MODELLING E-LEARNING IMPLEMENTATION IN TANZANIAN UNIVERSITIES

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By

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A Thesis submitted in Fulfilment of the Requirements for the Award of the Degree of Doctor of Philosophy of Mzumbe University

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CERTIFICATION

We, the undersigned, certify that we have read and hereby recommend for acceptance, by the Mzumbe University, a thesis entitled **Modelling E-learning Implementation in Tanzanian Universities,** in fulfilment of the requirements for the award of the degree of Doctor of Philosophy of Mzumbe University.

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DECLARATION

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I, **Simeo B. Kisanjara,** declare that this thesis is my own original work and that it has not been presented and will not be presented to any other university for similar or any other degree award.

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The achievement of this thesis is a consequence of numerous individuals who participated by making contribution of their efforts. I am actually aware of their contributions. It is good to declare and acknowledge everyone who contributed to this thesis, but in this part, I will mention some of contributors to present a large group that contributed to the accomplishment of this thesis. First, I would like to express my sincere thanks to my Almighty God who granted me with health to carry out this task up to its accomplishment.

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God bless you all!!

DEDICATION

This thesis is dedicated to my parents Boniphace Kisanjara and Alice Bakari and my family Elias S. Kisanjara, Boniphace S. Kisanjara, Elisie S. Kisanjara, Salome S. Kisanjara and Neema S. Kisanjara I Love you all.

LIST OF ABBREVIATION AND ACRONYMS

AGFI	-	Adjusted Goodness of Fit
AMOS	-	Analysis of Moment Structure
ANOVA	-	Analysis of Variance
CFA	-	Confirmatory Factor Analysis
CFI	-	Comparative Fit Indices
CMIN	-	Chi-square equivalent in Confirmatory Factor Analysis
CR	-	Critical ratio
DF	-	Degree of Freedom
DOI	-	Diffusion of Innovation
DVC	-	Deputy Vice Chancellor
EASSy	-	Eastern Africa Submarine Cable systems
FA	-	Factor Analysis
GFI	-	Goodness of Fit Index
HEIs	-	Higher Education Institutions
HEMP	-	Higher Education Master Plan
ICTs	-	Information and Communication Technology
IFI	-	Incremental Fit Index
IT	-	Information Technology
KMO	-	Keyser –Meyer-Olkin
MoEVT	-	Ministry of Education and Vocational Training
MUST	-	Mbeya University of Science and Technology
NFI	-	Normed Fit Index
NICTBB	-	National ICT Broadband Backbone -
PCOLE	-	Fit Indices in Confirmatory Factor Analysis
PhD	-	Doctor of Philosophy
RFI	-	Relative Fit Index
RMSEA	-	Root Mean Square Error of Approximation
SEACOM	-	Sea Communication
SEM	-	Structural Equation Modelling
SIMs	-	Subscriber Identity Module

SJUT	-	Saint Joseph University of Tanzania
SPSS	-	Statistical Package for Social Sciences
SUA	-	Sokoine University of Agriculture
TAM	-	Technological Acceptance Model
TBC	-	Tanzania Broadcasting Corporation
TCC	-	Tanzania Communication Commission
TCRA	-	Tanzania Communication Regulatory Authority
TCU	-	Tanzania Commission for Universities
TLI	-	Turkey Lewis Index
TPB	-	Theory of Planned Behaviour
TPTC	-	Tanzania Posts and Telecommunication Corporation
TRA	-	Theory of Reasoned Action
TTCL	-	Tanzania Telecommunication Company Limited
TV	-	Television
UDSM	-	University of Dar es salaam
UK	-	United Kingdom
UOI	-	University of Iringa
URT	-	United Republic of Tanzania
USA	-	United State of America
UTAUT	-	Unified Theory of Acceptance and Use of Technology
ZU	-	Zanzibar University

ABSTRACT

Poor implementation of e-learning due to lack of adequate model for improvement is a problem that Tanzanian universities have to endure. This study aimed at developing a model for improving e-learning implementation that would increase its uptake and effectiveness in teaching and learning in Tanzanian Universities. The study ascertained the extent of e-learning uptake, assessed the effectiveness of e-learning in education, determined factors influencing implementation of e-learning, and designed and validated a model for assisting universities improve the implementation of e-learning. The study was guided by diffusion of innovation theory (DOI), the unified theory of acceptance and the use of Technology (UTAUT) and the theory of planned behaviour (TPB). The study used a cross-sectional survey design to enable data collection at one point in time from geographically scattered universities. Intensive literature review helped in formulating testable specific research questions and operationalising variables and constructs. Four hundred (400) respondents including students, academic staff, ICT experts, and staff from the top management participated in the study. The results show that the average uptake of e-learning was as low as 17.15percent among students and academicians and 37.25 percent among ICT experts. The result shows further that e-learning was significantly effective on teaching and learning. The study revealed that technological, user, pedagogical, social and environmental characteristics significantly influence e-learning implementation. The study developed a model and specified interrelationship among the six factors, which were then, validated statistically, and theoretically using Structural Equation Modelling (SEM). The model was found valid and fit to explain the e-learning implementation in universities in Tanzania and in other countries with similar characteristics. Therefore, universities in Tanzania should restructure ICT policy to capture e-learning implementation. Future work should test the model using more than one sample. This study enriches literature in e-learning implementation by showing the influence of other factors such as human (user), social and environmental, which were inadequately addressed in the previous models. The study provides valuable information on the status of e-learning in the Tanzanian universities for making decision in policy reformulation.

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CHAPTER ONE

INTRODUCTION

1.1 Background Information

The changing landscape of higher education is driven by many social, economic, and technological factors including spectacular development of Information and Communication Technology (ICT). The dynamic, diverse, interactive, and ubiquitous nature of ICTs and its transformation power have an impact on what, how, where, and when people learn (Jones, 2011; Sidiquah and Salim, 2017). Greenberg (2005) and Pargaonkar *et al*. (2019) distinguish between old ICT technologies such as landline telephone, television, and radio that provide one-way communication, and the current ICT technologies such as cell phones, computers, the internet, and related digital devices that provide greater interactivity and a wider geographical coverage. However, technological convergences increasingly blur the distinction between the old and the new ICTs to the extent that there is now interactivity among technologies in receiving, processing, storing, and disseminating data and information through various formats such as texts, images, and sound.

The use of ICTs has led to tremendous changes in teaching and learning processes. This in turn, has led to more innovative and improved ways of communicating including sharing of large amount of information and having more revolutionized teaching and learning methods (Rostaminezhad *et al*., 2013; Shutenko *et al*., 2019). Currently, there is no any institution in the educational sector that functions without integrating ICTs applications in its operations. New ways of teaching and learning, the most important one being e-learning, have emerged globally.

E-learning is a broad concept that encompasses a variety of ICT applications and systems that support teaching and learning processes and activities. E-learning is defined differently in various contexts although most of these definitions focus mainly on the way ICTs support and facilitate teaching and learning processes. DeRouin *et al.* (2005) define e-learning as a wide set of applications of ICTs and

processes such as web-based learning, computer-based learning, virtual classrooms, and digital collaboration. According to Ngai *et al.* (2007) and Ryan *et al.* (2016), e-learning utilizes web-based communication, collaboration, multimedia, knowledge transfer, and training to support learners' active learning without time and space barriers. As observed by scholars (e.g. Wang *et al*., 2010, Khamparia and Pandey, 2017), e-learning is the use of computer network technology, primarily through the internet, to deliver information and instructions to learners. Recent definition is provided by Pham and Huynh (2018) and Elfaki *et al.* (2019) who see e-learning as the modern educational technologies that facilitate learning with the help of computer hardware and software applications and a virtual learning environment to deliver text, audio, images, and videos to learners.

Indicators of the presence of e-learning in educational institutions include but not limited to availability of ICT infrastructure and resources (for example, number of computers, servers and e-learning platforms), the frequency of using ICT in teaching and learning, the number of users, and availability of online academic programmes (Khan, 2005; Jirasak, 2014). As Mtebe and Raphael (2018) observe, and rightly so, a university should have ICT infrastructures such as computer hardware, software, internet connectivity, and other related electronic devices in order to implement e-learning. The frequency and pattern of accessing instructor's e-contents by individual students are good indicators of the presence of e-learning platforms and facilities and reflect students' behaviour in using e-learning. As e-learning offers a flexible way of conducting many teaching and learning sessions concurrently, more users engage on using e-learning platforms. Similarly, the number of online curricula programs indicates the presence of e-learning platforms and facilities, which can be used to conduct online courses as distance learning (Shutenko *et al*., 2019).

E-learning cannot take place unless there is a simple rationale element of technology, pedagogy, social, environmental, users, and administration (Sangra and Vlachopoulos, 2011). For instance, availability of ICT infrastructure depends on technological and environmental characteristics. The number of e-learning users and frequency of using e-learning depend on user characteristics. Mainstreaming ICTs in

teaching and learning as well as other online curricula programs depends much on pedagogical characteristics. Generally, these indicators are essential in measuring the level of e-learning implementation collectively.

The link between e-learning and education emanates from the reality that educational technology plays a vital role in improving learning, delivery, and administration of education activities. It is also a reverberation of previous dialogue on the positive links between e-learning and access to education (Eze *et al.,* 2018). In addition, the recognition of the significance of e-learning for education in African universities goes back to historical experience of its effectiveness on education activities in western and Europe countries. There is a widely held view that if many western and Europe countries found e-learning effective in education, there is no doubt that in Africa this technology would assist universities to overcome teaching and learning challenges (Obijiofor, 2009).

There are many challenges in the current teaching and learning systems in developing countries, and these include increased students' enrolment, lack of collaborations in teaching and learning between students and instructors, poor quality in teaching and learning, and lack of convenience of time, place, and flexibility (see Zoroja *et al.,*2015; Gaebel *et al.,* 2018).

In Tanzania for example, teaching and learning systems have encountered challenges such as more activities being performed by instructors instead of students, absence of adequate education budget, insufficient teaching and learning materials, and inadequate qualified teaching staff (Kisanjara *et al*, 2017; Lashayo *et al*, 2018). In the light of these challenges, e-learning is considered as the ultimate solution. For instance, some universities in Tanzania including OUT and UDSM are using customized platforms (e.g. WEBCT, Blackboard, Moodle, Joomla) to facilitate distance learning. In addition, studies (e.g. Mtebe, 2014; Naziabanu *et al.,* 2017) reveal that currently, students' enrolment in Tanzanian universities depends neither on the infrastructure nor on geographical locations. E-learning reduces instructors'

work load where students are engaged in distance learning regardless of geographical location.

Therefore, e-learning offers innovative solutions in addressing the cited challenges in teaching and learning systems and contributes not only to the quality of teaching and learning in higher education, but also to lifelong learning (Bhuasiri *et al.*, 2012; Gaebel *et al.*, 2018). Other studies (e.g. Bhuasiri, 2012[Muries and Masele, 2017) reveal that there are benefits resulting from effective implementation of e-learning ; namely, increased accessibility to information, better content delivery, personalized instruction, content standardization, accountability, on-demand availability, self-pacing, interactivity, confidence and increased convenience. Thus, through virtual learning environment, e-learning supports the collaboration between students and instructors.

It is now evident that e-learning is changing the way in which teaching, learning, and administration of education activities are being conducted in universities of developed countries. For instance, it is estimated that e-learning cuts down instruction time by up to 60 percent (Shah and Barkas, 2018). In the same vein, in the Zhu and Mugenyi (2015) estimation, e-learning consumes 90 percent less work than traditional courses. An IBM report indicates that utilization of e-learning tools and strategies in universities in the UK has increased by up to 65 percent (Guragain, 2016). According to Aftab *et al.* (2019) about 85.6 percent of college students are learning online using e-learning platforms in countries in the East. Thus, e-learning offers flexibility in terms of space and time of delivering or receiving learning materials (Shah and Barkas, 2018).

E-learning has changed the way knowledge and skills have been acquired among students in educational context. As argued by Pappas (2013), e-learning has the power of increasing information retention rate by up to 60 percent. According to Shah and Barkas (2018), e-learning facilitates learning, teaching, research, and library services delivery without having to organize when and where everyone can be physically present. E-learning provides new and innovative means of bringing

educational opportunities to the people of all ages (Zhu and Mugenyi, 2015). Students use e-learning technologies such as the internet, wikis, Weblogs, social bookmarking, social networking sites (Twitter, Facebook, and MySpace) to communicate with their colleagues, and lecturers (Munguatosha *et al*., 2011).

In the context of Africa, a study by Eze *et al.* (2018) indicates that in Uganda e-learning has facilitated the delivery of learning materials by 80 percent as opposed to traditional method. Despite the benefits of e-learning in teaching and learning, the technology is not fully implemented and utilized effectively in developing countries (see Kasse and Balunywa 2013). Thus, there is a need of establishing a mechanism of improving the implementation of e-learning for effective use in developing countries.

1.2 Status of E-learning Implementation in Tanzanian Universities

Although the use of e-leaning is growing in universities and colleges globally, its implementation in Tanzanian universities faces challenges. Scholars (e.g. Kisanga and Ireson, 2015; Tarus and Gichayo, 2015) cite the following as challenges, insufficient funds, inadequate e-learning skills and training, lack of support and commitment from top management, lack of infrastructure, and inadequate mainstreaming of e-learning in teaching and learning systems in universities and colleges in Tanzania. As argued by scholars (see Kisanjara *et al.*, 2017; Makokh and Mutisya, 2016), the implementation of e-learning in Tanzania is problematic. For instance, some universities in Tanzania including Open University of Tanzania (OUT), University of Dar es Salaam (UDSM), Mzumbe and University of Iringa (UoI) are partially implementing e-learning using customized platforms (e.g. WEBCT, Blackboard, Moodle, Joomla) to facilitate distance and campus learning (Lashayo *et al*., 2017; Mtebe and Raphael, 2018).

Furthermore, a study by Mtebe and Raisamo (2014) shows that the level of e-learning implementation at UDSM is 9.68 percent and at OUT it is 12.4 percent (Bhalalusesa *et al.*, 2013; Mtebe and Raphael, 2018). Thus, e-learning

implementation is a phenomenon, which requires immediate attention for improvement in Tanzanian context.

There are also concerns regarding the way e-learning has been implemented in many universities in Tanzania (Kahiigi *et al.*, 2008; Munguatosha *et al*., 2011). For example, according to Bourlova and Bullen (2018) the models for successful implementation of e-learning in Tanzanian universities are inadequate. Despite some considerable research efforts in this area, little has been done to look at e-learning implementation model that fits well in the learning environment of Tanzanian universities (Mtebe & Raphael, 2018; Lashayo *et al*., 2018). For example various studies (e.g. Njenga, 2011; Taha, 2014; Maina and Nzuki, 2015; Tarus and Gichayo, 2015; Oboko and Omwenga, 2017; Ashill, 2018) have applied the models reviewed in Chapter Three in subsection 3.3.4. These studies found that the models totally ignore synergistic influence of other success factors such as the user, social, and the environment in e-learning implementation. Additionally, these studies found that there is a need for the establishment of interrelationship among a set of factors for successful e-learning implementation model, which was not found in the existing models they applied. Thus, implementing e-learning without integrating it with human, pedagogical, socio-cultural, political and environmental factors is likely to make Tanzanian universities use e-learning systems to replicate their traditional practices instead of integrating the technology into their curricula so that teaching and learning are conducted innovatively.

Several progresses have been made to overcome the challenges that face e-learning implementation in Tanzanian universities. As argued by Sife *et al.* (2007) and Kisanjara *et al*. (2017), some of the universities in Tanzania adopted a blended approach for implementing e-learning on an ad-hoc basis. Other universities in Tanzania have started the basic process of ICT infrastructure expansion to include local area network implementation, Internet, computer labs, and other facilities, as a way towards establishing e-learning. Some universities have been implementing e-learning platforms in the form of patches using open sources such as WEBCT, Blackboard, and Moodle (Kisanjara *et al.*, 2017). Realizing the notable challenges of

e-learning implementation and the benefits of e-learning systems, this study is developing a model for improving implementation of e-learning in Tanzanian universities taking into consideration the factors from broader dimensions.

1.3 Problem Statement

The preconditions for effective implementation of e-learning in universities can be summed up as availability of appropriate infrastructure, facilities, and human resource, integration of ICTs into curricula and pedagogy. Other preconditions include; adaptation to appropriate environment and the existence of relevant policies, regulatory frameworks, and social and environment conditions that support ICTs (Sife *et al.*, 2007; Kahiigi *et al*., 2008; Munguatosha *et al*. 2011; Zhu and Mugenyi, 2015; Mtebe and Raphael, 2018). Despite the various initiatives made by the Government of Tanzania and Tanzanian universities of improving ICT infrastructural developments in the country, the implementation of e-learning in universities has continued to be grossly inadequate (Mtebe, 2014; Tarus and Gichayo, 2015; Naziabanu *et al.*, 2017; Dintoe, 2018).

