attitudes and lack of computer skills as hindrances. This is in agreement with Hinson and Amidu (2007) who reported access limitations and lack of skills as problems for final year students at Ghana's Oldest Business School. Parameshwar and Patil (2009) reported downloading problems, irrelevant information, finding relevant information and information overload as the major challenges for faculty members and research scholars at Gulbarga University's library in India.

According to Okello-Obura and Magara's study (2008), which they conducted in East Africa, revealed several problems students faced when using the internet at Makarere University in Uganda. These included lack of network skills, slow internet connection, inadequate networked computers, inadequate opening hours of the computer laboratory, library staff's unwillingness to help, lack of access to printers in the library at low cost and few computers in the internet laboratory. This is in agreement with the study Luambano and Nawe (2004) carried out at the University of Dar es Salaam which indicated points of internet access were few, the speed of connection was low, a shortage of time, and lack of awareness amongst students and inadequate skills as inhibitors to student' successful utilization of internet services. This was further complicated by inability to afford the access fee at the expenses added at the fee structure.

2.12 Conceptual Framework

The conceptual framework for this study displaying the relationship of the variables is as shown in the diagram below.

Independent Variable
ICT INFRASTRUCTURE: -Bandwidth -Computer Devices   -No. of Labs -WiFi/LAN   -Owned Devices

| **LITERACY LEVEL:**
 -Training & Awareness
 -Level of Competency
 -Frequency of Use |

| **ACCESSIBILITY:**
 -Relevance of Resources
 -Improvement in Education
 -Awareness of Services
 -Perceive Ease of Use |

Dependent Variable
OPTIMIZATION OF INTERNET USAGE: -Downloading data/information   -Online collaborations   -Browsing educational content   -Messaging & Communicating   -E-learning platforms   -Searching & Retrieval

Intervening Variable
USER FACTOR: -Age   -Gender   -Experience

Figure 2.5: Conceptual Framework

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter comprises of research design, research population, sampling, data collection instruments of data processing and analysis, data validity and reliability, and ethical considerations. The research methodology was driven and guided by the research objectives.

3.2 Research design

Research design is the arrangement of conditions for collection and analysis of data in a stated manner that aims to combine relevance to the research purpose with economy in procedure (Kothari, 2008). Research design gives the structure in which the research is conducted and contains the collection, measurement and analysis of data.

A survey research design was adopted and it will be achieved through enquiring and observing various people's opinions, behavior, perceptions, attitudes and values regarding the topic in questions of this descriptive study.

Leedy and Ormrod (2001) point out that in a descriptive study, the researcher used the results obtained from the sample to make generalizations about the entire population only when sample was truly representative of the population. Case Study research design was appropriate for this study because the study involved collection of quantitative and qualitative data from a varied number of respondents by interviewing or administering a questionnaire to a sample of respondents. The sample size of the study was drawn from Moi University Nairobi Campus. This aided in coming up with a suitable conceptual framework for the optimization of Internet Usage at Moi University Nairobi Campus while developing a model to be used by other Kenyan Universities.

3.2.1 Target research population

A population refers to an entire group of individuals, events or objects that have a common observable characteristic (Orodho, 2008). A population describes the parameters whose characteristics the research will attempt to describe. The population for this study included all students from Moi University Nairobi Campus and ICT Staffs who offer internet services. The target was students who used internet on a daily basis via campus laboratory or personal computers through the connection of campus internet. They were sampled from Moi University Nairobi Campus to serve as research population for the whole Kenyan universities.

Table 3.1 Research Population

Description	Population Size	Sample Size	Remarks
Students	110	100	Achieved 90
ICT Staffs	10	9	Achieved 7
Total	**120**	**109**	

3.2.2 Sampling

3.2.2.1 Sampling procedure and design

According to Kothari (2009) the study established that a sample design is a definite plan determined before any data are actually collected for obtaining a sample from a given population. The research employed interviews and questionnaires to the chosen population while sample design used was multistage sampling being combination of probabilistic and non-probabilistic sampling this is where a researcher aimed to generate a sample that was representative and also provided meaningful information (Graff, 2016). Purposive or non-

probability sampling is a sampling method that involves purposive or deliberate selection of particular units of the universe for constituting a sample which represents the universe the respondent. Random sampling is typically used by research in the positivist paradigm, because it ensures the objective reality is being measured accurately (Davis et.al. 2013).

3.2.2.2 Sampling technique

The study adopted clustered sampling where respondents who are of different caliber for the study were divided into (clusters) two heterogeneous groups:

(1) First group which included ICT Staffs where purposive sampling was used to identify core personnel that deals with internet services.

(2) Second group of respondents which students who were selected using random sampling because they had same caliber of characteristics for this study hence random selection worked.

Samples derived from purposive sampling and random samplings were used during the data analysis towards the fulfillment of research questions.

3.2.2.3 Sample size

Davis et.al (2013) study states that sample size is the number of data sources that are selected from the total population, size of the sample depends on a number of factors the researchers have to give in statistically information before they can get an answer. To determine a manageable sample size the researcher applied Slovins (l960) formula to the sample with a marginal error of 3%.The formula is as follows:-

$n = N/(1 + Ne^2)$ Where n is the sample size

- n is the sample size
- E is the margin error
- N is the population size
- 1 is the constant value

N=110/ $(1+110(0.03^{2})=$ 100 (Manageable sample size to carry out the study)

3.3 Data Needed: Operational definition of Variables

Table 3.2: Operationalization of variables

NO.	VARIABLE	INDICATORS	MEASUREMENT	METHOD OF ANALYSIS
1	Optimization of Internet Usage (Dependent)	Downloading Data	Likert Scale	Descriptive Analysis
		Online Collaborations		Frequencies(Mean/Mode/STD)
		Browsing educational content		
		Messaging & Communicating		
		E-learning platforms		
		Searching & Retrieval		
2	ICT Infrastructure (Independent)	Bandwidth	Likert Scale	Descriptive Analysis
		Computer Devices		Frequencies(Mean/Mode/STD)
		No. of Labs		
		WiFi/LAN		
		Owned Devices		
3	Literacy Level (Independent)	Training and Awareness	Likert Scale	Descriptive Analysis
		Level of Competency		Frequencies(Mean/Mode/STD)
		Frequency of Use		
4	Accesibility (Independent)	Relevance of Resources	Likert Scale	Descriptive Analysis
		Improvement in Education		Frequencies(Mean/Mode/STD)
		Awareness of Services		
		Perceive Ease of Use		
5	User Factor (Intervening)	Age	Ordinal/Nominal	Frequency Distribution
		Gender		Charts
		Experience		Tables

3.4 Data Collection Methods and Tools

The study adopted a mixed method research such as semi-structured and structured questionnaire and interviews with an aim of yielding data for quantitative and qualitative research. The questionnaire were administered to the students while the interview guide were used to

obtain information from the ICT staffs. Research strategies definitions according to (Kothari, 2009);

a) **Personal interviews:** The interview method was used in this study were open-ended interview questions to yield narrative data from respondents (ICT staffs) that were purposively selected to give insight on how they served students and how they access via internet and online resources. That is the reason why interview was appropriate to serve the different personnel and also get varied views that could not be captured via questionnaire.

b) **Questionnaires:** The study used close-ended questions on 4-Point Likert scale (for ease of dichotomous sampling during analysis) for pre-established and predetermined response. Questionnaires were self-administered to the respondents (student) with a request to return after completing the same. Most of the questions were restructured to a predetermined structure to have direct answers.

3.4.1 Data collection procedure

The researcher obtained an introduction letter from KCA University with a research permit from the National Council for Science and Technology as an okay to carry out the research. The permit was presented to the University Management of Moi University Nairobi Campus so as to be allowed to conduct the study within the institution. After that, the researcher booked appointments with the respondents for visit and administered the questionnaires and interview guides respectively and personally administered the instruments to all the respondents according to the planned arrangements.