The failures of implementing e-learning technologies have been recorded in a plethora of studies (i.e. Ndume *et al*., 2008; Munguatosha *et al*., 2011; Tossy, 2012; Naziabanu *et al*., 2017). For example, Tanzanian universities including the UDSM and OUT reported the levels of e-learning implementation of only 9.68 and 12.4 percent respectively (Raisamo and Mtebe, 2014; Bhalalusesa *et al.,* 2013). These levels are lower than 98 percent of e-learning implementation (in terms of extent of using of WebCT and VLE) reported in Oxford Brookes University in the UK (Sharpe *et al.,* 2006). Moreover, the failure is also because in practice, some of the universities in Tanzania have ICT policies that do not provide strategies and emphasis on how e-learning can be implemented (Ndume *et. al*, 2008; Zhu and Mugenyi, 2015; Dintoe, 2018).

Among the reasons for ineffective e-learning implementation are, frequent ad-hoc operation of e learning with no adequate model for successful implementation (Zhu and Mugenyi, 2015; Naziabanu *et al.,* 2017; Lashayo *et al.*, 2018). The existing

models and frameworks have mainly focused on technological, institutional, and pedagogical factors with little consideration on human, environmental, and social factors, which are also important. These problems and their associated causes call for the development of a model that addresses the identified challenges in a wide range of dimensions for successful implementation of e-learning in Tanzania (e.g. Kahiigi *et al.* 2008; Rosenblit and Gros, 2011; Mtebe and Raphael, 2018). This study therefore, develops a model for improved implementation of e-learning in Tanzanian universities by considering a wide range of factors in order to increase its uptake and effectiveness in teaching and learning.

1.4 Overall Research Objective

The overall objective of this study is to develop a model for improving implementation of e-learning in Tanzanian Universities and hence increasing its uptake and effectiveness in teaching and learning.

1.4.1 Specific Objectives

i. To ascertain the extent of e-learning uptake in Tanzanian universities
ii. To assess the effectiveness of e-learning in teaching and learning activities in Tanzanian universities.
iii. To determine the factors that influence e-learning implementation in Tanzanian universities.
iv. To design and validate a model for improving implementation of e-learning in Tanzanian universities. create

1.5 Research Questions

i. What is the extent of uptake of e-learning in Tanzanian universities?
ii. What is the effectiveness of e-learning in teaching and learning activities in Tanzanian universities?
iii. What are the factors influencing implementation of e-learning in Tanzanian universities?
iv. How best can e-learning be implemented in Tanzanian universities?

1.6 Operational Definitions of Terms and Key Concepts

For the purpose of this study, the following terms and concepts are defined as follows:

*Information and Communication Technologies (ICTs)**:*** In this study, ICTs refer to electronic devices that facilitate creation, process, storage, management, exchange, and dissemination of information to the intended users. These include computers hardware and software, the Internet, mobile phones, radio, and television (Pargaonkar *et al*., 2019).

E-learning is defined as the application of electronic devices to enhance and support teaching and learning processes (Jones, 2011). In this study, e-learning is defined as the instructional contents or learning experiences which are delivered or enabled by electronic devices and tools (such as computers, tablets, mobile phones, video conferencing, interactive whiteboard and the internet) and learning managements platforms (such as moodle, blackboard, midflash, Mytutor and uLearn).

*E-learning implementation**:*** in this study is defined *as a* process of putting up e-learning platforms and facilities and integrating them into the teaching and learning practices and processes for the actual and continued usage (Roggers, 2003). It is facilitated by availability of ICT infrastructure, electronic contents, readiness of users and management support, and availability of online programmes, among other factors.

E-learning Uptake: refers to the acceptance and actual use of e-learning facilities and platforms in teaching, learning, and administration activities in education context (Ozoemena, 2014). In this study, *E-learning Uptake* is defined as the actual and continued usage of e-learning facilities and platforms in teaching and learning activities. Thus, e-learning uptake is the actual results of e-learning implementation (Pinpathomrat *et al.,* 2013). It is ascertained by users' awareness, accessibility, attitude, availability, and frequency of using e-learning facilities as well as platforms, among other variables,

Modelling: This is the process or an art or activity of developing dimensional model that represents clearly the real picture (Andrew, 2009). The same definition has also been used in several studies, for example Bashir (2018) on modelling e-learning interactivity and Bett *et al*. (2014) on modelling e-learning implementation in primary schools. In this study, modelling is defined as a process in the stages of developing a dimensional model that represents clearly how the implementation of e-learning can be effective in Tanzanian universities. the modelling stages achieved in this study are clearly illustrated in the methodological chapter, section 4.10.3 using decision flowchart adapted from Hair *et al.* (2014).

A model: Heaps (2002) defines a model as the simplification of the real world representing the real phenomenon expressed in terms of figure, mathematics, flow diagram, or the use of words. For example, a study by Bashir (2018) indicates e-learning interactivity through pictorial diagrams; Bett *et al*. (2014) used mathematical formula to explain e-learning implementation in Primary school. In this study, a model is defined as a pictorial (figure) diagram representing how interrelated factors such as technological characteristics, user characteristics, pedagogical characteristics, social characteristics, institutional characteristics, and environmental characteristics significantly influence e-learning and how they can be effectively implemented in Tanzanian universities. The model is summarised and presented in Table 6.2.

A university: is an institution of higher education and research that grants academic degree in a variety of subjects and provides both undergraduate and postgraduate education (Tarus and Gichayo, 2015). In this study, a university is defined as an institution of higher education and research, which is recognized, approved, accredited by TCU as a fully-fledged entity of granting academic degree in a variety of subjects and provides both undergraduate and postgraduate education (TCU, 2016).

1.7 Scope of Work

Technological convergence and the application of ICTs in various sectors including education have been growing in recent years**.** Many universities and other academic institutions in Tanzania have started to integrate e-learning in teaching and learning activities. Thus, the current study focused on developing a model for improving implementation of e-learning in Tanzanian Universities and hence increasing its uptake and effectiveness in teaching and learning. The study used students, academic staffs, ICT experts, and management staff as a sample population.

1. 8 Organization of the Thesis

This thesis is made up of seven chapters. The first chapter introduces background information, statement of the problem, objectives, and research questions, operational definitions of key concepts, and organization of the thesis. The second chapter presents the research setting, which includes geographical background of Tanzania, the status of higher education in Tanzania, the status of ICT and availability and use of e-learning at the Tanzanian universities. The third chapter presents literature review that comprises theoretical review, empirical review, and synthesis of literature, conceptual framework, and operationalization of variables. The fourth chapter presents the methodology used in this study and includes introduction, research philosophies, methods, study design, study area, population, sampling procedures and sample size, and unit of inquiry. Other aspects in the chapter include data collection methods, data analysis, validity, and reliability followed by ethical issues. Chapter Five presents analysis and results. Chapter Six is on discussion of the findings presented based on specific research objectives. Chapter Seven comprises the summary, conclusion, recommendation, limitation, and implication. Figure 1.1 is a diagrammatical description of the overall organization of the thesis.

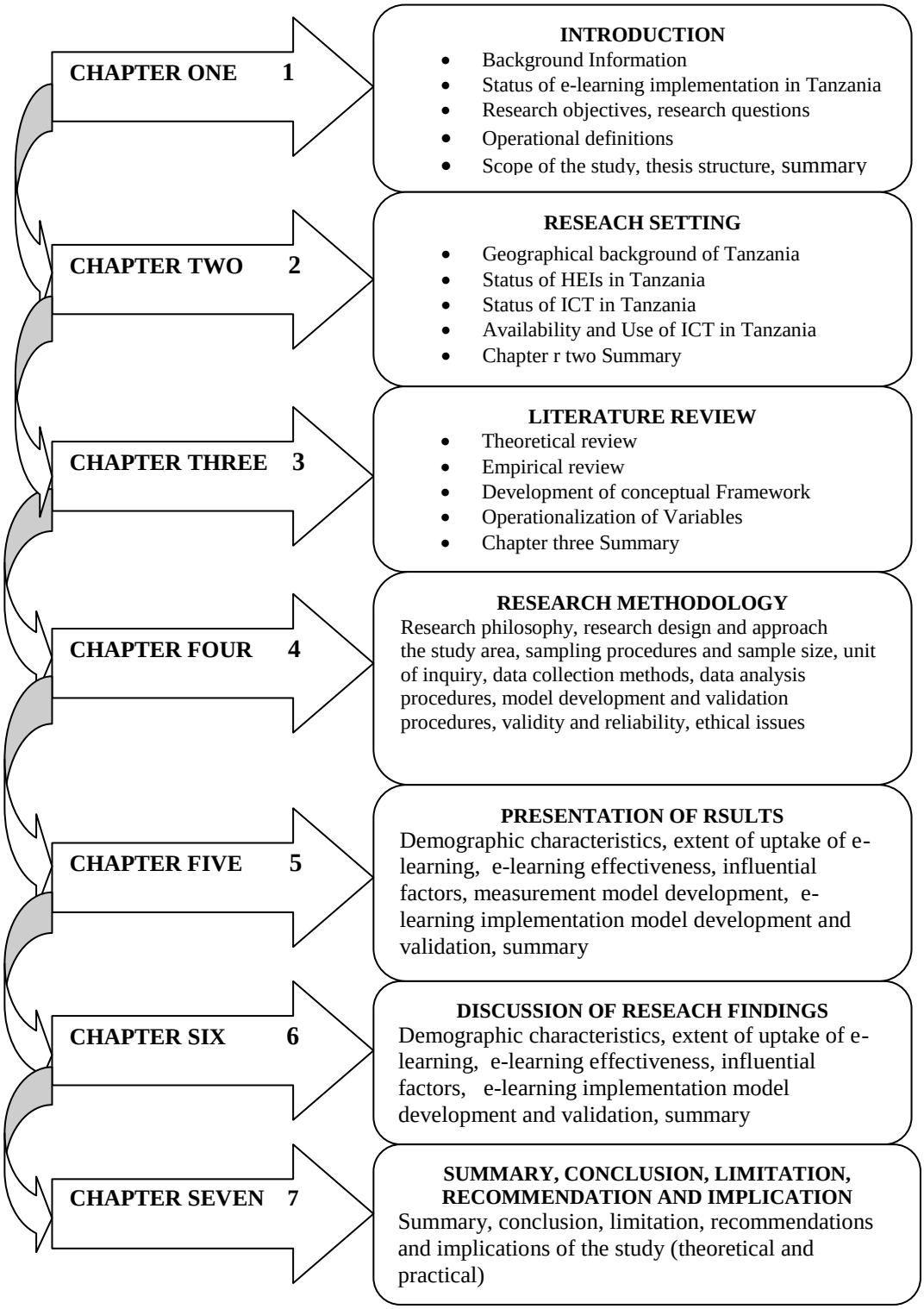


Figure 1.1 Organization of the Thesis (Source: Researcher)

1.9 Chapter Summary

In Chapter One, efforts have been made to set the scene by presenting the core research problem in the context of a conceptual background of the study. The chapter provides basic and valuable information that strengthens the present study, including background information and the status of e-learning implementation in Tanzanian universities. The chapter also presents the statement of the problem, objectives, research questions, operational definitions, and the organization of the thesis. As it is pointed out in Chapter One, despite the various initiatives made by the Government of Tanzania and Tanzanian universities for improving ICT infrastructural developments in the country, the implementation of e-learning in universities has continued to be grossly inadequate. The existing e-learning implementation models and frameworks have mainly focused on technological, institutional, and pedagogical factors with little consideration on human, environmental, and social factors, which are also important. This situation warrants empirical research in order to develop a model for improving e-learning implementation in Tanzanian universities and hence increasing its uptake and effectiveness in teaching and learning.

CHAPTER TWO

RESEACH SETTING

2.1 Introduction

The preceding chapter introduced the background information, problem statement, research objectives and questions, operational definitions of key concepts, the scope of the study, organization of the thesis and the summary of chapter one. This chapter presents geographical location of Tanzania, status of higher education in Tanzania, the status of ICT in Tanzania universities, and availability and use of ICT in Tanzanian Universities.

2.2 Background of Tanzania

Tanzania is located in the east coast of Africa with a population of just over 55 million people (URT, 2015). The United Republic of Tanzania was established in 1964, shortly after independence from the British colonialist, when the mainland Tanganyika merged with the islands of Zanzibar, which comprises Unguja and Pemba The country is in the southern part of the Equator between latitudes 1.04^0 South and 12^0 South and longitudes 30^0 and 40^0 East. With about 950,100 square kilometres in total, Tanzania is the eighth largest country in Sub-Saharan Africa.

Administratively, the country consists of 30 administrative regions: 5 in Zanzibar Island and 25 in Tanzania mainland (URT, 2007). Each region is subdivided into districts. Tanzania is bordered by Kenya and Uganda in the North; Rwanda, Burundi and the Democratic Republic of Congo in the west; Zambia and Malawi in the southwest; and Mozambique in the South. In the eastern part, there is the Indian Ocean that forms a costal line of about 1400 kilometres long. This information enabled the researcher to choose a research design, data collection methods, and sampling techniques suitable for collecting data from universities that are geographically scattered in Tanzania.

2.3 Higher Education in Tanzania

Higher education in Tanzania dates back to the early 1960s when the first university (University of Dar es salaam) started as a college of the University of London with a single faculty (Faculty of Law). In 1963, two years after the college was established, the college of the University of London became a constituent college of the University of East Africa, which at the time it included Nairobi University College in Kenya and Makerere University College in Uganda. The East African Authority's decision for a split in 1970 resulted in the establishment of Dar es Salaam University College, which later became fully fledged University of Dar es Salaam (UDSM). Majority of the current public institutions in Tanzania have been derived in one way or another from the UDSM (Mwollo-Ntallima, 2011).

Starting late in1980s up to mid - 1990s, Tanzania liberalized her political and socio-economical policies. The liberal reforms led to an increase of the demands for social services such as higher education. Since then, higher education has continued to expand leading to the establishment of private universities (Mgaya, 2016). This trend has been threatening the quality of higher learning institutions and the education provided. For instance, students were registered with low qualifications in private universities. As a result in 1995, the then Higher Education Accreditation Council (HEAC) was established, with the legal mandate of controlling the establishment and accreditation of private universities in the country (TCU, 2015). However, such a mandate mainly focused on private universities and was not conducive for the encouragement of a feasible public-private partnership in higher education as predetermined in the National Higher Education Policy of 1999 (URT, 1999).

The aforementioned situation led to the establishment of the Tanzania Commission for Universities (TCU) in 2005 through the enactment of the Universities Act Cap.346 in order to harmonize higher education system in the country. Therefore, TCU is a body corporate, which is mandated to recognize, approve, register, and accredit private and public universities operating in Tanzania and local or foreign

university programmes, which are offered by non-TCU registered higher education institutions (Msoroka, 2012; *Chris and Bisimba, 2007).*

Higher education in Tanzania has grown in terms of registered Higher Education Institutions (HEIs) and the number of students. Currently, there are 49 registered HEIs in Tanzania, 33 of these are universities, and 16 are university colleges (TCU, 2016). Among the 49 HEIs, 14 are public and 35 are private owned. Specifically, of the 33 universities in Tanzania, twenty one (21) are private owned and twelve (12) are public owned universities (TCU, 2018). Out of thirty three (33) universities, thirty (30) are universities in the Tanzania mainland and three (3) are universities in Zanzibar. These universities are categorized as biological sciences, technology, social sciences, and comprehensive discipline. Majority of these universities uses campus-based mode of delivery while others such as the UDSM and the OUT use distance learning mode of delivery. The universities in Tanzania are geographically scattered; some are located in the rural while others are located in the urban areas.

The students' enrolment in HEIs has also increased over the past 50 years. For instance, in 1961, East Africa (including Tanganyika) had only 178 students enrolled in the universities (Sanya and Kinunda, 1977). In the 2017/2018 academic year, students' enrolment in higher education institutions in Tanzania increased to 63,737 (TCU, 2018). This increase is partly attributed to the advancement of ICT that created new opportunities and increased private and public HEIs access to potential students. Because of an increase of students' enrolment, HEIs need to adopt and use ICTs in order to overcome challenges in teaching and learning process resulting from massification of students.

2.4 Status of ICT in Tanzania

ICTs, which started in 1990s in Tanzania, have improved substantially in recent years. The advancement is mainly attributed to the establishment of the communication sector and the global ICT revolution (TCRA, 2010). According to URT (2003) report, the Communication Act was endorsed in 1993 leading to the reformation of the previous Tanzania Posts and Telecommunications Corporation

(TPTC) into three separate companies, namely the Tanzania Communications Commission (TCC), Tanzania Telecommunication Company Limited (TTCL), the Tanzania Posts Corporation (TPC), and the Tanzania Broadcasting Commission (TBC). In view of these reforms, ICT becomes a very important tool in spearheading development in various sectors.

Various policies have also been formulated to promote and enhance ICT developments in Tanzania. Such polices include Information and Broadcasting Policy, Telecommunication Policy, and ICT Policy (TCRA, 2010). Information and Broadcasting Policy was formulated in 1993 and revised in 2003 (URT, 2003). The main objective was to create an enabling environment for the thriving information and broadcasting sectors. Based on URT (1997) report, the Telecommunication Policy was formulated in 1997 to promote the provision of sustainable, efficient, and effective telecommunication services. The ICT Policy was formulated in 2003 to provide a national framework for ICTs in order to significantly contribute towards the development of the sectors and achieve the goals of transforming Tanzania into a knowledge-based society (URT, 2003). Additionally, the current ICT Policy 2016 was established as the result of the revision of the ICT Policy 2003 to address the technological changes witnessed for over the past ten years (URT, 2016). This policy was meant to improve the ICT infrastructure in the country. Education and research institutions are significant for the growth of ICT industry, which has increased the demand for knowledge and skills. Thus, the restructuring of the national ICT policy that effectively guides the establishment of the ICT infrastructure is necessary.

The establishment of the Tanzania's communication sector and the global technological developments has noticeably increased the availability of ICT in the country. According to Sife (2010) and Sanga (2010), the government of Tanzania has made tremendous efforts of increasing broadband connectivity by joining the SEACOM and Eastern Africa Submarine Cable System (EASSy) networks in 2009 and by the launching of the National ICT Broadband Backbone (NICTBB) in 2010 and 2012. All major operators in Tanzania are now connected to the backbone leading to transparency in their management and provision of sustainable

communication services. The notable developments of ICT in Tanzania are viewed in the following perspectives: mobile phones penetration, digital migration, and internet utilizations.

In recent years, the mobile phone market in Tanzania has been growing rapidly. As reported by Tanzania Communication Regulatory Authority report (TCRA, 2019), mobile subscription increased by 8.8% in 2018. TCRA reported further that, there were over 41 million mobile SIM accounts by June 2018, representing a penetration rate of 92.6 percent of the population. The reality is that an increasing number of mobile users are acquiring second, third, and fourth SIMs in order to be able to place on-net calls over multiple networks and take advantage of promotional pricing. Thus, having 41million SIM accounts does not mean there are 41 million individual users. In April 2014, Smart became the eighth mobile operator in Tanzania, joining Zantel, Airtel, Vodacom, Tigo, TTCL, Sasatel and Benson (Balancing Act, 2014). This has accelerated the advancement of communication technology from analog to digital signal system.

Tanzania was the first mainland sub-Saharan country to complete the switchover from analog to digital TV transmission, the process started in December 2012 in Dar es Salaam and later on, it extended to other major cities in 2013 (TCRA, 2013). One of the critical advantages of migration to digital-only television transmission is the freeing up of frequency spectrum such as the 700MHz band (TCRA, 2013). This in turn offers increased range and lower operating and capital costs for mobile operators and is especially suited to broadband provision.

By the end of 2018, there were 23 million-internet subscribers who were served by multiple internet service providers (ISPs) in Tanzania. The TCRA estimates that there are 22,280,000 users of the internet in the country, translating into a penetration level of 43 percent (TCRA, 2019). This figure includes internet café users, business organizations, household users, individual users, and education institutions. Due to lack of fixed lines, low use of PCs and high cost of broadband connectivity, only 3.5 percent of the population managed to access the internet. As Esselaar and Adam

(2013) observe, low internet connectivity in rural area (where more than 70% of the population lives), limited income, low level of education and limited internet content are the factors that are likely to limit internet use. According to MoEVT (2007), Tanzania needs national ICTs such as mobile phones, computers, and internet sensitization by emphasizing on the applications of educational technologies such as e-learning, m-learning, and blended learning in campus education and in distance education.

2.5 Availability and Use of ICT in Tanzanian Universities

The ICTs applications are sought to be the ultimate solution in educational delivery in the context of HEIs. As Alshaher (2014) observes, ICT application provides the opportunity for students to learn anywhere, at any time, and at a minimal cost. According to MoEVT (2011), the HEIs in Tanzania should deploy ICTs for their day-to-day training activities in order to minimize training cost and to remain competitive in the market. It is observed further that there is a need for harnessing ICT opportunities to meet the goals of 2025 vision by blending strategic ICT leadership, ICT infrastructure, and ICT Industry through human capital. Emphasis on the role and usage of ICTs with a focus on educational context implies that ICTs' application on educational activities is significant.

Tanzania, like many other developing countries, is adopting ICTs in HEIs. As Angelo and Wema (2010) put it, information and communication are crucial assets in many sectors. However, the rate of utilization of ICT facilities and platforms in Tanzania is still very low despite the opportunities provided by the open source technologies and the favourable environments created by the Government (Sanga, 2010). The Government has taken some initiatives of developing ICT policies for smooth implementation ICTs. In addition, different national round table conferences and the formation of the Tanzania Commission of Universities (TCU) have created more opportunities on accessibility and use of ICTs in the HEIs in Tanzania.

Some of the established public and private HEIs including the UDSM, the OUT, Mzumbe University, and the University of Iringa have managed to implement ICT platforms in an ad hoc basis using either open source or customized platforms such as WEBCT, Blackboard, Moodle, and Joomla. Other universities in Tanzania have started expanding ICT infrastructure to include local area network implementation, Internet, computer laboratories, and other facilities to facilitate the establishment of ICTs such as e-learning (Sife *et al*., 2007). Thus, the universities in Tanzania need to fully implement e-learning for sustainable use in facilitating educational activities including teaching and learning.

The use of ICTs, particularly e-learning technology for educational delivery, communication, and information management is increasingly becoming important in Tanzania. As revealed by Angello and Wema (2010), the importance of ICTs in learning has motivated the universities to employ ICTs in teaching and learning. As reported by Ozoemena (2014), the use of ICTs complements traditional learning experience in Tanzania where the instructor teaches using a blended learning mode. The **blended learning mode** is normally employed using both online and face to face (f2f) learning experience in teaching in HEIs. For instance, in a blended-learning course, students attend a class taught by a teacher in a traditional classroom setting, while also independently completing online components of the course outside of the classroom (Tarus and Gichayo, 2015). Generally, the availability and use of ICT application in Tanzania HEIs is at the very basic stage.

2.6 Chapter Summary

This chapter describes the research setting by presenting the geographical background of Tanzania, status of higher education in Tanzania, status of ICT in Tanzanian universities, and the availability and use of ICT in Tanzanian universities. This chapter equips the reader with better understanding of geographical location were Tanzanian universities are located in relation to research design (including suitable data collection methods and sampling techniques) employed in this study.

The chapter provides clear understanding on the growth of HEIs in relation to the advancement of ICT in Tanzania. Finally, the chapter presents clear understanding on the availability and use of ICTs in Tanzanian universities particularly the e-learning and its status in the education context.

CHAPTER THREE

LITERATURE REVIEW

3.1 Introduction

This chapter establishes the context for the present study by reviewing the existing theoretical and empirical literature. The literature review highlights the related researches in terms of prominent research issues, the findings, and methodological aspects. This chapter is organized thematically beginning with a discussion on relevant theories that guided the present study. This is where the theoretical gap is established. Empirical literature focuses on the previous studies related to e-learning implementation including its effectiveness, uptake, factor influencing implementation and related models that guide e-learning implementation as well as methodological review. Finally, the chapter presents the synthesis of the reviewed literature that established the research gap and the conceptual model that guided the present study.

Literature review was done to establish a clear link between the current study and the available knowledge on the subject matter, ascertain the need for carrying out this study, and avoid unnecessary repetition. In other words, literature review was conducted to determine what has already been done in relation to the present research problem. Literature review provides many benefits including gaining new ideas, perspectives, and approaches on the topic by informing the researcher on issues raised by other studies. It shows further how methodological issues were handled in similar studies; it also helps to interpret the findings in the context of previous studies and strengthens the researcher's confidence that the topic is worth studying (Leady and Ormond, 2005).

3.2 Theoretical Literature Review

A theory is defined as a "believable or scientifically suitable set of general principles which are offered to explain phenomena" that have been observed over time and cannot be discredited by the existing knowledge (Merriam-Webster Collegiate

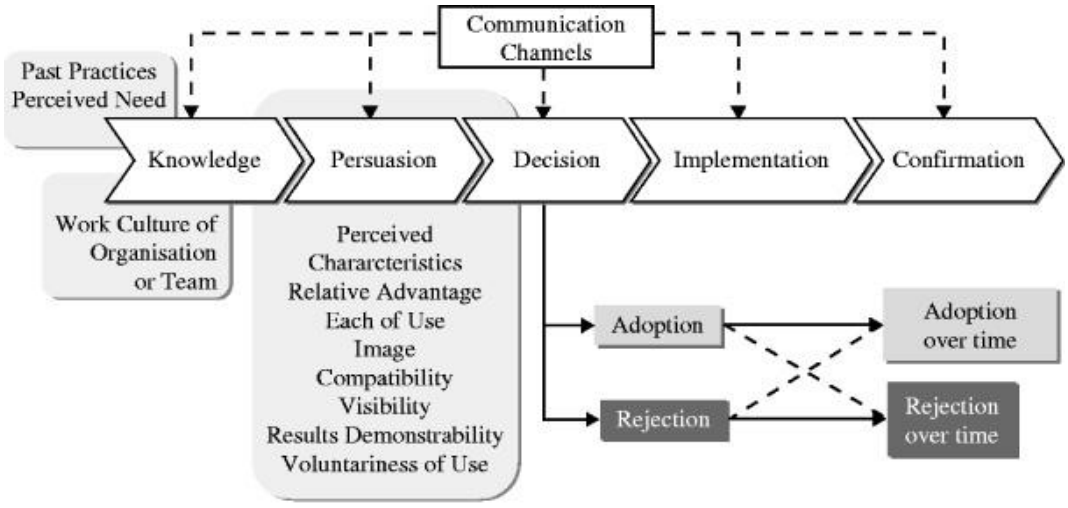
Dictionary, 2000). A theory is a form of "inclusive, logical, and internally consistent system of thoughts about a set of phenomena" and is a hypothesis, which is assumed for the sake of argument or study, or an unverified statement (Mergel, 1998). Theories are very useful and have been used in various researches in order to achieve a set of objectives. For instance, researches have been conceptualizing and carrying out studies to test predictions from theories, in order to develop and implement practices, which have been fostered and supported by theories.

Based on the relevance of theories in research, this section presents various reviewed theories including the Diffusion of Innovation Theory (DOI) (Rogers, 1995); the Unified Theory of the Acceptance and Use of Technology (UTAUT) and UTAUT2 (Venkatesh *et al*., 2003), and the Theory of Planned Behaviour (TPB) (Ajzen, 1991). Other theories reviewed include the Theory of planned behaviour (TRA) (Fishbein and Ajzein, 1975), The Social Cognitive theory (SCT) (Bandura, 1989) and the Technological Acceptance based theory model (TAM) (Davis *et al.*1989). Only three theories namely DOI, UTAUT, and TPB were found suitable and appropriate based on their strengths and contribution in guiding this study. This is because e-learning is an educational technology, which is to be studied in both human and technological perspectives. These theories were selected in order to capture in depth information from both human (behavioural) and technological perspectives. The other theories including TAM, TRA, and SCT were found unsuitable and irrelevant as they focus mainly on behavioural perspective. The selected theories complement each other and provide constructs from all perspectives (human, social, environmental, and technological) for guiding this study in order to avoid biasness.

3.2.1 Diffusion of Innovation Theory (DOI)

Diffusion of Innovation (DOI) theory was first developed by Rogers in 1995. Rogers defines diffusion as a process by which an innovation is communicated over time through certain channels among the members of a social system. The author defines an innovation as "an idea perceived as new by an individual" or other units of

adoption (Rogers, 1997). Figure 3.1 shows various stages of the adoption of technology. In the knowledge stage, the individual is exposed to an innovation, but he/she lacks information about the innovation. In the persuasion stage, the individual is interested in that innovation and actively seeks for related information/details. In the decision stage, the individual decides whether to adopt or reject the innovation based on the advantages/disadvantages of using the innovation as it is difficult to acquire empirical evidence in this stage. In the implementation stage, the individual puts the innovation into use to a varying extent depending on the environmental and technological as well as user characteristics. Just before the implementation stage, the theory insists, and realizes the effectiveness and successfulness of the innovation and may search for further information about its status. In the confirmation stage, the individual finalizes his/her decision to continue using the innovation.



Source: Rogers (2003)

Figure 3.1: Five Stages in the DOI Process (Rogers, 2003)

Based on DOI, implementation as well as usage of technologies such as e-learning arise mainly from the individual effect with the insistence on user awareness of particular activities, caused by five technological characteristics namely, relative advantage, compatibility, complexity, observability, and trial ability (Rogers, 2003). Thus, DOI contributes to the current study by emphasizing on user characteristics, technological, and environmental characteristics, which are essential constructs,

which need to be taken care of during the implementation stage of e-learning. In addition, the theory of DOI emphasizes on the need for the assessment of effectiveness and uptake of the technology before committing it into use (if the technology is not new, establishing its status is inevitable).

Although DOI has been used to explain the implementation of e-learning, it focused mainly on technological and user characteristics leaving out pedagogical, social, and institutional features, which are also important. E-learning can be described in more than one feature (Rosenblit and Gros, 2011) and these include technological, pedagogical, institutional, and social characteristics. Pedagogical issues include learning and teaching styles. For example, DOI does not take into account the consideration of customization of innovation for specific use it was made for (Njenga, 2011). Social aspect is less considered in the theories although this aspect acts as a facilitating condition when implementing e-learning in any organisation. For instance, studies by Bagozz (2007), Njenga (2011), and Maina and Nzuki (2015) identify key social factors that are likely to influence an individual into adopting and using e-learning. Such factors are normative influence, social interaction, social image, and mutual negotiation. In order to capture fully the factors, which are not captured well in DOI, in various dimensions beyond technological aspect, the unified theory of Acceptance and Use technology (UTAUT) was considered.

3.2.2 A Unified Theory of Acceptance and Use of Technology (UTAUT) & UTAUT2

Both the Unified Theories of Acceptance and Use of Technology (UTAUT & UTAUT2) have been reviewed. UTAUT2, which was developed by (Venkantesh and Thong, 2012) as an extension of the original UTAUT2, consist factors beyond those from the original UTAUT. The additional factors include hedonics motivation, price value, and habit. The extensions or rather addition of new factors, have been helpful to expand the theoretical horizons of UTAUT. However, the addition of factors has been on an *ad hoc* basis without careful *theoretical* consideration to the context being studied (Venkantesh and Thong, 2012). Additionally, the UTAUT2 has not been

tested empirically in different countries, to different age groups, and by different technologies compared to the original UTAUT. Based on this weaknesses or limitations of UTAUT2, UTAUT in Figure 3.2 has been adapted to explain how user characteristics influence behavioural intention towards implementation and use of e-learning. This theory consists of four factors namely performance expectancy, effort expectancy, social influence, and facilitating conditions. These factors explain user, social, and technological characteristics towards influencing e-learning implementation. In addition, the theory emphasizes on the importance of four moderators: age, gender, and experience that have a role in the user's acceptance towards e-learning implementation. Previous empirical tests provided strong support for UTAUT which explained about 70 percent of the variance in behavioural intention to use a technology and about 50 percent of the variance in the implementation and use of e-learning (Venkantesh *et al*., 2003; Bellaaj *et al*., 2015).