3.5 Issues to be considered during data collection

The researcher had to set goals on how to collect data and was decided on by ICT staffs and students to gather data from target population. The study was taking into consideration other data gathering issues which include:-

3.5.1 Ethical Considerations

Creswell et al. (2013) described the 'gate-keepers' as an individual in the organization supportive of proposed research that will essentially open up the organization. An approval for this study was sought from the School of Graduate studies. Assurance was given to the respondents on issues touching on integrity of the study including, confidentiality, privacy and any other research related ethical issues. The respondents were not required to indicate their names in the questionnaire which was be stored safely after the exercise. The researcher accepted individual responsibility for the conduct and consequences of the research and maintained openness and honesty in dealing with research subjects while the data was collected at this study used for academic purposes only.

3.5.2 Validity

Graff (2016) argues that the quality of data collected by researchers conducting mixed methods studies is determined to an extent by the standards of quality established for the qualitative and quantitative phase of research, valid and credible qualitative and quantitative data will contribute to high quality data in mixed method study. Validity of Instruments will be measures to what it is supposed to measured (Mugenda & Mugenda, 2003). At this case validity was aimed at gauging whether the subject matter was clear and relevant in generating data. Therefore instruments of data collection ensured that

each of the items in the instruments addressed specific contents of a particular concept of the study.

3.5.3 Reliability

Orodho (2009) established that reliability is the degree to which a measuring procedure gives similar results of a number of repeated trials. To determine reliability in quantitative phase of mixed methods study test-retest reliability must be done. This tested whether the instruments was reliable enough to collect data. Pre-testing provided a check on the feasibility of the proposed procedure for coding data and showed up flaws and ambiguities at the instruments of data collection. It yielded further suggestions for improvement of data collecting tools before being administered.

3.6 Data Analysis, Presentation & Interpretation

The researcher used both qualitative analysis for Interview questions and quantitative analysis for questionnaires after collection of data from the field due to mixed data collection methods.

Quantitative data was analyzed using a linear regression model to determine the extent which accessibility, literacy level and ICT Infrastructure predicts the optimization of Internet Usage at Moi University Nairobi Campus.

Qualitative data was analyzed using narrative analysis method technique which was summarized to various themes from different interviewee's and interpreted from many manageable statements that predicts the optimization of Internet Usage at Moi University Nairobi Campus.

Interpretation was done at every table and results obtained from the analyzed data and were from linear regression, correlations, tables, charts and narrative analysis (from interviews).

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the result of the analysis of the data obtained through various analysis techniques. As indicated in the research design, due to the nature of the study both qualitative and quantitative data has been used. The data obtained from the study has been clearly tabulated, analyzed, and presented using SPSS version 18.0, analytical tool.

4.2 Summary of Responses

The researcher undertook the research to analyze factors that influence optimization of Internet Usage at Moi University Nairobi Campus, a survey was set to interview and collect data from 110 respondents (students), however, 90 (81%) were returned while 30(19%) were not returned. Therefore, the data analysis is based on the returned instruments, as shown in table 4.1 below.

Table 4.1: Summary of the Responses

Category	Issued questionnaires	Returned questionnaires	Returned Questionnaires %
Students	110	90	81%
Category	Issued questionnaires	Not-Returned questionnaires	Not-Returned Questionnaires %
Students	110	30	19%
	Total	**110**	**100%**

Source: Field Data 2017

4.3 Demographic information

4.3.1 Gender proportion

On the gender of the respondents, the researcher found out that the male respondents constituted 51% of all the respondents while female respondents were 49% .This is an indication that study was balanced as per the proportions depicted in the pie chart below:
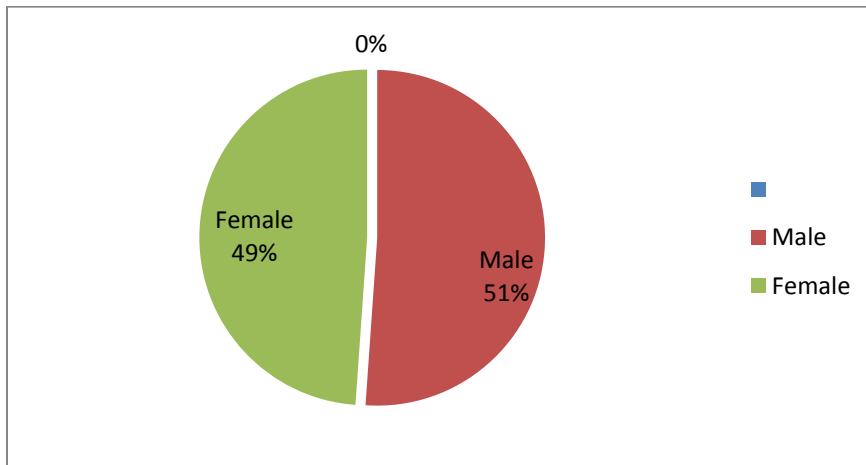
Figure 4.1: Gender Population   Source: Field Data 2017

4.3.2 Age Bracket Proportion

On the Age bracket of the respondents, the researcher found out that the 17-20yrs (8%), 21-25yrs (48%), 26-30yrs (24%), 30-35yrs (10%) while over 36yrs (10%).

This is an indication that study was balanced as per the proportions of years and showed that most students are between the age of 21-25yrs at the MUNC depicted in the pie chart below:
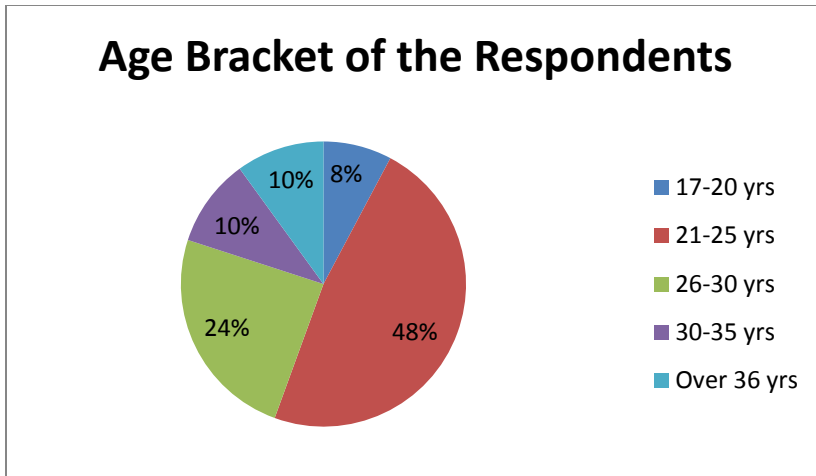
Figure 4.2: Age bracket Population Source: Field Data 2017

4.3.3 Level of Experience

On the level of experience of the respondents, the researcher found out that the novice level (2%), intermediate level (32%), advanced level (55%) and expert level (11%).

This is an indication that study showed more respondents were at advanced level in experience as depicted by 55% which above half the population of MUNC.
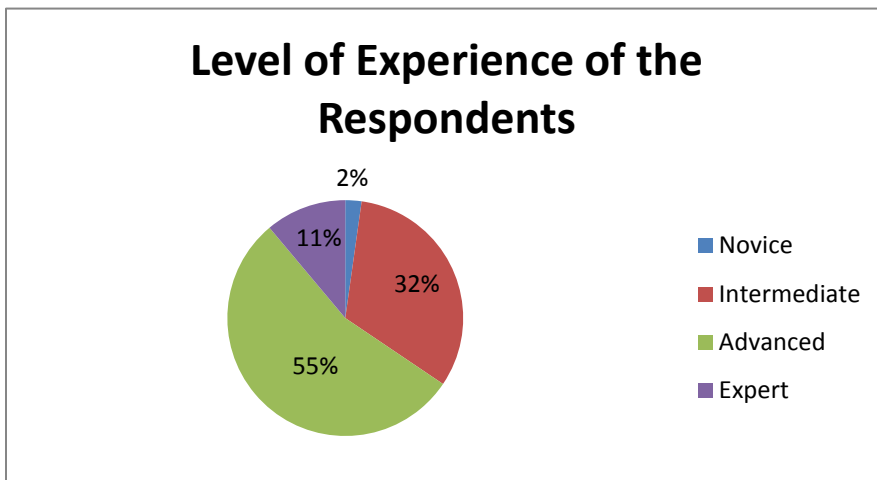
Figure 4.3: Level of Experience Source: Field Data 2017

4.4 ICT Infrastructure

Since this study was interested in understanding if ICT Infrastructure can influence the Optimization of Internet Usage, respondents were asked to rate specific statements relating to ICT Infrastructure using a Likert scale of 1-4(SA-SD). The results are summarized in table 4.2.

Table 4.2: ICT Infrastructure

ICT INFRASTRUCTURE					
Indicators	**N**	**Mean**	**Std. Deviation**	**Rank**	**Variance**
Most of the courses are conducted via computer laboratories compared to normal classroom.	90	2.8	.9	High	.9
MUNC got a good number of Computer Laboratories to serve the students who don't own computer devices.	90	2.6	1.0	High	1.0
MUNC has a good number of WiFi access points to satisfy need of students who use owned portable devices(laptops).	90	2.5	1.0	High	1.0
WiFi/LAN access within MUNC is available for students to use during educational research fully without much interruption.	90	2.5	1.1	High	1.1
Available Computer devices at MUNC serve the students fraternity expectation in educational works.	90	2.3	.9	High	.8
Bandwidth provided by MUNC is enough to sustain my downloading and uploading of academic works.	90	2.3	1.0	High	.9
I own (tablets/Smart phone/Laptop) that I use to access the internet compared to using university computer machines.	90	1.9	.9	Low	.7
I prefer using my own devices (Laptops/Smart Phones) due to portability and also content storage and access within MUNC.	90	1.8	1.0	Low	.9
There is need to regulate bandwidth within MUNC to allow maximum usage and reduce fluctuation during use by users.	90	1.7	.9	Low	.7
	Average (listwise)	2.3	.9		

Source: Field Data 2017

The respondents generally agreed that ICT Infrastructure played a big role in determining the Optimization of Internet usage through considering: Most of the courses are conducted via computer laboratories compared to normal classroom (M=2.8, SD: 0.9), MUNC got 4

laboratories that serve the students who don't own computer devices (M=2.6, SD=1.0), MUNC has 10 WiFi access points that satisfy need of students who use owned portable devices (laptops) (M=2.5, SD=1.0), WiFi/LAN access points within MUNC is available for students to use during educational research fully without much interruption for deciding which is favorite and efficient (M=2.5, SD=1.1), Approximate of 350 available Computer devices at MUNC serve the students fraternity expectation in educational works (M=2.3, SD=0.9), Bandwidth provided by MUNC is enough to sustain downloading and uploading of students' academic works (M=2.3, SD=1.0), students who own (tablets/Smart phone/Laptop) can use them to access the internet compared to using university computer machines (M=1.9, SD=0.9), They prefer using their own devices (Laptops/Smart Phones) due to portability and also content storage and access within MUNC (M=1.8, SD=1.0) and There was need to regulate bandwidth within MUNC to allow maximum usage and reduce fluctuation during use by users (M=1.7, SD=0.9). Most of the respondents rated ICT Infrastructure highly as per the calculated average mean which were greater amongst the listed means hence it marks as a major factor in Optimization of Internet Usage. This was characterized with highly ranked means (4) of (2.8, 2.6, 2.5, 2.5 and 2.3) compared to lowly ranked means (3) of (1.9, 1.8 and 0.9) to the average mean of (2.0).

4.5 Literacy Level

Also this study was interested in understanding if Literacy Level amongst Users can influence the Optimization of Internet Usage, respondents were asked to rate specific statements relating to Literacy Level using a Likert scale of 1-4(SA-SD). The results are summarized in table 4.3.

Table 4.3: Literacy Level

LITERACY LEVEL					
Indicators	**N**	**Mean**	**Std. Deviation**	**Rank**	**Variance**
I learnt about internet and its services of MUNC from friends and colleagues with regular trainings with them.	90	2.4	1.0	High	1.0
I access the internet more than 3hours daily for academic purposes while at MUNC.	90	2.2	1.0	High	1.0
I use the available online services (E-learning/Student Mail) within the MUNC systems on a daily/weekly basis for classwork	90	2.2	1.0	High	1.0
I regularly use internet for academic purposes and related studies while at MUNC.	90	1.8	.8	Low	.7
Am good at evaluating relevant academic websites necessary for classwork and research.	90	1.8	.7	Low	.5
I am aware of searching techniques used in searching information online through self-taught.	90	1.7	.7	Low	.5
I consider myself efficient in using Search Engines and Online Academic Databases while using Internet.	90	1.6	.7	Low	.4
	Average (listwise)	2.0	.8		

Source: Field Data 2017

The respondents generally agreed that Literacy Level played a big role in determining the Optimization of Internet usage through considering: They learnt about internet and its services of MUNC from friends and colleagues with regular trainings with them (M=2.4, SD=1.0), They access the internet more than 3hours daily for academic purposes while at MUNC (M=2.2, SD=1.0), They use the available online services (E-learning/Student Mail) within the MUNC systems on a daily/weekly basis for classwork (M=2.2, SD=1.0), They regularly use internet for academic purposes and related studies while at MUNC (M=1.8, SD=0.8), They good at evaluating relevant academic websites necessary for classwork and research (M=1.8, SD=0.7), They are aware of searching techniques used in searching information online through self-taught.

(M=1.7, SD=0.7) and they consider themselves efficient in using Search Engines and Online Academic Databases while using Internet (M=1.6, SD=0.7). Most of the respondents rated Literacy Level to be average as per calculated average which is agreeable as per the listed mean but marks as a factor in Optimization of Internet Usage. This was characterized with highly ranked means (3) of (2.4, 2.2, and 2.2) compared to lowly ranked means (4) of (1.8, 1.8, 1.7, and 1.6) to the average mean of (2.0).

4.6 Accessibility

Also this study was interested in understanding if Accessibility can influence the Optimization of Internet Usage, respondents were asked to rate specific statements relating to Accessibility using a Likert scale of 1-4(SA-SD). The results are summarized in table 4.4.

The respondents generally agreed that Accessibility played a big role in determining the Optimization of Internet usage through considering: ICT department has initiated different awareness sessions on various services within MUNC and its benefiting them as user (M=2.4, SD=1.0), MUNC has provided adequate E-resources (E-journals/E-books) via its website for them as users (M=2.4, SD=1.0), Most of the frequently used online databases/resources are subscribed with MUNC hence maximum use of E-resources (M=2.3, SD=0.9), They are aware of the online services (E-learning/Student Mail) through notice boards and university lecturer referrals (M= 2.2, SD=0.9), They do school work via internet through softcopy editing and backing it up via print material as a backup at MUNC (M=2.0, SD=1.0), For their school information needs, they prefer internet based materials more than print materials (M=1.8, SD=0.8),Daily use of Internet has increased their education skills and links by initiating

subscription to more academic sites and updates (M=1.7, SD=0.8) and Regular use of Internet has increased their computer and internet skills while doing their school work (M=1.6, SD=0.7)