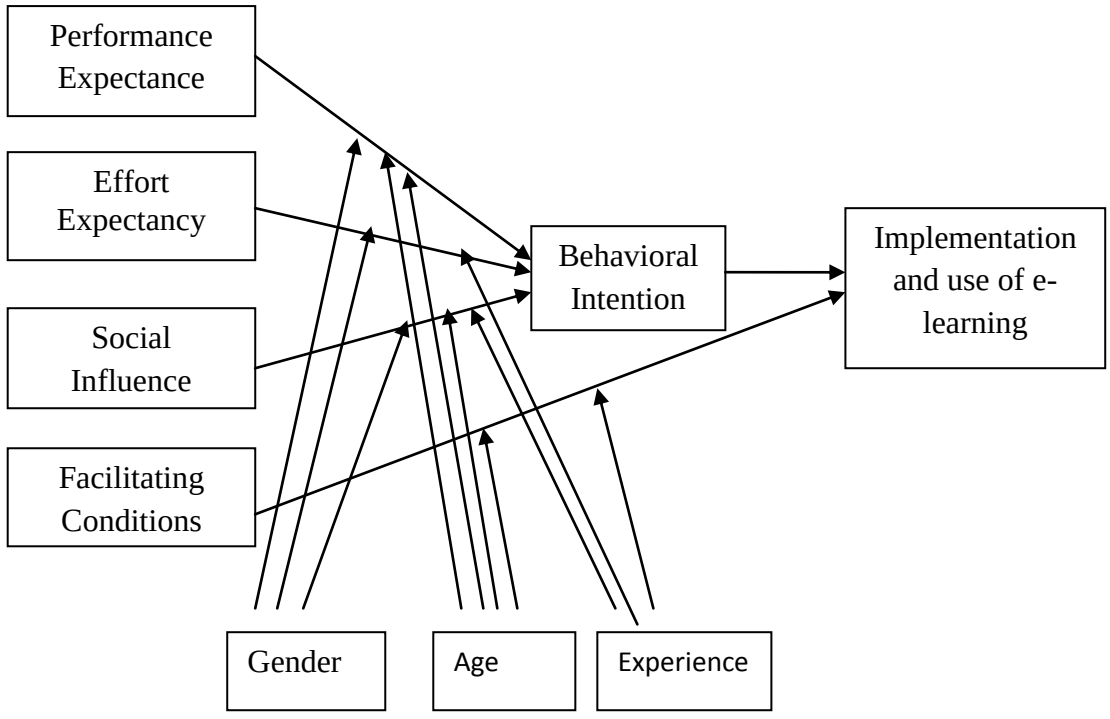


Figure 3.2: Unified Theory of Acceptance and Use of Technology (Venkantesh et al., 2003)

UTAUT was relevant to the current study as it provided external factors such as user and technological characteristics. UTAUT was also found relevant to this study as it is commonly used to address the usage of e-learning. UTAUT is most powerful in explaining e-learning implementation and use due to the integration of eight other models, including Technological acceptance model (TAM) and DOI. Despite its strength in this study, UTAUT fails to address the effectiveness of e-learning on individual and institutional aspects based on educational activities. The theory also ignores internal social factors as well as institutional, environmental, and pedagogical external factors. For these reasons, a theory of Planned Behaviour (TPB) was considered in order to capture fully some of the weaknesses revealed in UTAUT.

3.2.3 A Theory of Planned Behaviour (TPB)

The Theory of Planned Behaviour (TPB), which is a derivative of the Theory of Reason of Action (TRA), has overcome the TRA's weaknesses "in dealing with behaviours over which users of the e-learning technology have incomplete volitional controls" (Ajzen, 1991:181). As presented in Figure 3.3, TPB describes the interrelationships between attitudes towards a reasoned behaviour (A), the subjective norm (SN), and the perceived behavioural control (PBC) of performing the behaviour (B) in question (Ajzen, 1991). The revealed construct in TPB determines an intention or behaviour of users and internal social characteristics towards e-learning implementation. Although, internal social characteristics have not been clearly captured in UTAUT, they are addressed in TPB. For instance, attitude is a factor, which may be favourable or unfavourable, depending on the perception of users on specific phenomenon. Subjective norm is the user's evaluation of social influences when performing a behavioural action, while the perceived behavioural control is the personal evaluation of his/her ability to perform successfully the behaviour of interest (Workman, 2005). It is defined as the degree to which the use of an e-learning is perceived to enhance one's image or status in one's social system (Vankatesh, 2003; Maina & Nzuki, 2015).

TPB was relevant to this study as it deals with behavioural interest in the implementation and use of e-learning. In this case, attitude, social interaction, image/status, and subjective norms were the constructs that contributed to user and social characteristics as addressed in this study. Bagozzi (2007) identifies key issues that are likely to influence users' decision in using e-learning as social normative influence, image, social status, relative position in social networks, and the environmental characteristics. There has to be the necessary technological opportunities and resources to the users, and who should have a positive attitude towards implementation and use of e-learning. This attitude is created after the user has evaluated the e-learning implemented opportunities and the available resources (such as facilities and platforms of e-learning) for them to realize the usefulness of the e-learning (Bagozzi, 2007).

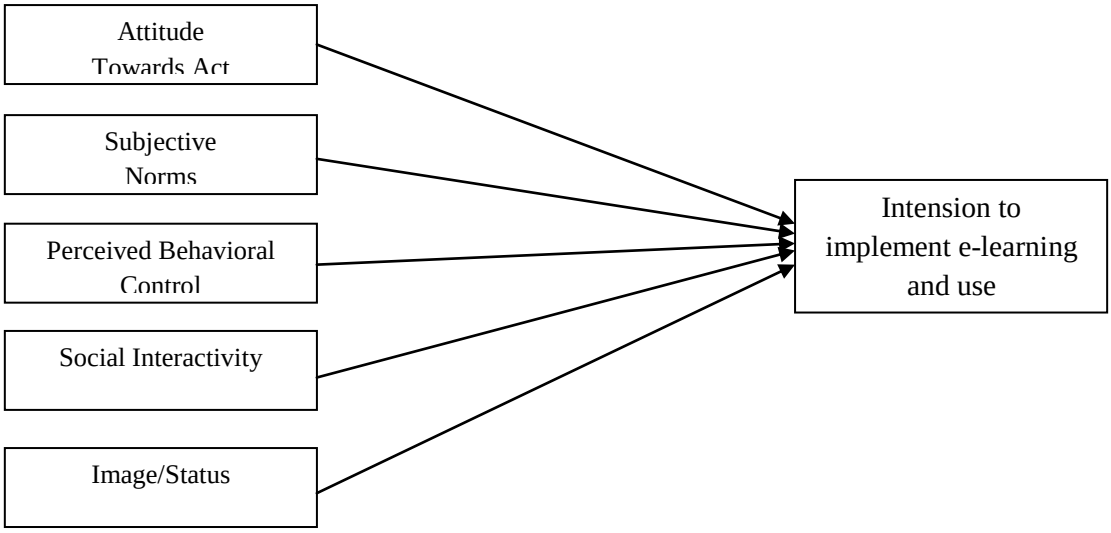


Figure 3.3: Modified theory of Planned Behaviour (Ajzen, 1991)

TPB ignores the environmental, institutional characteristics and pedagogical aspects of decision-making. Separating users from environment characteristics is a key weakness in the implementation of e-learning within a university. TPB also ignores the external environmental and institutional factors that support the e-learning implementation. In assessing the implementation of e-learning, environmental, and institutional factors are inevitable as they support the deployment of the e-learning

system. Environmental factors include ICT experts, internet connectivity, electricity, and availability of bandwidth. Institutional factors include support and commitment from the management, policies and regulations, funds and other financial aspects. Based on the review of the relevant theories namely DOI, UTAUT, and TPB, Table 3.1 summarizes the strengths and weaknesses in order to identify the gap in theory.

Table: 3.1 Summarized Strengths and Weaknesses of the Suitable reviewed Theories

Theory	Strengths	Weaknesses	The gap
DOI	It emphasizes the assessment of status of technology if it is not new.	Not captured institutional, pedagogical and internal social characteristics	Theories fail to address clearly Institutional, Pedagogical, and environmental characteristics in e-learning implementation context
UTAUT	It focus on external factors such as technological, user characteristics but little on environmental characteristics It address external user, technological characteristics but little on social characteristics Commonly about 70% empirically used to explain the assessment of actual usage of e-learning.	Fail to capture institutional, environmental pedagogical and internal social characteristics Fail to explain the effectiveness of the technology	
TPB	It deal with the behavioural interest It address the internal social and user characteristics	Fails to capture external factors such as institutional, environmental, pedagogical, and external social characteristics Fail to explain the effectiveness of the technology	

Based on Table 3.1, three relevant theories including Diffusion of Innovation Theory (DOI), the unified Theory of Acceptance and Use of Technology (UTAUT) and the Theory of Planned Behaviour (TPB) were reviewed and adapted to guide the current study. The outcome of the review shows that there is a theory gap in that both theories fail to address clearly Institutional, Pedagogical, and environmental characteristics in e-learning implementation context. Thus, there is a need of filling

such a gap by addressing Institutional, Pedagogical, and Environmental characteristics in the conceptual framework, which is to be tested in the current study.

3.3 Empirical Literature Review

This section reviews empirical literature on what has been done so far. The section focuses on major recurring themes in the literature. The section organizes knowledge and applicability of the main findings of the studies. These themes include the uptake of e-learning, the effectiveness of e-learning, the factors influencing e-learning implementation, and various models for the implementation of e-learning. Finally, the section reviews methodologies of the past relevant studies.

3.3.1 Extent of E-learning Uptake in Universities

Recently, diffusion of e-learning in developing world has been growing rapidly. The implementation of e-learning in some of the universities in the developing countries has far reaching effects. Scholars (e.g. Mtebe, 2014; Ssekakubo *et al.,* 2011) agree that in Africa, universities have been adopting and using various e-learning technologies to enhance education. For instance, 54 universities in 27 African countries have adopted e-learning technologies of various types for their campuses. In Tanzania, almost 80 percent of 33 universities have implemented a range of e-learning technologies by 2011 (Munguatosha *et al.,* 2011). Nevertheless, the extent of e-learning uptake among users is inadequately researched in Tanzanian universities (Lashayo *et al.*, 2017). This was due to the reality that many researches focused on availability of e-learning platforms and facilities leaving out other variables such as frequency of use, accessibility, awareness, and attitude, which are deemed important to ascertain the extent of the uptake of e-learning. These collectively can provide evidence of the status of e-learning implementation in Tanzania.

It is evident that attitude plays a great role in ascertaining the uptake of e-learning. Robertson *et al*. (1996) examined the usage of e-learning in the USA using a theory of planned behaviour. The authors found that attitudes among users lead to personal view and emotional factors that affect e-learning usage. Similar findings by Idris and Osman (2017) indicate that attitudes create high control that influences the uptake of e-learning among students and academicians. In another study in the US, Pinpathomrat, Gilbert and Wills (2013) revealed that an attitude among users is likely to affect the uptake of e-learning. Notwithstanding the importance of attitude in determining uptake of e-learning, the variable is still inadequately emphasized in Tanzania.

Contrasting views on the relationship between awareness and uptake of e-learning have been reported in various studies. Nwana *et al.* (2017) revealed that user awareness on e-learning had negative influence on e-learning uptake. On the other hand, Idris and Osman (2017) and Weber (1996) reported that awareness among e-learning users in Saud Arabia increased the uptake of e-learning. In Ghana, a study by Nyagorme *et al*. (2017) on awareness and use of e-learning indicates that users were aware of e-learning facilities and e-learning platforms but they lacked adequate training, which led to negative influence on e-learning uptake. These contrastive findings might be a result of contexts, population, and methodologies used in these studies. This again, emphasizes the need for employing user awareness for ascertaining e-learning uptake in order to fill the existing gap between users' awareness and the extent of e-learning uptake.

E-learning accessibility is an important variable of ascertaining e-learning uptake (Gichayo, 2015). Arrigo (2005) conducted a study in the United States using variables including usability, pedagogical, and student learning styles to measure accessibility of e-learning. The findings indicate that these variables had positive influence on e-learning usage. Owate *et al.* (2017) conducted a study on e-learning uptake using t-test analysis technique in a Nigerian secondary school. The findings show that e-learning accessibility has a significant contribution to e-learning uptake. As suggested by Zhu and Mugenyi (2015), low level of internet connectivity,

inadequate number of computers, and power interruptions are the problems which users encountered in accessing e-learning platforms and facilities. Accessibility of e-learning facilities in teaching and learning context should be considered to ensure a smooth e-learning uptake. Thus, the establishment of unified variables of measuring accessibility among e-learning users is significant in encouraging sustainable e-learning uptake.

E-learning uptake in developing countries has been studied using various variables. However, few variables namely *availability and frequency of use* have been used to measure the extent of e-learning uptake. Munguatosha *et al*. (2011) and Tarus *et al.* (2013) investigated e-learning usage in Tanzania and Kenya respectively. Both studies found that availability of e-learning facilities and platforms has a high correlation with the actual usage of such e-learning. The findings in a study by Ssekakubo *et al*. (2011) indicate that availability and frequency of use of e-learning had some influence on the extent of e-learning uptake. Similar findings are reported in a study by Owate *et al.* (2017) in Nigeria, and Lwoga and Komba (2015) in Tanzania showing that frequency of use has a correlation with extent of e-learning uptake. It is argued however that, both availability and frequency of use of e-leaning and facilities are important factors in ascertaining the extent of e-learning uptake.

There are apprehensions that the extent of e-learning uptake has been elucidated and interpreted one-sidedly in the context of Tanzania. It is argued further that the available evidence on the topic is largely subjective and is conquered by promises than the reality (Jethro *et al*., 2012; Gilbert and Willis, 2013). Various studies on the extent of e-leaning uptake in Tanzanian universities based on assumptions, beliefs, and opinions; and these were influenced by emotions and personal feelings without factual data. For instance, Munguatosha et al. (2011) speculated that, in Tanzania, almost 80% of the relevant institutions had installed various e-learning systems by the end of 2011. Similarly, subjective information regarding the extent of e-learning uptake is revealed in the study by Mtebe and Raphael (2018) who reported the extent of e-learning uptake of about 76 percent based on the availability of e-learning

platforms. It is argued that the extent of e-learning uptake is reported without fact-based data leading to biasness.

There are also concerns that there is scarce evidence on the extent of e-learning uptake in Tanzanian (Munguatosha *et al*, 2011). Majority of studies have reported the extent of e-learning uptake focusing regularly on the availability of e-learning (such as the internet and support of services) (Lwoga, 2012; Ssekakubo *et al.*, 2011). Yet, other important variables including attitudes, awareness, and accessibility of e-learning have been inadequately measured in ascertaining e-learning uptake in developing countries (Al-Alak and Alnawas, 2011; Pinpathomrat et al., 2013; Kisanjara, 2014; Kisanjara et al., 2017; Mtebe and Raphael, 2018; Makokha and Mutisy, 2016; Owate *et al.*, 2017). Thus, there is a need of considering these variables collectively to establish the extent of e-learning uptake in Tanzanian universities for emperical evidence.

Few previous studies have been done in developing countries particularly Tanzania. However, these studies were not empirically grounded. As a result, they provide a subjective conclusion on the extent of e-learning uptake (Lwoga, 2012; Nyagorme et al., 2017). Consequently, the shortage of empirical evidence is based on the context, population, and the methodologies used (Al-Alak and Alnawas, 2011). Therefore, the current study employed fuzzy logic membership function model (methodology) in handling uncertainties using various variables collectively including attitudes, awareness, accessibility, and availability of e-learning. Alshaher (2014) establishes the scale to gauge the extent of e-learning uptake through fuzzy logic membership function as follows: the extent of e-learning uptake is high if $x \geq 50$ percent. Otherwise, it is low; where x is the variable indicating the extent of e-learning uptake. This scale provides the basis for ascertaining the extent of e-learning uptake in Tanzanian universities.

3.3.2 E-learning Effectiveness on Teaching and Learning in Universities

E-learning contributes to improved access to and sharing of information and knowledge among students and academic staff, regardless of time and location. El-

Seoud *et al*. (2014) reported an annual increase of about 12-14 percent in the enrolment of online learning over a five-year period from 2004 to 2009. This is because e-learning gives students' greater access to education as opposed to traditional methods of teaching and learning. Thus, students can undertake their studies from anywhere and at any time and can have the option of studying part-time or full-time (Worthen, 1987). Unless e-learning is well implemented, it cannot transform the educational sector by enabling users to share and access information and data in a relatively easy way.

Universities are becoming aware of the contributions of e-learning for enhancing education performance. According to El-Seoud *et al*. (2014), the use of interactive features of e-learning increases the motivation of undergraduate students in the Egyptian universities in learning. Using Pearson's correlation coefficient analysis to determine the effectiveness of e-learning in Tehran Alzahra University, Harandi (2015) confirmed that e-learning is an element, which motivates students and teachers in the teaching and learning process. Testing their hypotheses on a sample of 383 students partaking online courses, Wang *et al*. (2008) found that the capability of virtual e-learning influence significantly the results of teaching and learning activities. In France, Christmann and Lemaitres (2006) conducted a study and found that e-learning increases the time of teaching; furthermore, it encourages more active learning and creates self control among users. Thus, understanding effectiveness of e-learning and its contributions in teaching and learning process in Tanzanian universities would help decision makers to justify the investment made in e-learning.

By its very nature, e-learning has a significant effect on teaching and learning. A study by Jelfs and Colbourn (2002) on effectiveness of e-learning found that motivation, self esteem, and confidence have a positive correlation with teaching and learning through virtual seminars. As Harrison *et al*. (2001) argue, the use of e-learning creates a learner-cantered environment which motivates learners by combining a text, sound, colour, and moving images that make the learning of content easier. As observed by Ruiz-Moreno *et al*. (2008), the use of e-learning makes the user have control over the pace of learning of the contents, time, and

experience in meeting their personal learning objectives. Mason and Rennie (2006) observe that enabling learners some control over their pace and learning style provides a rich stimulating teaching and learning experience. It can therefore be concluded that using e-learning in teaching and learning motivates students to learn more.

There is debate on people's perceptions towards the effectiveness of e-learning within universities in developing countries. Scholars (e.g. Kim and Park, 2011; Rostaminezhad *et al*., 2013) argue that the effectiveness of e-learning is seen in terms of dropout rate in e-learning usage. In contrast, Zhu and Mugenyi (2014) argue that the effectiveness of e-learning is seen in terms of strength and opportunities. Noesgaad and Omgreen (2018) are of the view that e-learning effectiveness is seen and measured in terms of motivation, performance, engagement, satisfaction, self-confidence, cognitive learning, and personalization. It is argued that different perceptions towards effectiveness of e-learning in teaching and learning may lead to ineffective access and use of e-learning. As reported by Rosenblit *et al*. (2011), empirical evidence on the relationship between e-learning effectiveness and its usage in educational activities in developing countries is still scarce. This trend is attributed to the lack of uniform indicators of assessing effectiveness of e-learning. Thus, a clear understanding of the effectiveness of e-learning on educational practices is also necessary for effective access and use of e-learning in teaching and learning achievement.

3.3.3 Factors Influencing Implementation of e-learning

There are many factors that influence the implementation of e-learning in education institutions. Such factors include technological characteristics (Njenga, 2011 and Munguatosha *et al.,* 2011), user characteristics (Taha, 2014; Ordonez, 2014), pedagogical characteristics (Anderson and Gro¨nlund 2009; Mtebe and Raisamo, 2014), and institutional characteristics (Tarus and Gichayo, 2015; Madar and Wills, 2014; Khan, 2005; Dabbagh, 2005). Others include social characteristics (Fresen, 2010; Busaka *et al.,* 2016) and environmental characteristics (Teo, 2011; Zhu and

Mugenyi, 2015; Yew and Jambligan, 2015). The critical review of these factors is paramount in revealing the strengths and weaknesses in this study as presented in the following subsections.

3.3.3.1 Technological Characteristics

There are several internal technology-related characteristics that have been researched in the current study and have some influence on the implementation of e-learning for sustainable use. These include and not limited to compatibility, relative advantages, ease of use, authenticity, and complexity of the technology (Roggers, 2003). For instance, a study by Sanga (2010) identifies factors with characteristics such as usability, maintainability, and deployability as critical in user satisfaction and acceptance of the e-learning system. A study by Njenga (2011), which employed DOI and UTAUT theories, revealed that the perceived usefulness, self-efficacy, demonstrability, the perceived ease of use, complexity, and compatibility were important technological characteristics that influenced e-learning implementation. Munguatosha *et al*. (2011) studied social networked learning adoption in universities in Tanzania employing Vygotsky's social development theory. The findings indicate that ease of use and relative advantage are among the technological factors that influenced social networked learning adoption and implementation. Ndonje (2013) conducted a study on e-learning adoption in Tanzania using DOI to explain the causal chain of the constructs. The findings indicate that technological complexity, compatibility, and relative advantage have significant influence on e-learning implementation. Therefore, studying and determining technological factors that significantly influence e-learning implementation are important.

3.3.3.2 User Characteristics

Several user related characteristics that have some influence on implementation and sustainable use of e learning have been researched in the current study. These include and not limited to effort expectancy, self-efficacy, and performance expectancy. It is widely acknowledged that user characteristics influence the way e-learning is perceived, implemented, and used. A study by Park (2009) indicates that user

attitudes towards e-learning significantly influence e-learning implementation. Similarly, Zewayed (2012) conducted a study on users' adoption of e-learning among 926 secondary schools in Bahrain and found that self efficacy and motivation influence e-learning implementation. A study by Taha (2014) revealed that the following factors have significant influence on e-learning implementation in the Kingdom of Bahrain, namely student characteristics (computer skills, motivations, and self-efficacy), and teacher's characteristics (attitudes, control of technology and pedagogy, and teaching style). Others include technological characteristics (quality and effectiveness of infrastructure), as well as design and content (perceived ease of use, quality content). Ordenez (2014) conducted a comparative study in four countries (China, Spain, USA, and Mexico) on predicting international critical success of e-learning. The findings revealed that course design, learning contents, and prior knowledge were significant predictors in learner's success towards e-learning. The author observed further that course design, instruction, learning platform, learning interaction, and learning contents are factors that affect an effective online teaching and learning process.

In contrast to the foregoing arguments, Dowling *et al*. (2003) point out that factors, which are related to users, improve e-learning implementation for education quality, apply only for specific forms of collective assessment. Akkoyuklu and Soylu (2006) revealed that factors related to users could not simply support e-learning implementation in the absence of supporting social interactions. The most noticeable criticism of the implementation and use of e-learning is lack of a vital factor such as social interactions, not only between learners and instructors, but also among learners (Al-adwan and Smedly, 2012). In general, for any technology to be valuable, it should be appropriated into particular user characteristics accompanied with other supporting factors such as pedagogical and social characteristics.

3.3.3.3 Pedagogical Characteristics

There are several pedagogical-related characteristics that have been researched in the current study and have some influence on the implementation of e-learning for sustainable use. These include but not limited to e-learning content development, education training, and user skills. Pedagogical characteristics play a crucial role in influencing the implementation of e-learning in improving accessibility, efficiency, and quality of teaching and learning. A study by Khan (2005) revealed that pedagogical characteristics are the key factors that directly influence the e-learning implementation. As Mtebe and Raisamo (2014) observe, the quality and appropriate course contents are the determinants of the e-learning implementation. Thus the provision of pertinent training to e-learning users particularly lecturers, would enable these users develop quality e-learning contents which have a positive effect on students' satisfaction towards the use of e-learning system. Tarus and Gichayo (2015) affirmed quite clearly that users' skills on e-learning, adequate, and quality e-learning content are important pedagogical characteristics that significantly influence successful implementation of e-learning. However in practice, e-learning is used as add on function in most universities in developing countries without integrating it in the pedagogical features. In other words, learning involves teaching by considering course curricular, contents, and teaching strategies as pedagogical characteristics.

As Anderson and Gro¨nlund (2009) observe, pedagogical characteristics need to be clearly stated and considered in successfully implementation of e-learning. Empirical studies indicate that one of the reasons of the failure of many e-learning projects is the resistance against change among e-learning users (Njenga and Fourie, 2010). This is attributed to inadequate consideration of pedagogical issues. In another study, Ndonje (2013) observes that since e-learning is quite different from traditional settings, pedagogical characteristics need to be designed specifically to fit the e-learning in order to influence significantly its implementation. In this regard, pedagogical characteristics with their focus on teaching and learning are inevitable when planning to integrate any technology in the educational context.

3.3.3.4 Institutional Characteristics

There are several institutional-related characteristics that have been researched in the current study and have some influence on the implementation of e-learning for sustainable use. These include but not limited to financial, ICT policy, management support, commitment, and training on e-learning. Institutional characteristics are the major factors for successful implementation of e-learning. It is thus widely acknowledged that clearly defined institutional characteristics may lead to effective e-learning implementation in the education context. Studies (e.g. Tarus and Gichayo, 2015; Njenga, 2011; Madar and Wills, 2014; Khan, 2005; Dabbagh, 2005) have confirmed the theoretical and empirical facts of significant influence among the institutional characteristics in successful implementation of e-learning. For example, Tarus and Gichayo (2015) studied the influence of pre-condition factors on the implementation of e-learning in Kenya universities. The findings revealed that institutional characteristics had significant influence on e-leaning implementation. Njenga (2011) investigated factors influencing e-learning adoption and use in the Eastern and Western countries using exploratory design. The findings show that institutional characteristics had a significant contribution to the implementation of e-learning. Thus, decision, support, commitment, and availability of funds are the necessary institutional characteristics for the implementation of e-learning.

Similarly, Khan (2005) established institutional characteristics such as budget, commitment, constructive communication, and management support as having significant influence on e-learning implementation. A study by Rogers (2003) showed that constructive communication between the various stakeholders within institutions, significantly influence the adoption, and implementation of any innovation. As Munguatosha *et al*. (2011) elaborate, self-efficacy, reliable technical and administrative support, adequate budget, accountability, and flexible institutional structure were the factors, which were found to influence the e-learning implementation. These findings demonstrate that in the absence of institutional characteristics, the implementation of e-learning in education remains elusive. Thus, the institutional characteristics have the potential of improving formal and informal

activities related to e-learning implementation to support education aspects. It is argued however that in practice, institutional characteristics such as budget and commitment towards the implementation of e-learning are inadequate in most universities.

3.3.3.5 Social Characteristics

There are several social-related characteristics that have been researched in the current study and have some influence on implementation of e-learning for sustainable use. These include but not limited to social interactivity, subjective norms, image/status. A number of studies (e.g. Khan, 2005; Fresen, 2010; Busaka *et al*., 2016) have explained the influence of social factors in e-learning implementation. For example, Khan (2005) argues that, social interaction, cultural interaction, and increased motivation of using e-learning influence the implementation of e-learning particularly in education context. Munguatosha *et al*. (2011) insist that among the application of social networking sites twitter and blogs provide the opportunities for the user to socialize, chat, and exchange their ideas while learning. This in turn increases positive attitude towards the adoption and use of e-learning. Social constructivist learning theory postulates that applicability of social networking sites enables universities to achieve social aspects of user's learning of gaining status or image (Vygotsky, 1978). However, in most cases, e-learning users lack appropriate training and awareness of understanding the essence of using social e-learning platforms in teaching and learning context.

The findings from a study by Sridharan *et al.* (2008) revealed that social characteristics are among the critical success factors on the implementation of e-learning in HEIs. This factor provides productive relationship among users, discussion groups, and collaborations. Khan (2005) and Ghinea (2013) argue that lack of consideration of social factors leads to a great challenge that negatively influence the implementation of e-learning. Taha (2014) conducted a study on the success of e-learning in the Kingdom of Bahrain and found that social presence in terms of subjective norm was found to be an influential factor either directly or

indirectly on the implementation of e-learning. Similarly, the analysis of the findings of several studies indicates that users such as students and lectures are fully aware of the significance of social interaction in supporting successful e-learning implementation (Malik, 2010; Mbarek and Zaddem, 2013). It is argued that e-learning implementation in relation to social characteristics has two perceptions y; one is student's interaction with learning materials and technologies, and another is the social activity of exchanging and generating ideas (Nunes and McPherson, 2007). Thus, these views draw attention and require consideration through e-learning training and workshops prior to the implementation of e-learning

3.3.3.6 Environmental Characteristics

There are several environmental-related characteristics, which have been researched in the current study and found to influence the implementation of e-learning for sustainable use. These include but not limited to internet/bandwidth, electricity, and ICT infrastructure. Environmental characteristics are reported as important in influencing the implementation of e-learning differently, as a general factor and as a specific factor. For instance, Yew and Jumbligan (2015) conducted a review of studies and discussed critical factors on the implementation of e learning in Malaysia. The authors identify environmental factors such as hardware and software as the necessary e-learning infrastructures. Zhu and Mugenyi (2015) conducted a SWOT analysis on the integration of e-learning in Ugandan and Tanzanian universities and revealed and revealed internet connectivity, bandwidth, and sustainable electricity as the general environmental characteristics that significantly influence the implementation of e-learning. Thus, absence of environmental characteristics in many universities in developing countries is a major limitation for these universities to implement e-learning.

As Teo (2011) argues, inadequacy of technical support contributes significantly to the failure of implementing e-learning. Training skills and administrative support are reported as important factors in influencing e-learning implementation and thereby surpassing effective use of the technology. As observed by Yew and Jambulingan

(2015), the support from ICT units or departments significantly helps users to use the e-learning effectively. It might be very difficult for them to catch-up through only training. In this regard, computer hardware and software are necessary to e-learning users for successful implementation of e-learning. This argument implies that absence of sufficient ICT infrastructure dishearten e-learning implementation in the educational aspects.

Studies on the factors influencing implementation of e-learning have been done in different context and with unique methodologies. This makes the level of e-learning implementation differ from one context to another. Scholars (e.g. Njenga, 2011; Painter-Marland *et al*., 2003; Rogers, 2003) conclude that although studies on the implementation of e-learning explain various factors, which vary depending on the type of innovation, the potential adopters and users, and their unique context of implementation. Besides, these factors are mainly limited to technological and institutional dimensions. Social, environmental, user, and pedagogical issues are inadequately addressed in most of the reviewed studies. Further, despite that there are researches that addressed various factors on the implementation of e-learning, these factors are still not addressed in most recent studies in Tanzanian universities (Nagunwa and Lwoga 2012; Sanga *et al*., 2013; Kisanga and Ireson, 2015). To fill this empirical knowledge gap, this study determined a wide range of factors (technological, institutional, pedagogical, environmental, social and users) for successful e-learning implementation in the context of Tanzania.

3.3.4 Existing E-learning Implementation Models

A model is defined as an important approach in supporting the implementation of any technology including educational technologies. Previous studies (Khan, 2005; Dabbagh, 2005; Madar and Willis, 2014; Tarus and Gichoya, 2015) have developed e-learning models. Khan (2005) identified eight dimensions of e-learning evaluation including pedagogical, technological, interface design, evaluation, management resource support, ethics, and institutional. Dabbagh (2005) developed a model that identified factors from technological characteristics and pedagogical characteristics

for supporting the implementation of e-learning. Madar and Willis (2014) extended the Dabbagh's (2005) model which identified pedagogical, technological, and institutional factors; and Tarus and Gichayo (2015) proposed a pre-conditional model composed of pedagogical, technological, and institutional factors. Therefore, in view of the cited studies, it can be noted that the implementation of e-learning has many dimensions depending on the nature of the potential e-learning adopters and their unique context where it is implemented.

Khan's (2005) e-learning model is an important contribution in providing guidance in the planning, designing, development, delivery, evaluation, and implementation of e-learning environments (Figure 3.4). The model also offers a logical base for all e-learning instructional designers to facilitate evaluation of an effective e-learning environment (Taha, 2014). However, Khans' model does not take into consideration the role of e-learning users. It is believed that a meaningful and successful e-learning environment can be implemented for a particular group by considering users' characteristics (Suail and Mugisa, 2009). For instance, identification of the key users and their roles is particularly important (Kituyi and Tusubira 2013; Taha, 2014). Lacking capacity building in human resource is also considered as one of the inadequacies of the model. Besides, Khan's model is suitable and appropriate at the time it was formulated and constructed and in the context of advanced economy. Many factors and emerging trends such as social, user, and technology characteristics have taken prominence in giving way for the modification of the approach for successful implementation of e-learning.

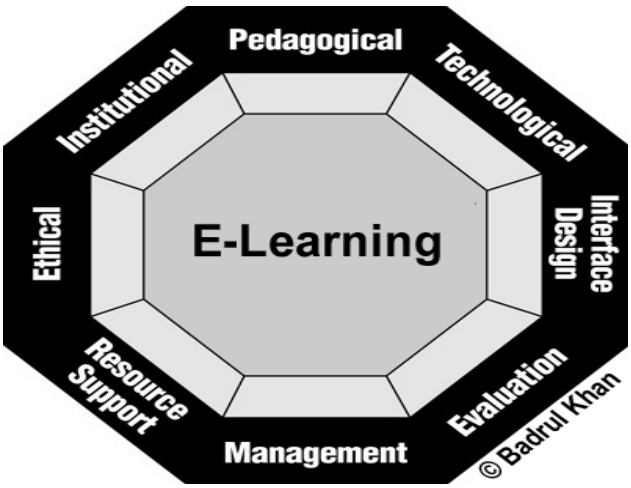


Figure 3.4: E-Learning Model (Khan, 2005)

Dabbagh (2005) developed a theory-Based Design model for e-learning implementation as a means of combining strategies, learning technologies, and pedagogy (Figure 3.5). In this model, the elements of instructional design and pedagogy represent the pedagogical dimensions of the model and technology that assist both dimensions to work together effectively and efficiently. However, the theory-based model does not adequately address the user's characteristics, neither does it address institutional or social support dimension (Madar and Wills, 2014; Taha, 2014). As Andrews and Haythornthwaite (2009) contend, these dimensions are primarily related to e-learning implementation. Similar argument is made by Rosenblit and Gros (2011) that due to its relationships, a change in any of these dimensions also affects other dimensions during the implementation of any technology.