Table 4.4: Accessibility

ACCESSIBILITY					
Indicators	**N**	**Mean**	**Std. Deviation**	**Rank**	**Variance**
ICT department has initiated different awareness sessions on various services within MUNC and its benefiting me as a user.	90	2.4	1.0	High	1.0
MUNC has provided adequate E-resources (E-journals/E-books) via its website for students use.	90	2.4	1.0	High	1.0
Most of the frequently used online databases/resources are subscribed with MUNC hence maximum use of E-resources.	90	2.3	.9	High	.8
I am aware of the online services (E-learning/Student Mail) through notice boards and university lecturer referrals.	90	2.2	.9	High	.9
I do my school work via internet through softcopy editing and backing it up via print material as a backup at MUNC.	90	2.0	1.0	Low	1.0
For my school information needs, I prefer internet based materials more than print materials.	90	1.8	.8	Low	.7
Daily use of Internet has increased my education skills and links by initiating subscription to more academic sites and updates.	90	1.7	.8	Low	.7
Regular use of Internet has increased my computer and internet skills while doing my school work.	90	1.6	.7	Low	.5
Average (listwise)		2.1	.9		

Source: Field Data 2017

Most of the respondents rated ICT Infrastructure to be average as per the calculated average mean which was average amongst the listed means hence it marks as a major factor in Optimization of Internet Usage. This was characterized with highly ranked means (4) of (2.4, 2.4, 2.3 and 2.2) compared to lowly ranked means (4) of (2.0, 1.8, 1.7, and 1.6) to the average mean of (2.0).

4.7 Optimization of Internet Usage

As the study was interested in understanding factors that influence Optimization of Internet Usage, respondents were asked to rate specific statements relating to Optimization Of Usage using a Likert scale of 1-4(SA-SD). The results are summarized in table 4.5.

The respondents generally agreed that Optimization of Internet usage was necessary and the results summarized via table 4.5.

The respondents responses generally agreed with the following: That's MUNC had established Online Collaborations (14) with Academic Institutions linkages (M=2.3, SD=1.0), They use E-learning portal available for school work and presentation as required by lectures and course tutor (M=2.2, SD=0.9), MUNC E-learning portal is easy to use and access as a student (M=2.2, SD=1.0), MUNC has provided enough information/data for downloading at the online sources for academic purposes (M=2.1, SD=0.9), MUNC intranet and portals offers more educational content hence enriching my browsing space in line with education (M=2.1, SD=0.9), Most of my communication/messaging via available platforms revolves around academic purposes compared to other works (M=1.9, SD=0.8), Most of their Downloads/Uploads are linked to educational works (M=1.9, SD=0.8), They make use of the online collaborations to enhance their academics and establishing more linkages (M=1.8, SD=0.9), As users, they use the available internet presence in browsing educational content regularly (M=1.7, SD=0.8) and Most of their searching and retrievals within the network are academic based unlike other non-academic purposes (M=1.7, SD=0.7).

Table 4.5: Optimization of internet Usage

OPTIMIZATION OF INTERNET USAGE					
Indicators	**N**	**Mean**	**Std. Deviation**	**Rank**	**Variance**
MUNC has established a good number of Online Collaborations with Academic Institutions linkages.	90	2.3	1.0	High	.9
I use E-learning portal available for school work and presentation as required by lectures and course tutor	90	2.2	.9	High	.8
MUNC E-learning portal is easy to use and access as a student.	90	2.2	1.0	High	1.1
MUNC has provided enough information/data for downloading at the online sources for academic purposes.	90	2.1	1.0	High	1.0
MUNC intranet and portals offers more educational content hence enriching my browsing space in line with education.	90	2.1	.9	High	.9
Most of my communication/messaging via available platforms revolves around academic purposes compared to other works	90	1.9	.8	Low	.7
Most of my Downloads/Uploads are linked to educational works.	90	1.9	.8	Low	.6
I am making use of the online collaborations to enhance my academics and establishing more linkages.	90	1.8	.9	Low	.7
As a user, I use the available internet presence in browsing educational content regularly.	90	1.7	.8	Low	.6
Most of my searching and retrievals within the network is academic based unlike other non-academic purposes.	90	1.7	.7	Low	.54
	Average (listwise)	2.00	.9		

Source: Field Data 2017

Most of the respondents rated Optimization of Internet Usage highly achievable as per the listed means. This was characterized with highly ranked means (5) of (2.3, 2.2, 2.2, 2.1 and 2.1) compared to lowly ranked means (5) of (1.9, 1.9, 1.8, 1.7 and 1.7) to the average mean of (2.0) which predicted its attainability.

4.8 Optimization of Internet Usage Factors measures

Descriptive statistics of the Optimization of Internet Usage indicators are presented in Table 4.6 below.

Table 4.6: Descriptive Statistics of All Factors

Descriptive Statistics of all Factors					
Variable	Rank	Minimum	Maximum	Mean	Std. Deviation
ICT Infrastructure	High	.90	3.00	2.04	.49
Accessibility	Moderate	.80	2.80	1.65	.45
Literacy Level	Low	.70	2.50	1.38	.36

Source: Research Data 2017

The result shows that the ICT Infrastructure had the lowest value of 0.90 and highest value of 3.00 for Optimization of Internet Usage while having a mean of 2.04 and Standard deviation of 0.49 hence being ranked as the high achievable factor. Regarding Accessibility had the lowest value of 0.80 and highest value of 2.80 while having a mean of 1.65 and Standard deviation of 0.45 hence being ranked as the moderate achievable factor. Finally Literacy Level had the lowest value of 0.70 and highest value of 2.50 while a mean of 1.38 and Standard deviation of 0.36 hence it is being ranked as the low achievable factor.

4.9 Reliability Test

The researcher also used the Cronbach's alpha which is the most common measure of internal consistency, that is, ***Reliability.*** It is most commonly used when you have multiple Likert questions in a survey/questionnaire that form a scale and you wish to determine if the scale is reliable. The value of Cronbach's Alpha test is 0.854, 0.745 and 0.710 for ICT Infrastructure,

Literacy level and Accessibility respectively. These imply a high level of internal consistency for our scale with this specific sample.

Table 4.7: Cronbach Analysis

Reliability Statistics for :		
	Cronbach's Alpha	N of Items
ICT Infrastructure	.854	10
Literacy Level	.745	9
Accessibility	.710	7
Optimization I.U.	.770	8

Source: Field Data 2017

4.10 Intervening Variable Analysis with other Variables

Correlation analysis was done for all variables with intervening variables against them as hwon at the table 4.8.

Gender proved to be positively correlated with most variable values (OIU=0.826, ICTI=0.071, LL=0.104 and A=0.142) while Experience was also proved to positively correlated with most variables values (OIU=0.185, ICTI=0.011, LL=(-)0.098 and A=0.021) but Age proved to be negatively correlated with most values hence it was less correlated with most variables values (OIU=(-)0.62, ICTI=(-)0.071, LL=0.032 and A=(-) 0.103) hence it was not considered at the final model as a factor at the Intervening Variable.

Table 4.8: Intervening Variables Analysis

Correlation of Variables with Intervening Variables				
Intervening		Gender	Age Bracket	Experience
Optimization of Internet Usage	Pearson Correlation	.086	-.062	.185
	Sig. (2-tailed)	.422	.562	.081
ICT Infrastructure	Pearson Correlation	.071	-.071	.011
	Sig. (2-tailed)	.509	.507	.919
Literacy Level	Pearson Correlation	.104	.032	-.098
	Sig. (2-tailed)	.330	.764	.357
Accessibility	Pearson Correlation	.142	-.103	.021
	Sig. (2-tailed)	.183	.334	.844
	N	90	90	90

Source: Field Data 2017

4.11 Factor Analysis for All Variables

4.11.1 Accessibility Factor Analysis

As the study was interested in understanding factors that influence Optimization of Internet Usage with a view of developing a model for Optimization of the Internet; questions were clustered as per the variable indicators via questionnaire. Factor analysis of Accessibility has factored questions and derived reliability test for each to form a derived factor for a final model development. The results are summarized in table 4.8.

Rotated component matrix below has factored accessibility variable into two derived factor named: (1) Internet Based Accessibility and (2) Online Service/E-Resource Based Accessibility

with reliability Cronbach of (.729) and (.755) respective that was a summarized version of component factor of each factor. For the final model the accessibility will now be classified with two indicators from the derived factor that is either; (1) User based or (2) Institution based towards factor based Optimization of Internet Usage.

Table 4.9 Factor based derived for Accessibility

Rotated Component Matrixa for Accessibility					
	Component Factor		Factor Based	Realiability	Derived Factor
	1	2	OIU	Cronbanch	
For my school information needs, I prefer internet based materials more than print materials.	.774		UB	.729	Internet Based Accessibility
I do my school work via internet through softcopy editing and backing it up via print material as a backup at MUNC.	.729		UB	.729	
Daily use of Internet has increased my education skills and links by initiating subscription to more academic sites and updates.	.728		UB	.729	
Regular use of Internet has increased my computer and internet skills while doing my school work.	.668		UB	.729	
MUNC has provided adequate E-resources (E-journals/E-books) via its website for students use.		.836	IB	.755	Online Service/E-Resources Based Accessibility
ICT department has initiated different awareness sessions on various services within MUNC and its benefiting me as a user.		.820	IB	.755	
Most of the frequently used online databases/resources are subscribed with MUNC hence maximum use of E-resources.		.754	IB	.755	
I am aware of the online services (E-learning/Student Mail) through notice boards and university lecturer referrals.		.516	IB	.755	

 Source: Field Data 2017

4.11.2 ICT Infrastructure Factor Analysis

As the study was interested in understanding factors that influence Optimization of Internet Usage with a view of developing a model for Optimization of the Internet; questions were clustered as per the variable indicators via questionnaire. Factor analysis of ICT Infrastructure has factored questions and derived reliability test for each to form a derived factor for a final model development. The results are summarized in table 4.9.

Table 4.10 Factor based derived for ICT Infrastructure

Rotated Component Matrixa for ICT Infrastructure						
	Component Factor			Factor Based	Realiability	Derived Factor
	1	2	3	OIU	Cronbanch	
Bandwidth provided by MUNC is enough to sustain my downloading and uploading of	.836			IB	.826	Campus Laboratories, Connections and Computer Machines
MUNC got a good number of Computer Laboratories to serve the students who don't own computer devices.	.819			IB	.826	
Available Computer devices at MUNC serve the students fraternity expectation in educational works.	.755			IB	.826	
WiFi/LAN access within MUNC is available for students to use during educational research fully without much interruption.	.736			IB	.826	
MUNC has a good number of WiFi access points to satisfy need of students who use owned portable devices(laptops).	.674			IB	.826	
Most of the courses are conducted via computer laboratories compared to normal classroom.	.523			IB	.826	
I own (tablets/Smart phone/Laptop) that I use to access the internet compared to using university computer machines.		.840		UB	.556	User-owned Devices
I prefer using my own devices (Laptops/Smart Phones) due to portability and also content storage and access within MUNC.		.783		UB	.556	
There is need to regulate bandwidth within MUNC to allow maximum usage and reduce fluctuation during use by users.			.883	IB	.821	Bandwidth Regulation

Source: Field Data 2017

Rotated component matrix above has factored ICT Infrastructure variable into three derived factor named: (1) Campus Laboratories, connections and computer machines, (2) User-owned devices and (3) Bandwidth regulation with reliability Cronbach of (.826), (.556) and (.755) respectively that was a summarized version of component factor of each factor. For the final model the ICT Infrastructure will now be classified with three indicators from the derived factor that is either; (1) User based or (2) Institution based towards factor based Optimization of Internet Usage.

4.11.3 Literacy Level factor Analysis

As the study was interested in understanding factors that influence Optimization of Internet Usage with a view of developing a model for Optimization of the Internet; questions were clustered as per the variable indicators via questionnaire. Factor analysis of Literacy level has factored questions and derived reliability test for each to form a derived factor for a final model development. The results are summarized in table 4.10.

Table 4.11 Factor based derived for Literacy Level

	Component Factor		Factor Based	Realiability	Derived Factor
Rotated Component Matrixa for Literacy Level					
	1	2	OIU	Cronbanch	
I learnt about internet and its services of MUNC from friends and colleagues with regular trainings with them.	.544		UB	.646	Self-Taught Literacy Acquisition
Am good at evaluating relevant academic websites necessary for classwork and research.	.711		UB	.646	
I consider myself efficient in using Search Engines and Online Academic Databases while using Internet.	.783		UB	.646	
I regularly use internet for academic purposes and related studies while at MUNC.	.475		UB	.646	
I am aware of searching techniques used in searching information online through self-taught.	.684		UB	.646	
I access the internet more than 3hours daily for academic purposes while at MUNC.		.827	IB	.731	Online/Internet Literacy Acquisition
I use the available online services (E-learning/Student Mail) within the MUNC systems on a daily/weekly basis for classwork		.822	IB	.731	

Source: Field Data 2017

Rotated component matrix above has factored Literacy Level variable into two derived factor named: (1) Self-taught literacy acquisition and (2) Online/Internet literacy acquisition with reliability Cronbach of (.646) and (.731) respectively that was a summarized version of component factor of each factor. For the final model the Literacy level will now be classified with two indicators from the derived factor that is either; (1) User based or (2) Institution based towards factor based Optimization of Internet Usage.

4.11.4 Optimization of Internet Usage factor analysis

As the study was interested in understanding factors that influence Optimization of Internet Usage with a view of developing a model for Optimization of the Internet; questions were clustered as per the variable indicators via questionnaire. Factor analysis of Optimization of Internet Usage has factored questions and derived reliability test for each to form a derived factor for a final model development. The results are summarized in table 4.11.

Table 4.12 Factor based derived for Optimization of Internet Usage

Rotated Component Matrixa for Optimization of Internet Usage					
	Component Factor		Factor Based	Realiability	Derived Factor
	1	2	OIU	Cronbanch	
MUNC E-learning portal is easy to use and access as a student.	.837		IB	.825	Online Services and Data
MUNC intranet and portals offers more educational content hence enriching my browsing space in line with education.	.818		IB	.825	
MUNC has established a good number of Online Collaborations with Academic Institutions linkages.	.666		IB	.825	
I use E-learning portal available for school work and presentation as required by lectures and course tutor	.648		IB	.825	
MUNC has provided enough information/data for downloading at the online sources for academic purposes.	.590		IB	.825	
I am making use of the online collaborations to enhance my academics and establishing more linkages.	.521		IB	.825	
Most of my Downloads/Uploads are linked to educational works.		.812	UB	.762	User Data and Information Uploads/Downloads
As a user, I use the available internet presence in browsing educational content regularly.		.757	UB	.762	
Most of my communication/messaging via available platforms revolves around academic purposes compared to other works		.688	UB	.762	
Most of my searching and retrievals within the network is academic based unlike other non-academic purposes.		.668	UB	.762	

Source: Field Data 2017

Rotated component matrix above has factored Optimization of Internet Usage variable into two derived factor named: (1) Online services and Data and (2) User Data and Information uploads/downloads with reliability Cronbach of (.825) and (.762) respectively that was a

summarized version of component factor of each factor. For the final model the Optimization of Internet Usage will now be classified with two indicators from the derived factor that is either; (1) User based or (2) Institution based towards its output for the study.

4.12 Correlation Analysis

Before running the model the researcher conducted some diagnostic tests in order to see whether there is any violation of the classical linear regression assumptions. The researcher conducted a test of Multicollinearity using the Pearson Correlation test and the results are presented in table 4.12.