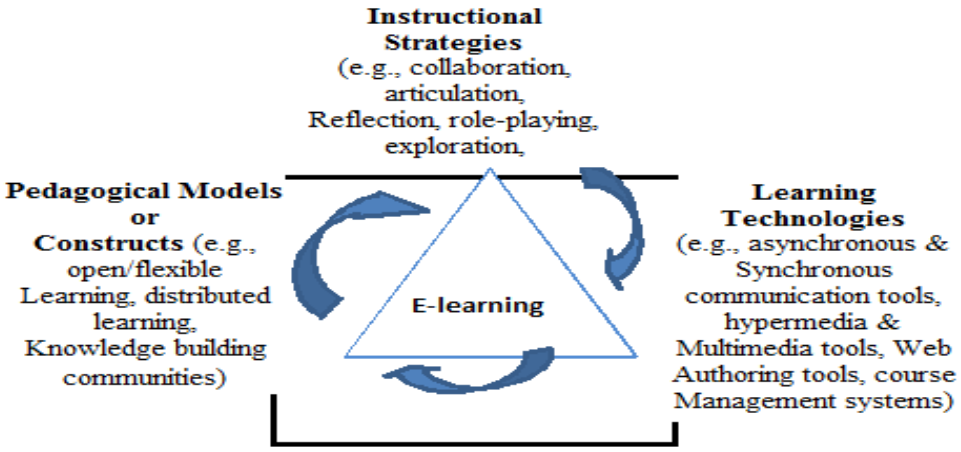


Figure 3.5: Theory-Based Design Model (Dabbagh, 2005)

Madar and Willis (2014) developed a funnel model joining three interrelated components that interact for successful implementation of e-learning (Figure 3.6). The Funnel Model is designed to address the mismatches between curriculum design of e-learning and its delivery. In addition, the model was relevant to the current study as it incorporates institutional dimension, which encompasses governance and finance. However, the model's weaknesses resides on ignoring social, environmental, and user dimensions (Malik, 2010; Mbarek and Zaddem, 2013; Maina and Nzuki, 2015). Similar views are explained by other studies (e.g. Ali *et al*. 2013; Kituyi and Tusubira, 2013; Taha, 2014) who observe that the implementation of e-learning is not considered in a narrow dimension, however, a model with different factors from broader dimensions including environmental, social, and behavioural contexts.

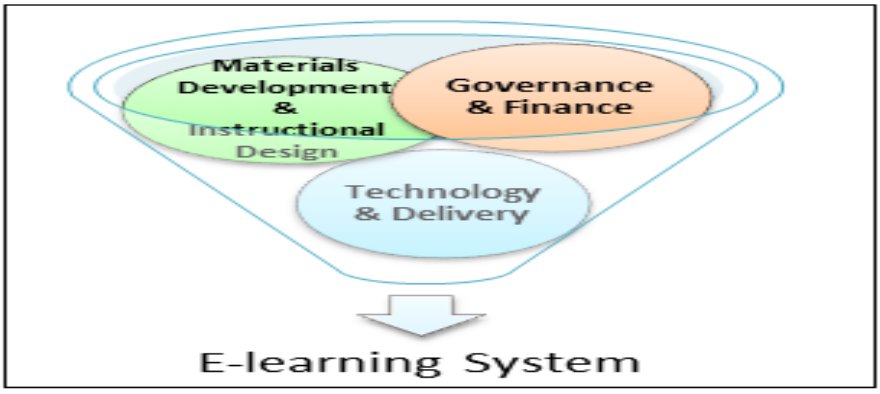


Figure 3.6: Funnel Model for E-learning (Madar & Willis, 2014)

Tarus and Gichayo (2015) proposed a three-precondition model for a successful implementation of e-learning in Kenyan universities (Figure 3.7). These pre-conditions include technological, organizational, and pedagogical components. These factors were considered important for successful implementation of e-learning. However, the model lacks other dimensions such as social, environmental, and user characteristics. These dimensions are considered critical in successful implementation of e-learning (Bagozz, 2007; Njenga, 2011; Terrace, 2011; Taha, 2014). For instance, the environmental dimension namely ICT infrastructures, government policies, and regulations are critical variables and are more sensitive in fast tracking the implementation of innovation and technologies (Rosenblit and Gros, 2011). These observations imply that planning for the implementation of e-learning requires a holistic approach including many factors from wide dimensions.

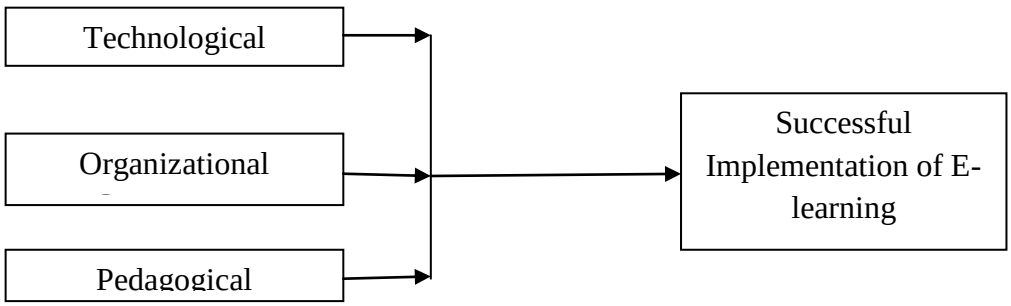


Figure 3.7: Pre-conditions Model (Tarus & Gichayo, 2015)

The existing e-learning implementation models play an important role in education context. Nonetheless, most of these models have been widely applied in developed countries for the e-learning implementation. The application of these models varies depending on the type of technology, potential adopters, and the unique context for which it was developed (Njenga, 2011). The models contribute to the current study by providing important factors in relation to the education context of Tanzania as summarized in Table 3.2. Such factors include technological, institutional, and pedagogical characteristics. Nevertheless, usefulness of these models is limited due to lack of other important factors such as environmental, social, and human factors. To overcome this limitation, this study is developing a comprehensive model addressing factors from a broader dimension for implementing e-learning in Tanzanian universities.

Table 3.2: Summarized Strengths and Weakness of Reviewed Existing Models

Model	Strengths	Weaknesses
E-learning Model (Khan, 2005)	It emphasizes institutional, pedagogical, Technological, management, evaluation and interface design characteristics	Does not capture social, environmental characteristics and human factors
Theory based design model (Dabbagh, 2005)	It addresses pedagogical and technological characteristics	Does not capture social, environmental, institutional characteristics and human factors
Funnel Model (Madar and Wills, 2014)	It addresses pedagogical, technological and institutional characteristics	Fails to capture environmental, social, and human factors
Pre-conditions Model (Tarus and Gichayo, 2015)	It addresses organizational, pedagogical and technological characteristics	Fails to capture environmental, social, and human factors

3.3.5 Methodological Review for Similar Studies on E-learning

Studies on e-learning have been conducted over the past years employing various methodologies in different contexts. Although literature has a wide coverage of research methodologies used in these studies, this review focused on the main themes that appear repeatedly throughout the literature. These themes include research

design, sampling techniques and sample size, research tools, data analysis techniques and limitation of each methodology.

3.3.5.1 Research Design Used in Previous Studies

Both quantitative and mixed (quantitative and qualitative) approaches have been commonly employed in e-learning studies as indicated in Table 3.3. Majority of studies are deductive in nature, and aimed at examining and confirming the predetermined research question/hypothesis and generalized sample results to the targeted population (Creswel, 2013). The deductive study employs a "theory - concept - knowledge" approach. Six out of the eleven reviewed studies employed quantitative design while five employed mixed designs. Quantitative design was appropriate for the current study, as it tended to generalize the findings in addressing issues of reliability.

3.3.5.2 Sampling Techniques Used in Previous Studies

In order to produce valid and reliable results that can be generalized to the targeted population, large sample size and the use of probability supplemented by non probability sampling techniques in quantitative methods are necessary (Tabanchnick and Fidel, 2001). Most studies have mainly employed probability-sampling techniques and few studies used non-probability sampling techniques such as convenience, purposeful and quota sampling in selecting the respondents (Table 3.3). However, non-probability or probability sampling techniques on their own are not ideal in researches that intend to generalize sample results to large population with similar characteristics. They tend to generate representative sample that may not produce reliable results when generalized to a population (Kish, 1995 and Teddlies and Yu, 2007).

Limited studies on e-learning have applied both probability and non probability sampling approach. The use of probability supplemented by non-probability sampling techniques is considered as ideal because it captures all factors within the study and produces representative sample if carefully applied (Teddlies and Yu,

2007). Such factors include the absence of sampling frame, time limitation, and inadequacy of funds and manpower. In additional, if the study population is very large leading to various groups with different characteristics, a mixture of sampling techniques is inevitable. In order to improve the quality of the study, probability sampling supplemented by non-probability sampling techniques was adopted in the current study.

Table 3.3: Methodological Review

Article/Topic	**Country where study conducted**	**Research Type**	**Sampling Technique/Sample size**	**Research tool/Respondents**	**Data analysis Techniques**	**Methodological Limitations**	**Data Collection tools**
El-Zayat (2009). A strategy to improve, E-learning adoption, implementation and development	Egypt	Mixed methods	Stratified and simple random sampling/Sample size of 807	Questionnaire, focus group, interview/students and academic staff	Multivariate analysis	Limited on probability sampling	Questionnaire and Semi structured interview
Ma (2010). Implementing in Traditional Universities	China and Sweden	Quantitative method	Multistage clusters and simple random sampling techniques/Sample size of 342	Questionnaire survey/Lecturers	Multivariate analysis techniques	Limited on probability sampling, it was not ideal for generalization of study findings	Questionnaire
Al-alak (2011). Measuring the Acceptance and Adoption of E-Learning	Jordan	Quantitative method	Simple random sampling/Sample size of 1000	Questionnaire survey/students	SEM technique	Limited on probability sampling, it was not ideal for generalization of study findings	Questionnaire
Algahtan (2011). Evaluating the	Saud Arabia	Mixed Method	Purposive sampling/ sample size	Questionnaire and focus group interview/Mal	Multivariate analysis techniq	The sampling technique was not	Questionnaire and Structured

Article/Topic	Country where study conducted	Research Type	Sampling Technique/Sample size	Research tool/Respondents	Data analysis Techniques	Methodological Limitations	Data Collection tools
Effectiveness of the E-learning			of 321	e students	ue	ideal for generalization of study findings	Interview
Njenga (2011). E-learning adoption	Eastern and Southern Africa	Mixed methods	Simple random/ Sample size was 67	Questionnaire Survey and in-depth interview/Academic staff	Multivariate and SEM techniques	The sample size was too small to generalize the findings	Questionnaire and Structured Interview
Munguatosha *et al*. (2011). Social Networked learning adoption model	Tanzania	Mixed methods	Simple random, stratification and purposeful/Sample size was 1,500	Questionnaire and Interview	SEM technique	The sample size was extremely large for mixed method	Questionnaire and Interview
Taha (2014) Investigating the Success of E-Learning in Secondary Schools	United Kingdom of Bahrain	Quantitative method	Simple random sampling/sample size was 400	Questionnaire survey/students and Teachers	T-test and ANOVA	Limited on probability sampling technique was not ideal for generalization of study findings	Questionnaire
Ordonez (2014). Predicting International Critical Success Factors in e-learning	China and Mexico	Quantitative Method	Purposive sampling/Sample size of 279	Survey questionnaire/ students and Lecturers	Multivariate analysis	The sampling technique was not ideal for generalization of findings	Questionnaire
Abu-Al-Aish (2014). Toward	UK	Quantitative method	Not described	Questionnaire survey/students and lecturers	SEM technique	sampling technique is adequately	Questionnaire

Article/Topic	Country where study conducted	Research Type	Sampling Technique/Sample size	Research tool/Respondents	Data analysis Techniques	Methodological Limitations	Data Collection tools
Mobile Learning Deployment in Higher Education						described	
Lwoga and Komba (2015). Antecedents of continued usage Intentions of web-based LMS	Tanzania	Quantitative method	Simple random/sample size 300	Questionnaire survey/students and staff	Multivariate analysis technique	Limited on probability sampling technique	Questionnaire
Taurus and Gichayo (2015). Pre-condition for successful e-learning implementation	Kenyan	Mixed method	Purposive sampling/Sample size was 512	Questionnaire and In-depth interview/students, lecturers and supporting staff	Multivariate analysis	The sampling techniques was not ideal for generalization of study findings	Questionnaire and structured Interview

3.3.5.3 Research Tools/Techniques Used in Prior Studies

Structured questionnaire, focus group, and in-depth interview were the commonly employed research tools for data collection in previous studies (Table 3.3). These techniques were chosen because of the nature of the research design employed. For instance, six quantitative design based studies employed structured questionnaire supplemented by interview guide while five mixed research design based studies employed structured questionnaire, focus groups, and in-depth interviews. Thus, the structured questionnaire supplemented by an interview guide is very important for a

quantitative design based study. This in turn increases generalization of the study findings.

3.3.5.4 Analysis Techniques Used in Relevant Previous Studies

An empirical review summary in Table 3.3 shows that multivariate analysis techniques except structural equation modelling (SEM) were commonly used in the majority of the studies in analyzing the relationship between independent and dependent variables. However, multivariate technique assumes that independent variables are measured with errors (Tabancnick and Fidel, 2007). Additionally, the technique is criticized for its inability to model individual variables and variables of a single factor. As Hair (2003) observes, in examining the relationships between multiple dependent and independent constructs simultaneously, the relationship between latent variables and their observed variables has to be considered. This is because this relationship shows how each variable measures the latent variables. All of these are difficult to be evaluated when analyzing the data using other multivariate method only without SEM.

3.4 Research Gaps

The research gap, which was revealed through a review of literature, was found to limit the ability of e-learning decision-makers (including policy-makers, practitioners) and other stakeholders. The decision maker fails to make decisions concerning the improvement of e-learning implementation in Tanzanian universities. The gap has been divided into three categories as presented in the following subsections.

3.4.1 Theoretical Gap

Although DOI, UTAUT, and TPB have been extensively used in studying e-learning (Saimu, 2006), they have shown that e-learning implementation focused on the perceptions towards technological and user' characteristics but little on social and environmental characteristics. However, the e-learning implementation in education

context may in fact be influenced by external factors as well (Ajzan, 1985). These include pedagogical, institutional, and environmental characteristics; these have been inadequately captured in the theories. Therefore, considering this theoretical gap, external and internal factors have been clearly addressed through comprehensive conceptual framework for guiding this study.

Important models on e-learning implementation have been reviewed globally. However, models and theories of e-learning are still deemed inadequate in embracing comprehensive relevant factors from dimensions such as technological, pedagogical, institution, users, social, and environmental characteristics. Many of the existing models have considered factors mainly from technological, pedagogical, and institutional characteristics leaving out environmental, social, and human factors (User) characteristics. Therefore, the reviewed literature indicates the absence of appropriate, innovative, and inclusive e-learning implementation model with broader factors for successful implementation of e-learning in Tanzanian universities in order to sustain the e-leaning uptake. Thus, the current study was set to address this research gap, which is also part of the fourth specific research objective presented in Chapter One.

3.4.2 Empirical Gap

Despite the escalating global researches on e-learning implementation, there are concerns in the literature that empirical research on the topic has not been diverse in terms of concept and context (Kahiigi *et al.*, 2013). The researched topics are limited to the usage of e-learning, effectiveness of e-learning and e-learning critical factors in the education context. Overall, much of this research has been carried out in the developed world, Europe, Asia, and Latin America. The empirical literature review indicates that the available researches in developing countries had not adequately ascertained the extent of e-learning uptake, e-learning effectiveness, and the factors influencing e-learning implementation generally.

Although previous studies have investigated the extent of uptake of e-learning, the concept of e-learning uptake is said to have been explained and interpreted subjectively. Most of these studies focused on the availability of e-learning in determining the extent of e-learning uptake. Thus, other critical variables including attitudes, awareness, and accessibility of e-learning have been scarcely considered in research in the context of Tanzania. There are also concerns that evidence on the actual extent of e-learning uptake in Tanzanian universities is still scarce (Ndume *et al.,* 2008; Kahiigi *et al.,* 2013). Thus, this study was set to address this research gap, which is also part of the first specific objective presented in Chapter One.