Table 4.13: Correlation Analysis

Correlations Co-efficients					
		ICT Infrastructure	Literacy Level	Accessibility	Optimization of Internet Usage
ICT Infrastructure	Pearson Correlation	1			
	Sig. (2-tailed)				
	N	90			
Literacy Level	Pearson Correlation	.476	1		
	Sig. (2-tailed)	.000			
	N	90	90		
Accessibility	Pearson Correlation	.629	.673	1	
	Sig. (2-tailed)	.000	.000		
	N	90	90	90	
Optimization of Internet Usage	Pearson Correlation	.716	.534	.704	1
	Sig. (2-tailed)	.000	.000	.000	
	N	90	90	90	90

Source: Field Data 2017   NB: *: Correlation is significant at the 0.05 level (2-tailed)

The results shows that there is a positive correlate on between ICT Infrastructure and Optimization of Internet usage (N=90, r=0.716, p=0.000), positive correlation between Accessibility and Optimization of Internet usage (N=90, r=0.704, p=0.000) and another positive correlation between Literacy level and Optimization of Internet usage (N=90, r=0.534, p=0.000).

It is evident that all the independents variables did not have the correlation coefficient of more than 0.8 implying that there is no severe Multicollinearity. Severe Multicollinearity occurs if the correlation coefficient is greater than 0.8 and that violates the assumptions of classical linear regression.

4.13 Regression Analysis

To establish whether Accessibility, ICT Infrastructure and Literacy Level can influence the Optimization of Internet Usage among Kenyan Universities, ordinary Least Square method was used. The results of the multiple regression analysis are shown in the Tables 4.13, 4.14 and 4.15.

4.13.1 The Multiple Coefficient of Determination R^2

The coefficient of determination is a measure of linear relationship. R^2 is a statistical term saying how good one term is at predicting another. If R^2 is 1.0 then given the value of one term, you can perfectly predict the value of another term. If R^2 is 0.0, then knowing one term does not help to know the other term at all. More generally, a higher value of R-Square means that you can better predict one term from another.

The rule of thumb is that, usually an R square of more than 50% is considered as better. In this study R squared was found to be 0.622 implying that cumulatively the independent variables in this study account for 62.2% of Optimization of Internet Usage. This is an indication that there

are other factors that influence the dependent variable that are not included in the model while in this study, the researcher was focusing on the optimization factors specifically on literacy level, ICT Infrastructure and accessibility. The results are shown in table 4.9 below.

Table 4.14: Model Summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.789	.622	.609	.3910
Predictors: (Constant), Accessibility, Literacy Level, ICT Infrastructure				

Source: Research Data 2017

4.13.2 ANOVA Interpretation

ANOVA table shows that the sum of squares of the regression is 19.067 at 3 degrees of freedom and a mean square of 6.356. The residual sum of squares is 11.583 with 86 degrees of freedom and mean square value of 0.135. The Total sum of squares is 30.650 with 89 degrees of freedom. The test for the joint significant which is given by the F statistic is 47.189 and as observed in a table below, it is statistically significant at 0.01level of significance. This implies that the independent variables, that is, Literacy level, ICT Infrastructure and Accessibility significantly influence the Optimization of Internet Usage among Kenyan Universities.

Table 4.17: ANOVA Table

Model	Sum of Squares	df	Mean Square	F	Sig.
ANOVA Table					
Regression	19.067	3	6.356	47.189	.000
Residual	11.583	86	.135		
Total	30.650	89			
a: Predictors: (Constant), ICT Infrastructure,Literacy Level,Accessibility					
b: Dependent Variable: Optimization of Internet Usgae					

Source: Field Data 2017

4.13.3 Regression Coefficients

Regression coefficients for (Optimization Model) shown in table 4.15 where the dependent variable is the Optimization of Internet Usage among Kenyan Universities. The column headed 'B' shows unstandardized regression coefficients for the equation.

Table 4.16: Coefficients Table for Dependent Variable is the Optimization of Internet Usage

Optimization Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-.059	.186		-.319	.750
ICT Infrastructure	.535	.103	.446	5.212	.000
Literacy Level	.110	.145	.068	.756	.452
Accessibility	.493	.133	.378	3.708	.000

(*) denotes significant at 0.05 significance level.   **Source: Research Data 2017**

Then the equation may now be constructed as follows:

OIU($_i$)= (-)0.059+0.535ICTI($_i$)+0.110LL($_i$)+0.493A($_i$)+ e($_i$)………………………..Equation

Where:

OIU : denotes the *Optimization of Internet Usage*

ICTI : denotes *ICT Infrastructure*

LL : denotes *Literacy Level*

A : denotes *Accessibility*

e($_i$) : denotes *Error*

From the table 4.15, the researcher regressed the literacy level, ICT Infrastructure and accessibility to determine the influence on Optimization of Internet Usage as a dependent variable (see in Table 4.15).

From the coefficient table above holding all other independent variable constant every unit change on ICT Infrastructure shall increase Optimization of internet usage by 0.535, while accessibility shall increase Optimization of internet usage by 0.493 and literacy level shall increase Optimization of internet usage by 0.110.

This is explained by the fact that ICT Infrastructure plays a major role in Optimization of Internet Usage as it is the conduit for internet and hence maximum implementation or utilization will directly impact the optimization and inverse is true.

This also could be explained by the fact that Accessibility plays a major role in Optimization of Internet Usage as it is the access to the conduit for internet and hence availability of services will directly impact the optimization and inverse is true.

Moreover, it can be explained by the fact that Literacy Level plays a major role in Optimization of Internet Usage as it is the educative level measure among users as it is the driver of other factors in optimization.

4.14 Discussion of the Findings

This study has achieved to develop an Optimization model after conducting a successful data analysis from the collected data and with the help of factor analysis attribute it has narrowed down the indicators to factors that are linked to the optimization of the internet at Kenyan Public University. Reliability of the derived factors has established an achievable model for implementation at Kenyan Public Universities and its classification of either Institution Based or User Based from other indicators with moderating indicators of User factors as shown below.
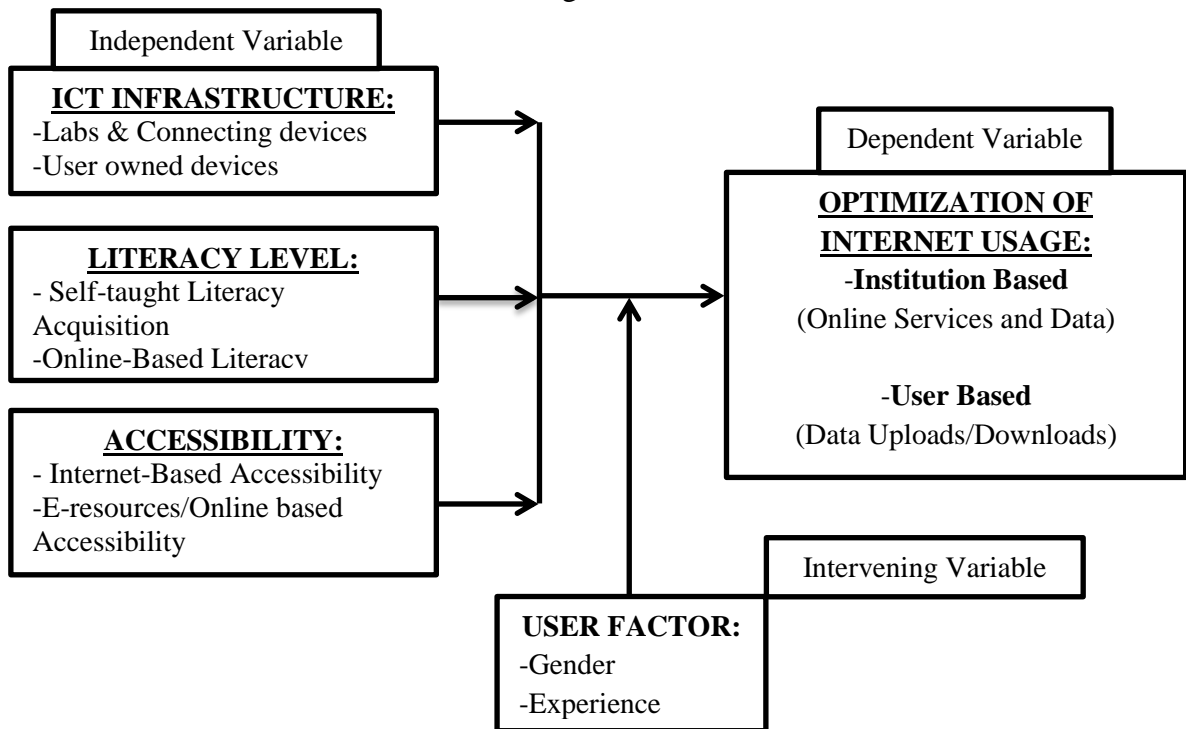

Figure 4.4: A developed Optimization Model after factor analysis of the indicators to a fine model.