Despite the notable characteristics of the utilization of e-learning in education, its effectiveness in teaching and administration of learning activities remain elusive and open to debate as there are few conclusive statements. It is also argued that data on the perceived effectiveness towards e-learning technologies are limited in Tanzania. In developing countries, there is paucity of information about the relationship between e-learning technologies and teaching, learning, and administration activities. The reviewed empirical literature shows the role of e-learning in learning context but there is paucity of documented information regarding the effectiveness of e-learning systems on education practices particularly in the Tanzanian universities. Thus, this study was set to address this research gap, which is also part of the second specific objective presented in Chapter One.

Several studies, which have been reviewed on e-learning implementation, mainly focused on the factors influencing the implementation of e-learning. However, these factors vary depending on the type of innovation and the potential adopters and their unique context. In this regard, little is documented on the factors influencing e-learning implementation in the Tanzanian universities including social, pedagogical, and environmental. Hence, this study was set to address this research gap, which is also part of the third specific objective presented in Chapter One.

3.4.3 Methodological Gap

Concerning e-learning implementation, eleven studies, which were reviewed (See Table 3.3) revealed that majority of studies, focused on the probability or non-probability sampling techniques. It is argued that employing only one kind of sampling technique is not ideal especially with a quantitative design based study that intends to generalize the finding. For instance, a study by Ordonez (2014) in Predicting International Critical Success Factors in e-learning used purely quantitative design and the population of the study was very large (see Table 3.3). The study employed purposely-sampling technique only which in reality is not adequate for the generalization of the study findings to other universities with similar characteristics.

Few studies (see Table 3.3) employed SEM multivariate technique, which enables a more powerful analysis than what can be achieved by other different multivariate analysis techniques, taking into account the modelling of interactions, correlated independents, measurements of errors, correlated error terms, multiple latent independents and one or more latent dependents. For these reasons, the current study employed a SEM multivariate analysis technique supplemented by other multivariate analysis techniques such as Factor analysis. Further, there was a need to use both probability and non-probability sampling techniques for a quantitative design based study to allow generalization of the study findings.

3.5 Conceptual Framework Development

The conceptual Framework was proposed (based on the assumptions and requirements of SEM as outlined clearly in Chapter 4) to guide this study, and which was expressed using latent variables with the observed variables or indicators. The conceptual framework was developed in relation to the gaps revealed in both empirical and theoretical literature by including social, user, and environmental characteristics apart from technological, institutional, and pedagogical characteristics, which were observed to dominate the majority of models and theories. The focus of current study was on developing a model for improving

implementation of e-learning in Tanzanian universities. Thus, the established conceptual framework has been considered “e-learning implementation level” as a phenomenon studied and is addressed as a dependent concept as indicated in Figure 3.8. Factors from theories and empirical studies of e-learning were considered and addressed in Figure 3.8 as independent variables. From Figure 3.8, the six latent variables with their indicators are independent variables. The e-learning implementation level with their indicators is the dependent part of the conceptual framework.

Thus, the conceptual framework depicted in Figure 3.8 serves as the foundation of the development of e-learning implementation model in this study using Structural Equation Modelling (SEM).

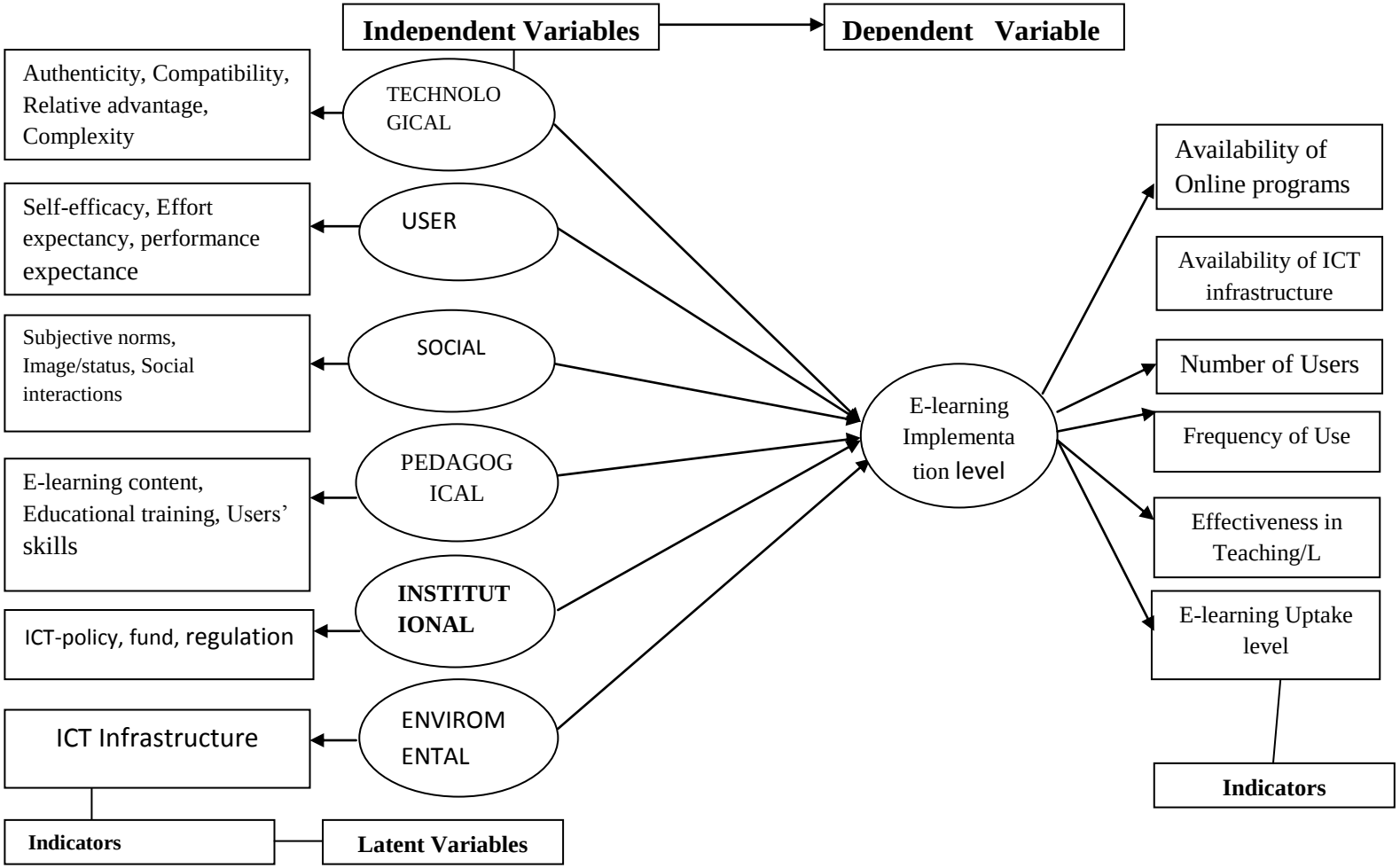


Figure 3.8: A Conceptual Framework Based on DOI (Rogers, 2003), UTAUT (Vekantesh, 2003), TPB (Ajzen, 1991)

The theoretical review, DOI captured factors from technological and users characteristics only, while UTAUT captured factors from technological and users characteristics and very little on social characteristics. TPB goes beyond these theories by encompassing technological and social characteristics. However, in both theories, environmental, pedagogical, and institutional characteristics were inadequately addressed. Similarly, the empirical review shows that few studies captured factors from user, environmental and social aspects in different contexts (Namisiko *et al*., 2014; Taha, 2014; Tarus and Gichayo, 2015). The proposed conceptual framework of the current study addresses the identified gaps from the theoretical and empirical point of view. This is supported by other scholars (e.g. Ali *et al*., 2013; Rosenblit and Gros, 2011) to incorporate social, users and environmental aspects in developing a model for successful implementation of e-learning in Tanzanian universities as the overall research objective of the current study. The proposed conceptual framework is as depicted in Figure 3.8.

From literature review, it has been revealed that e-learning dimensions include the latent variables such as technological, user, pedagogical, institutional, environmental, and social that influence the e-learning implementation level. These factors alter the availability of ICT infrastructure and resources, the extent of e-learning uptake, user motivation, effectiveness in teaching and learning systems, the number of e-learning users and availability of online curriculum programmes which in turn lead to successful implementation of e-learning. The relationships between latent and observed variables are presented in Figure 3.8 and presented in Table 3.2.

3.6 Operationalisation of Variables

Operationalisation of the observed variables from manifest or measurable variables describe and define how the research variables can be measured and hence enables the researcher to establish specific types of questions in the data collection tools. The operationalization of variables is deemed important in achieving theoretical and statistical validity of the study findings. The following variables as presented in Table 3.4 have been operationalised

Table 3.4: Operationalisation of Variable

Latent variables	Measurable Indicators	Description and sources
Technological Characteristics	Compatibility (CB),	Compatibility is used to describe how different systems are capable of exchanging data via a common set of procedures (Davis, 1989 and Rogers, 1995).
	Authenticity	Authentic activities are defined as tasks that are relevant and useful to the real world, and provide the learners with a scenario of identifying the outcome and activities that are logically related to the scenario (Ndonje, 2013)
	Relative Advantages	Is an indicator which makes e-learning less frustrating by making it more interactive and engaging, be able to adjust the time, location, content according to their own personal schedules (Davis, 1989 and Rogers, 1995)
	Complexity	Complexity in e-learning is measured by finding, among others, how cumbersome it is to use, ease of acquiring eLearning skills, and elements of frustrations in using eLearning. It is postulated that the lesser eLearning is perceived to be complex, the more likely is the decision to adopt it (Njenga, 2011).
Users Characteristics	Effort expectance	The degree of ease that an individual thinks he or she will have when using the technology (Vankatesh, 2003: Namisiko, 2014)
	Performance expectancy	Performance expectancy is defined as the extent to which a person believes that using an information system would help him or her to benefit in terms of job performance (Vankatesh, 2003: Namisiko, 2014).
	Self efficacy	One‘s perceptions of his or her confidence to engage with the available e-learning technologies to complete specific tasks (Munguatosha *et al*., 2011: Ndonje, 2013:Adedoja, 2013)
Pedagogical Attribute	E-learning contents development	Course content that meet intended educational benefits, appropriate to learners’ knowledge, skills and abilities in order to behave and use LMS, and to increase learners’ satisfaction with the system (Tarus & Gichayo, 2015: Namisiko, 2014)
	Education Training	Refers to clear training strategy, and training needs (Tarus and Gichayo, 2015: Ndonje, 2013
	Users’ skills on e-learning	Refers to the ability of users to integrate e-learning and learning context for behavioural use LMS (Tarus & Gichayo, 2015)
Institutional Characteristics	Financial allocation	Critical in supporting e-learning related activities such as installation and maintenance of the e-learning platform, training of instructors, e-content development as well as e-learning infrastructure development (Tarus & Gichayo, 2015: Ndonje, 2013)
	National/Institutional policy (IP)	The policies that assists the wide adoption and 59behaviour59on using e-learning to support learning and teaching in higher learning institution for example ICT policies and Educational policies (Tarus & Gichayo, 2015: Ndonje, 2013).
	Training on e-learning (TE)	Provision of ICT knowledge through workshops and seminar implementation must be done and supported by institutions for creating awareness and experience on how to use e-learning sustainably (Ndonje, 2013)
Social Characteristics	Social interactivity	Such social services are: Online chat-rooms, online conversation and discussions using social networking sites such as twitter, facebook etc.
	Subjective norm	Subjective norms (SN) refer to the perceived social pressure to perform or not to perform the 59behaviour.” Thus, SN is directly proportional to the sum of the products of individual’s beliefs concerning others’ view of behaviour and the individual’s willingness to comply with the number of the salient normative beliefs identified

Latent variables	Measurable Indicators	Description and sources
		(Ajzen, 1991; Al-alak, 2011).
	Image or Status	It is defined as the degree to which the use of an innovation is perceived to enhance one's image or status in one's social system (Vankatesh, 2003; Maina & Nzuki, 2015).
Environmental Characteristics	ICT Infrastructure	Refers to the basics things that act as a road of supporting the deployment of e-learning systems. Such infrastructure includes availability of internet connectivity, sustainable e-electricity, and bandwidth and ICT unit/directorate to oversee and provide technical support (Zhu and Mugenyi, 2015 and Tarus and Gichayo, 2015).

3.7 Chapter Summary

Chapter Three reviewed both theoretical and empirical literature on e-learning implementation. Theoretical review focuses on various theories and selected DOI, UTAUT and TPB to guide the current study. These theories contributed significantly to the current study. However, they focus on technological, user, social characteristics, but little on environmental characteristics and without considering institutional and pedagogical factors, which are also important in e-learning implementation. Empirical review focuses on the extent of uptake of e-learning, its effectiveness, factors influencing e-learning implementation, and the existing similar e-learning implementation models as well as methodologies used in the previous studies. It has been unequivocally shown that the extent of e-learning uptake in the context of Tanzania is still unclear. For this reason, the extent of e-learning uptake has been explained subjectively. The literature indicates that there are still different perceptions towards effectiveness of e-learning in teaching and learning which lead to ineffective access and use of e-learning. Further, the literature indicates that the existing models focus on pedagogical factors without addressing users, social and environmental factors that are equally important in supporting e-learning implementation. Moreover, several studies used homogeneous sample and sampling techniques, which were inadequate in generalizing data to a particular population. Finally, this Chapter pointed out theoretical and empirical gaps, which facilitated the development of the conceptual framework presented in Figure 3.8.

CHAPTER FOUR

RESEARCH METHODOLOGY

4.1 Introduction

This chapter presents the research methodology that was employed in this study and this includes the research philosophy, the research approaches and their justification, the research design, the study area, the study population, the sampling technique, the sample size, and the unit of analysis. Data collection technique and data collection instruments, methods of analysis, procedures, and modelling stages are also presented. The chapter illustrates how validity and reliability issues were considered and achieved. Finally, the chapter presents ethical issues in this study.

4.2 Research Philosophy

Various research philosophies influence researchers' way of perceiving the phenomena under the study and of reflecting on the research methods, study design, and analysis techniques (Saunders *et al*., 2012). According to Myer (2009), the most appropriate philosophies are those labelled as epistemological assumptions, which fall into two main paradigms including positivistic and phenomenological (interpretive). The positivism paradigm is based on the assumption that there are factual based data about the social world. These data can be collected and analysed to obtain the needed facts through deductive approach (Saunders *et al*., 2012). The positivism philosophy seeks to quantify variables of interest and is normally evaluated using statistical measures of reliability and validity (Bryman and Bell, 2011). Unlike the positivism, the interpretive paradigm focuses on the approaches of data collection such as interviews and observations and integrates human interest into a study. Accordingly, this philosophy emphasizes qualitative analysis over quantitative analysis and follows under inductive approach (Myer, 2009).

This study used deductive approach, which bridged the existing gap between the language of the concepts and the language of research. For this approach, this study was guided by positivism philosophy for several justifications. First, the main principle of positivism is the ability to guide the creation of hypotheses or research

questions to be tested through the collected data as this study performed. Second, the extent of e-learning uptake, its effectiveness, the influential factors, and demographic variables were measured statistically. Third, data collection methods including questionnaires and checklists were used in this study. Fifth, the study intended to generalize its findings to other universities with similar characteristics in developing countries.

4.3 Research Approach

Generally, there are three research approaches namely quantitative, qualitative, and mixed approaches (Bryman and Bell, 2007). *Qualitative research* is an approach of exploring and understanding the meaning individuals or groups ascribe to a social or human problem (Creswell, 2003). It emphasizes much on inductive style of conducting research and the use of focus group, observation, and interview in data collection using interpretive philosophy. Unlike qualitative, quantitative approach is an approach, which is used to quantify the problem by way of generating numerical data or data that can be transformed into usable statistics (Creswell, 2003). It is used to quantify attitudes, opinions, behaviours, and other defined variables and generalize results from a larger sample population. One of the key facets of quantitative research approach is that it is considered to maximize objectivity, replicability, and generalisability of research findings (Harwell, 2011). Quantitative research is also related to formulating and testing specific research questions in order to reduce the event into simple elements (Remenyi *et al*., 2003). It is argued that the findings of any study, which employs quantitative approach, are based on well-known theories. Thus, quantitative research approach was deemed appropriate in this study because the study investigated the event through mathematical calculation in order to confirm the findings made by theories, which were independent from the researcher interest. In addition, data were obtained from calculations and presented in numeric values.