Literacy Level has derived two factors namely; Self-taught literacy acquisition and Online-based literacy acquisition that is now classified as User based and Institution based on Optimization of Internet Usage; Accessibility has derived similarly two factors namely; Internet based accessibility and Online/E-resource based accessibility that is now classified as User based and Institution based on Optimization of Internet Usage and ICT Infrastructure has derived three factors namely; Campus Laboratories, Connections and Computer Machines, User-owned Devices and Bandwidth Regulation. All the above will now be a basis in determining indicators that will be achieved if Optimization of Internet Usage is to be guaranteed and which has been categorized under two major factors; User based and Institution based because it all depends on the Users (students and staffs) and the provision of connectivity and devices by the institution which is a necessity as per the Kenyan Universities Policies and Acts.

Moderating factors for achievement of Optimization of Internet Usage are still the same User factors namely; Age, Gender and Experience as they cut across both major factors and determine the reliability of both during its optimization process.

Evidence from other scholarly works (Okello-obura and Magara 2008; Talja and Maula 2003; Parameshwar and Patil 2009) there were a number of challenges that students face when using Internet. They cited lack of access, inadequacy of IT resources, lack of Internet skills, low connectivity speed, few computer laboratories and including lack of consistent technical support. This is not different from the situation in most Kenyan universities in regards to internet usage as per the carried study. However, the degree of presented factors has shown some influence in optimization of internet usage keeping other factors constant. In this study a theoretical framework has been empirically tested identifying relationship between accessibility, ICT

Infrastructure and literacy level and optimization of internet usage. Findings have revealed that there is a positive relationship between optimization of internet usage with a cumulative 62.2 percent from independent variables; accessibility, literacy level and ICT Infrastructure among Kenyan Public Universities

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This section of the study summarizes the findings, draws conclusions and also gives recommendations based on the findings of the study.

5.2 Summary of the Findings

Based on each objective of the study, it was possible to draw a summary of the findings from the data obtained accordingly. The study managed to establish the influence of accessibility, literacy and ICT Infrastructure as factors influencing optimization of internet usage.

It was evident that ICT Infrastructure as a factor in optimization of internet usage was agreeable with majority of the respondents (M=2.3, SD=0.9) and ranking it as highly rated factor. Moreover, the regression analysis result has shown that ICT Infrastructure have influence on optimization of internet usage since its coefficient parameters are statistically supportive (Co-efficient= 0.716).

Literacy level as a factor in optimization of internet usage was also agreeable with majority of the respondents (M=2.0, SD=0.8) and ranking it as lowly rated factor. Adding to that fact, regression analysis results has shown that Literacy level have influence on optimization of internet usage since its coefficient parameters are statistically supportive Co-efficient= 0.534).

Also it was evidently shown that accessibility as a factor of optimization of internet usage was also agreeable with majority of the respondents (M=2.1, SD=0.9) and ranking it as moderately rated factor. Moreover, the regression analysis result has shown that accessibility have influence

on optimization of usage since its coefficient parameters are statistically supportive (Co-efficient= 0.704).

5.3 Conclusion

This study reported on influence of literacy level, accessibility and ICT Infrastructure on optimization of internet usage among Kenyan Public Universities. From the findings of the study, it is evident that all Kenyan Public Universities need to optimize internet usage as currently constituted while keeping all other factors constant the studied factors contribute cumulatively to this attainment with 62.2 percent hence it is listed a moderating factors.

ICT Infrastructure has shown a high ranking in establishing the influence of optimization of internet usage because it is conduit for internet and its implementation is core followed by Accessibility that has shown a moderate ranking in establishing the influence of optimization of internet usage likewise to literacy level which counts as the measure of level of understanding the education level of users and ability to understand the various parameters that is involved in internet usage.

As has been seen above, it is very critical to note that the influence of ICT Infrastructure, accessibility and literacy level have shown attainability of optimization if the said factors are fully considered across board. If implementation of said factors is implemented by various Kenyan Universities then optimization of the internet usage is achievable through close monitoring.

Moreover, most of the respondents who participated at this study agreed with the fact that age can influence the usage of internet in relation to academic purposes from the balanced gender proportion. Also noting that frequent use of ICT's implying any machine or equipment that can access internet directly influence the usage of internet.

5.4 Recommendations

The following are the recommendations emanating from the findings of this study: Since technological advancement is aggressively and continuously adopted in Kenya and its medium of transfer is Internet, the government should provide incentives for research and development to researchers who would continue to invest their time and skills in discovering more educative skills and factors that can improve optimization of internet usage among Kenyan Universities. It is recommended that the government also pursues a strategy to provide incentives for technology transfer from more developed economies in order to promote the adoption of world class innovations in education such as E-learning systems et.al.- this will boost prosperity in the education in Kenya in future while enriching the environment.

Professionals in the education sector should invest their time, effort and resources towards innovations that are relevant and compatible to their educative services. In Kenya there are most students who aren't aware of the benefits of internet in education but there is need for literacy advancement with the help of professionals. More interactivity to mobile phones and internet have been found to have a major influence in delivery technology driven purposes and if education sector can tap such idea and convert most of the services to mobile version for ease of portability, this can be summed up through support in delivery platforms.

5.5 Suggestions for Further Research

Since optimization of internet usage is still a relatively new phenomenon with few studies on it, the researcher recommends that further and extended research be carried out in finding more about staffs and different schools on levels of optimization of internet among Kenyan Public Universities and get other pending factors.

More so, this study did not include feedbacks from teaching staffs and other non-teaching staffs and further study is recommended to include services from KENET on analysis of Bandwidth among different universities to ascertain the true fact of consumption and also records of services running via internet and its penetration can form another side of the study. This is attributed to the attained high penetration of internet in Kenya but no certain scale of literacy levels has been gauged to have fine results on the same.

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Appendix II: Cover Letter

KIPRONO BRIAN

KCA UNIVERSITY,

P.O.BOX 49.

NAIROBI.

KENYA.

11/10/2017

Dear Respondent,

I am a graduate student at KCA University, carrying out a research on ***Optimization of Internet Usage among Kenyan Public Universities: A case study of Moi University Nairobi Campus***. This is in partial fulfillment of the requirement of the Master of Science in Information Systems Management at KCA University.

You have been randomly selected among many to participate in this study. It is estimated that it will take less than ten (15) minutes of your time to complete the questionnaire. Please respond as honestly and objectively as possible. Your participation is very essential for the accomplishment of this study and it will be highly appreciated. I guarantee that the information that you will provide will be treated with the utmost confidentiality and will be used only for academic purposes.

Thank you.

Yours faithfully,

Kiprono Brian

Appendix III: Questionnaire

Note: This is an academic exercise and all information provided by the respondents in the questionnaire will be treated with at most high level of confidentiality. **MUNC**- Means Moi University Nairobi Campus

SECTION A: Optimization of Internet Usage

To what extent do you agree with the following statements regarding optimization of Internet Usage? Use a scale of 1 – 4 where (1-Strongly agree and 4-Strongly Disagree)

	SA	A	D	SD
	1	2	3	4
MUNC has provided enough information/data for downloading at the online sources for academic purposes.				
MUNC has established a good number of Online Collaborations with Academic Institutions linkages.				
As a user, I use the available internet presence in browsing educational content regularly.				
Most of my communication/messaging via available platforms revolves around academic purposes compared to other works				
I use E-learning portal available for school work and presentation as required by lectures and course tutor				
Most of my searching and retrievals within the network is academic based unlike other non-academic purposes.				
Most of my Downloads/Uploads are linked to educational works.				
I am making use of the online collaborations to enhance my academics and establishing more linkages.				
MUNC intranet and portals offers more educational content hence enriching my browsing space in line with education.				

	SA	A	D	SD
MUNC E-learning portal is easy to use and access as a student.				

SECTION B: ICT Infrastructure

To what extent do you agree with the following statements regarding ICT Infrastructure? Use a scale of 1 – 4 where (1-Strongly agree and 4-Strongly Disagree)

	SA	A	D	SD
	1	2	3	4
Bandwidth provided by MUNC is enough to sustain my downloading and uploading of academic works.				
MUNC got a good number of Computer Laboratories to serve the students who don't own computer devices.				
WiFi/LAN access within MUNC is available for students to use during educational research fully without much interruption.				
I own (tablets/Smart phone/Laptop) that I use to access the internet compared to using university computer machines.				
Available Computer devices at MUNC serve the students fraternity expectation in educational works.				
There is need to regulate bandwidth within MUNC to allow maximum usage and reduce fluctuation during use by users.				
Most of the courses are conducted via computer laboratories compared to normal classroom.				
MUNC has a good number of WiFi access points to satisfy need of students who use owned portable devices(laptops).				
I prefer using my own devices (Laptops/Smart Phones) due to portability and also content storage and access within MUNC.				

SECTION C: Literacy Level

To what extent do you agree with the following statements regarding Literacy Level? Use a scale of 1 – 4 where (1-Strongly agree and 4-Strongly Disagree)

	SA	A	D	SD
	1	2	3	4
I learnt about internet and its services of MUNC from friends and colleagues with regular trainings with them.				
Am good at evaluating relevant academic websites necessary for classwork and research.				
I consider myself efficient in using Search Engines and Online Academic Databases while using Internet.				
I regularly use internet for academic purposes and related studies while at MUNC.				
I am aware of searching techniques used in searching information online through self-taught.				
I access the internet more than 3hours daily for academic purposes while at MUNC.				
I use the available online services (E-learning/Student Mail) within the MUNC systems on a daily/weekly basis for classwork				

SECTION D: Accessibility

To what extent do you agree with the following statements regarding Accessibility? Use a scale of 1 – 4 where (1-Strongly agree and 4-Strongly Disagree)

	SA	A	D	SD
	1	2	3	4

MUNC has provided adequate E-resources (E-journals/E-books) via its website for students use.				
Regular use of Internet has increased my computer and internet skills while doing my school work.				
I am aware of the online services (E-learning/Student Mail) through notice boards and university lecturer referrals.				
For my school information needs, I prefer internet based materials more than print materials.				
Most of the frequently used online databases/resources are subscribed with MUNC hence maximum use of E-resources.				
Daily use of Internet has increased my education skills and links by initiating subscription to more academic sites and updates.				
ICT department has initiated different awareness sessions on various services within MUNC and its benefiting me as a user.				
I do my school work via internet through softcopy editing and backing it up via print material as a backup at MUNC.				

SECTION E: Demographic Information

Kindly answer all the questions either by ticking in the boxes or writing in the spaces provided. Note that the evaluation will be considered incomplete if you do not answer all the questions.

Age Bracket

17–20yrs ( )   21–25yrs ( ) 26–30yrs ( ) 30–35yrs ( ) Over   36yrs   (   )

Do you think Age can influence Usage of Internet for academic purpose?

Yes ( )   No ( )   Not Sure ( )

Gender

Male ( )   Female ( )

Experience

Novice ( )   Intermediate ( )   Advanced ( ) Expert ( )

Can frequent use of ICT's influence Internet usage?

Yes ( )   No ( )   Not Sure ( )

THANK YOU FOR YOUR TIME

Appendix IV: Interview Guide

Note: This is an academic exercise and all information provided by the respondents at the interview will be treated with at most high level of confidentiality. **MUNC**- Means Moi University Nairobi Campus

 SECTION A: Demographic Information

Age Bracket

   1) 25–30yrs ( )   30–35yrs ( )   Over 36yrs ( )

Gender

   2) Male ( )   Female ( )

Experience

   3) Novice ( )   Intermediate ( )   Advanced ( )   Expert ( )

SECTION B: General Questions

   4) What is the ICT Structure at MUNC?

   5) How many staffs serve students Internet needs?

   6) What are the different roles of the ICT staffs within MUNC?

SECTION C: ICT Infrastructure

   7) How many computer laboratories is the department heading?

   8) How many computer devices does the department serve students with?

   9) Do students bring their own devices to access internet?

   10) What is the rate of bandwidth supplied to students?

11) Are all supplied computer devices fully accessing internet?

12) Which Internet Service Provider company supplies Internet to MUNC?

SECTION D: Literacy Levels

13) Do you offer training as a department to students?

14) If trainings are offered, how often does the department do per academic year?

15) Any awareness methods on services you offer at MUNC?

16) How can you rate the level of competency of most students?

17) Are students regularly using the computer devices for school work?

SECTION E: User Satisfaction

18) What kind of resources do you offer students?

19) How relevant are the resources MUNC offering to students?

20) Has presence of Internet and its services improved on academic works?

21) What are the services available and are students aware?

22) Is using Internet considered easy to use or otherwise at MUNC?

SECTION F: Optimization of Internet Usage

23) What are students downloading/uploading while using the Internet?

24) Are online collaborations amongst students of MUNC high or low & why?

25) What are students browsing more between educational or non-educational contents?

26) What are the main messaging and communicating ways used by students at MUNC?

27) How do you rate e-learning implementation at MUNC?

THANK YOU FOR YOUR TIME

Appendix V: Budget

Item Description	Cost (Kshs.)
Proposal writing typing and typesetting	7,000
Flash disk/CDs and other accessories	5,500
Printing 4 draft copies of 50 pages	6,000
External hard drive	6,500
Photocopy & Binding	1,000
Total	26, 000
Data Collection	9,000
2 research assistants	30,000
Transport (fuel)	4,000
Laptop(purchase)	27,000
Total	70,000
Preparation of research findings	
Binding & photocopy	4,000
Report compilation	3,000
Final printing 4 draft copies of 70 pages	6,800
Photocopy & Binding hard cover	8,200
Total	22,000
Miscellaneous	8, 000
Grand Total (Kshs.)	**126, 000**

	Task	Duration in weeks	Planned Completion	June	July	Aug	Sept	Oct	Nov	Nov
1.	Topic approval Preliminary Investigation	4	16/06/2017	■						
2.	Planning the Research Gathering Literature	2	08/07/2017		■					
3.	Preparation of Research Proposal	4	14/07/2017		■					
4.	Feasibility Study Research proposal approval	3	20/08/2017			■				
5.	Collection of data	3	10/09/2017				■			
7.	Presentation of WIP & Analysis of Collected data	4	03/10/2017 05/11/2017					■	■	
8.	Final defense & Presentation	1	15/11/2017							■
9.	Final Report	1	18/11/2017							■

Annex I

Moi University Nairobi Campus Bandwidth Graph showing the Inbound and Outbound