4.4 Research Design

Since this study employed positivism philosophy, adopted quantitative research approach, and conducted a single observation, the cross-section survey design was more appropriate than was the case with other with longitudinal design. According to Gable (1994), the cross-section survey design refers to a group of methods that emphasize on quantitative analysis, where data are collected from a large population at one point in time. In longitudinal design, a researcher conducts several observations of the same subjects over time, sometimes lasting many years. Due to the limitation of longitudinal design, cross-section survey was used in this study. Cross-section survey allows the reality to be captured in a single observation for one or more purposes such as explanatory, descriptive, or hypothesis testing. It is the most suitable technique where the capturing of the respondents' self-reported information is involved and where generalization of results to a wider population is required (Rea and Parker, 2005). This study employed a cross section design because it enabled the researcher to collect data at one point in time from geographically scattered universities. Cross-section design was also suitable because most of the questions in this study started with "What" and "to what extent" as supported by Yin (2003).

4.5 Study Area

The current study was conducted in eight (8) out of thirty three (33) public and private Tanzanian universities. These universities were purposively chosen from among 33 universities in Tanzania (TCU, 2015) in order to obtain a representative sample, which ensured generalization of the study findings. Generalization was ensured because the universities in Tanzania have similar characteristics. These include contextual, social, and cultural characteristics, which e-learning development and implementation depend upon (Rogers 2003 and Dintoe, 2018). The selected universities were the University of Dar-es Salaam, Sokoine University of Agriculture, the State University of Zanzibar, the University of Zanzibar, the University of Iringa, Open University of Tanzania, St. Joseph University of Tanzania

and Mbeya University of Science and Technology. The selection criteria are depicted in Table 4.1. The academic nature of the universities, including technology, social sciences, and biological sciences based university are likely to influence the implementation of e-learning. The age of the university is likely to influence the e-learning implementation in the sense that older universities have the necessary infrastructure for e-learning as opposed to younger universities. In this case, old universities were considered as those having more than 20 years since their establishment. The mode of delivery such as distance learning and campus based learning influence the implementation of e-learning. Universities that practice distance learning are more likely to implement e-learning than is the case with those that do not do so. Ownership type such as private and public universities may influence the implementation of e-learning because of the financial and administrative support, which is required to be provided by the owners of a respective university. Location such as urban or rural and Tanzania mainland or Zanzibar can influence the implementation of e-learning due to availability of support infrastructure such as electricity and the internet.

Table 4.1: Selected Universities

UNIVERSITY	SELECTION CRITERIA													
	Nature of the University				Geographical location		Ownership		Age		Location		Mode of delivery	
	Biological Sciences	Social science	Technology	Comprehensive	Mainland	Zanzibar	Private	Public	Old	New	Urban	Rural	Distance Learning	Campus based
UDSM				√	√			√	√		√		√	
SUA	√				√			√	√		√			√
OUT				√	√			√	√				√	
SJUIT			√		√		√			√	√			√
UOI		√			√		√			√		√		√
SUZA		√				√		√		√	√			√
ZU		√				√	√			√	√			√
MUST			√		√			√	√			√		√

4.6 Study population

The population of this study was all students and staff in the eight selected Tanzanian universities. The estimated population of students and staff in these universities during the 2015/2016 academic year was 64,896. The study population involved 58,000 students and 6,896 staff (see Table 4.2 for detailed description)

4.7 Sampling procedure

This study ensured that the findings could be generalized to other universities with similar characteristics in Tanzania. In this case, generalization of research findings is called statistical generalization, which means the findings from a small sample brings the same results in a very large population based on the assumptions of probability theory (DeVaus, 2002). Therefore, the objective was clearly achieved as the respondents including students, academic staff, ICT experts and the management were sampled and treated differently through sampling procedures as presented in Figure 4.1 and explained in subsequent subsections.

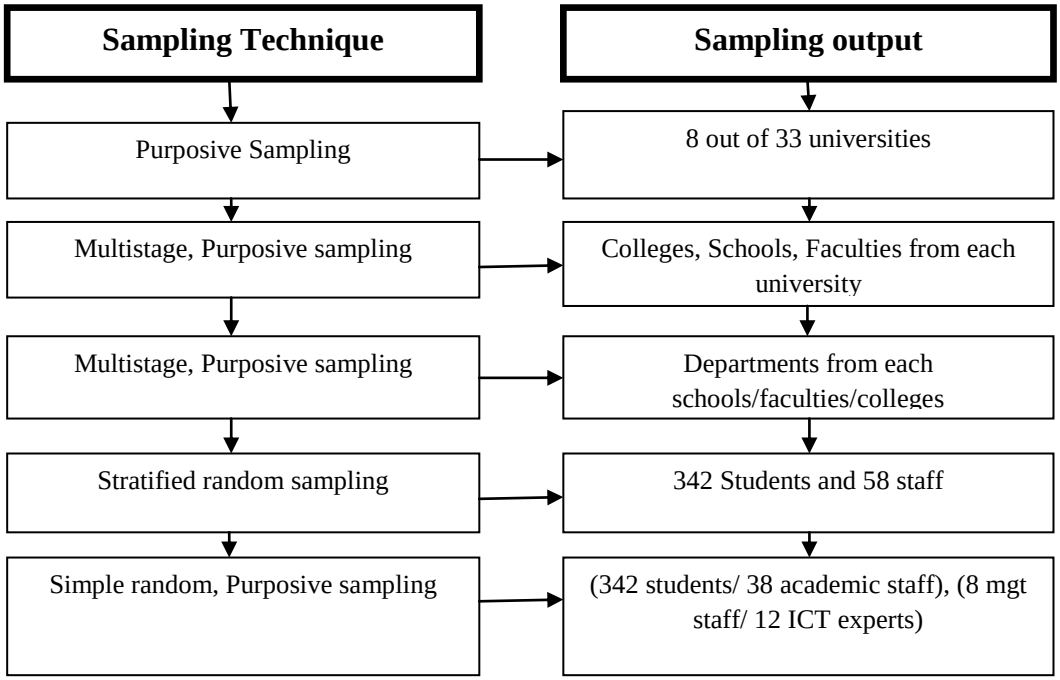


Figure 4.1: Sampling Procedure

This study employed multistage sampling technique by clustering the universities into various groups. This was necessary because universities are organized into colleges, school, faculties, departments, and other units. The study employed a mixture of sampling techniques, that is, non-probability (purposive sampling) and probability sampling (stratified and simple random sampling) techniques to draw the study sample at various stages.

Stratified random sampling technique, was used to divide the heterogeneous study population into various strata. The sub units of analysis were selected based on the probability proportional to size (PPS). The sample size of each subgroup was in proportion to the population size of the displaced groups. The sample size of each subgroup was determined by equation: $nh = (N_h / N) * n$. Where n_h is the sample size of the sub-group ***h***, N_h is the population size for the sub-group ***h***, *N* is the total population size and ***n*** is the total sample size (Trochim, 2006). The correction factor to eliminate the extreme cases of the population was used as supported by Trochim (2006). The sampling procedure as illustrated in Table 4.2 indicates how the population is proportionate to the sample size of 400 students and staff adopted in this study.

Simple random sampling technique was also used in this study to select the representation of sample size from the list of students and academic staff in their subgroups established based on probability proportional to size (PPS) using lottery method. Each member of the subgroup was assigned a number using a small piece of paper. These pieces of papers were folded and mixed into a box. Lastly, samples were taken randomly from the box by choosing folded pieces of papers in a random manner. The simple random sampling particularly the lottery method was employed in order to minimize bias from the selection procedure to sample representation. In addition, the population was separated into subgroups and reduced to small sample per group whereby the lottery method is more reliable than computer-generated process (random number generator software) (Saunder *et al*, 2012).

Purposive sampling technique was used to select the sample based on the size of the population, time constraints, and unique characteristics of a particular sample. For instance, ICT experts and staff from management were also considered in this study. In this case, the selection of ICT experts and staff from the management was made through purposive sampling since these were the respondents with unique characteristics in relation to the study.

Table 4.2: Sample Population and Sample Size

	CATEGORY					
UNIVERSITY	**STUDENTS CATEGORY**		**STAFF CATEGORY**		**Total Sample Frame**	**Total Sample Size**
	Sample Frame	Sample Size	Sample Frame	Sample Size		
UDSM	17,500	103	2350	18	**19,850**	**121**
SUA	8,988	53	1500	13	**10,488**	**69**
OUT	10,684	63	663	5	**11, 347**	**68**
SJUT	4,883	29	400	3	**5,283**	**31**
UOI	5786	34	850	7	**6,636**	**41**
SUZA	2,704	16	330	3	**3034**	**19**
ZU	2, 544	15	300	3	**2, 844**	**18**
MUST	4,909	29	503	4	**5, 412**	**33**
TOTAL	**58,000**	**342**	**6,896**	**58**	**64, 896**	**400**

4.8 Sample size

The factors, which were considered in determining the sample size for this study, include how representative the sample was and the methods used in analyzing the data (Isaga, 2012). As the current study employed factor analysis and structural equation modelling (SEM), the selection of the sample size was largely dependent on multivariate analysis requirements. For instance, the factor analysis technique requires the sample size to be at least 300 (Hair *et al*., 2006; Tabachnick and Fidel, 2007). In addition, SEM technique requires the sample size ranging from 100 – 400 (Hair *et al.*, 2014). Similar previous studies (Tarus and Gichoya, 2015; Lwoga and Komba, 2015; Taha, 2014; Alshaher, 2013; Munguatosha *et al*., 2011; Njenga, 2011) employed the sample size ranging from 100 to 700 respondents. The sample size employed in this study considered the median number of sample size of 400 within a

range of sample size of 100 – 700 from similar previous studies as supported by (Glenn, 1992; Ahrens and Zascerinska, 2010; Sigh and Masuku, 2014). Therefore, the sample size for the present study was 400 respondents based on the aforementioned justification.

4.9 Unit of Inquiry

According to literature (see Singleton *et al.,* 1988; A Dictionary of Sociology, 1998), a unit of inquiry (sometimes called a unit of analysis) is a unit, such as an individual, a household, a corporation, or whatever from which information is required in a research study. Similarly, Tronchin (2006) considers a unit of enquiry as the entity that a researcher wish to be able to say something about at the end of the study, probably what is considered the focus of the study. The focus of this study is the Tanzanian universities, thus the required data were obtained from staff and students within the selected universities. The staff and students were considered as the respondents because they are the main stakeholders of e-learning systems and provide information on behalf of the University. The phenomenon of this study (that is e-learning implementation) requires more insight information from wide perspective (i.e. teaching, learning, research, and administration activities) within the universities. Based on this justification, the university is a unit of inquiry whereby students, academic staff, management staff and ICT experts were representing the university by providing required information on the implementation of e-learning.

4.10 Data Collection Methods

Data for this study were collected mainly using structured questionnaires supplemented by physical checklist. Structured questionnaire was used to collect primary data from students, academic staff, and staff from management (Deputy Vice Chancellor, Academic, deans, directors, Heads of Department, and ICT experts). Physical checklist was employed to gather secondary data to supplement data from questionnaires. Data collection instruments were designed based on the conceptual framework of the current study and the research objectives. In this regard,

the use of questionnaires supplemented by physical checklist increased the consistency of the data that were gathered in the current study.

4.10.1 Questionnaires Design

The structured questionnaire was designed for students, academic staff, ICT experts, and the management. Each category of the questionnaire was preceded by an introductory part that introduced the researcher, the purpose of the study, and assuring confidentiality of the information provided by the respondents.

Questionnaire for Academic Staff and Students: These categories of instruments were constructed so as to address all the four specific objectives presented in five (5) sections as shown in Appendices 1-B and 2-B in page 201 - 212. However, the items included in each of the categories varied depending on the role of the academic staff and students towards the use of e-learning. In constructing these questions, Likert scale items were developed to assess the variables from each section.

Section 1 covered the respondents' demographic information. Section 2 covered five variables (awareness, availability, accessibility, attitude, and the frequency of using e-learning) which were used to ascertain the e-learning uptake. In this section, the respondents were asked to rate their opinions on a 5-point Likert scale with respect to the statements rated 1= strongly disagree up to 5= strongly agree. Section 3 covered eleven items of measuring the effectiveness of e-learning in education activities. In this section, the respondents were asked to rate their judgment on a 5-point Likert scale with respect to the statements rated 1= Declined a lot up to 5= Improved a lot. Section 4 of the instrument covered six factors each with the items used to assess influential factors on e-learning implementation. In this section, the respondents were asked to rate their responses on a 5-point Likert scale with respect to the statements rated 1= Very low up to 5= Very high. Section 5 contained one open-ended question to provide room for the respondents to give their comments regarding the implementation of e-leaning in their universities.

Questionnaire for ICT experts: This category of the instrument had three (3) sections as shown in Appendix C page 212 - 215. Section 1 covered background information of the respondents. Section 2 included questions, which required the respondents to provide information about ICT infrastructure in their universities. Section 3 covered questions, which required the respondents to provide the challenges of e-learning implementation in their universities.

Questionnaire for Management: This category of the instrument had four (4) sections as shown in Appendix D in page 216 - 218. Section 1 covered background information of the respondents. Section 2 covered the extent of e-learning usage within the university. Section 3 covered questions, which required the respondents to provide information about the effectiveness of e-learning usage on educational activities. Section 4 covered six factors each with the items used to assess the influencing factors on e-learning implementation. In this section, the respondents were asked to rate their opinions on a 5-point Likert scale with respect to the statements, rated 1= strongly Disagree up to 5= Strongly Agree.

4.10.2 Results of Pre-Testing of a Questionnaire

Pre-testing is a very important procedure or step in the designing of data collection instruments. In this study, the pre-testing was done to discover fallacy, concealed problems, and other aspects so as to ensure the appropriateness or correctness of the questions. The first draft of the questionnaire was sent to the supervisors for commenting. The improved versions of the questionnaires were sent to three e-learning experts at the Open University of Tanzania, the University of Dar es Salaam, and Sokoine University of Agriculture. Constructive comments and suggestions were provided and the questionnaires were improved accordingly. Data collection instruments were tested through a sample of 30 respondents at Mzumbe University in which 15 were students, 10 were academic staff, 3 were ICT experts and 2 were management staff (1 Director and 1 Head of Department).

Prior to the distribution of questionnaires for pretesting, reliability testing was conducted in order to ensure that each factor revealed the required level of internal consistency. In this regard, Hinton *et al*. (2004) propose four dissimilar points of internal reliability namely excellent range (0.90 and above), high (0.70 - 0.90), moderate (0.50-0.70), and low (0.50 and below). The pretesting was conducted at Mzumbe University employing a sample size of 30 respondents. The average cronbach's alpha value was 0.89. Therefore, the pilot study was considered to reveal high internal reliability. However, minor modifications of data collection instrument were done for excellent internal reliability in the main study.

The construct validity was also performed using CFA in order to guarantee that variables as well as each questionnaire category measured what it was intended to measure and each variable or factor has construct validity for its purpose. There was an average correlation value of 0.79 with a significant level smaller than 0.05. Based on the findings of pretesting, it was concluded that suitable level of construct validity and the survey were valid for their anticipated goal. However, minor corrections were done to reach to a very high improvement of construct validity in the main study.

4.11 Data Analysis Procedures

The collected data were processed and analysed using the Predictive Analytic Software (PASW) version 20 including SAS, STARTA, MULTLAB and R-Software. PASW is more convenience to use and available than the rest of the software. In addition, PASW provide other inbuilt software such as AMOS, which was necessary in the current study to handle the analysis of SEM. At the preliminary stage, the collected data were coded and entered in the PASW. The data were cleaned and screened to remove coding errors. Various tests such as normality, reliability of the data were performed before conducting descriptive and inferential analysis in order to attain the internal consistency of data. The data analysis techniques were employed based on the requirements and the nature of each specific research objective.

Normality test: Multivariate normality test was done in this study for each variable and linear combination of construct in order to determine whether the sample data drawn were normally distributed. All skewness and Kurtosis indices range were found to be less than 3 or greater than -3 and less than 10.0 respectively in each construct. This result is in line with the assumption of Kline (2005) and Kline (1998) that for the data to be univariate normally distributed, skewness must be less than 3 or greater than -3 and kurtosis must be less than 10.0. This shows that the data for this study were univariate normally distributed. On the other hand, multivariate was checked using kurtosis critical ratio (c.r) and the study data were found to be multivariate normal. This is in line with the assumptions by Tabachnick and Fidell (2011) that for the data to be multivariate normal, the c.r values have to be less than 1.96 or greater than -1.96.

Descriptive data analysis: Descriptive data analysis provided the researcher with the appreciation of the actual numbers and values, and hence of the scale the researcher employed. Therefore, frequency, variances, means, standard deviation, and percentage measures were used to analyze the numerical data, which were obtained from the questionnaires. Descriptive data analysis technique was employed to supplement other analysis techniques specified in each specific research objective.

In the first specific research objective: descriptive analysis was done to obtain the means and standard deviations of the extent of uptake of e-learning among students and academician. The t-test analysis technique was employed to test whether the differences in the mean scores were statistically significant among the groups. The means and standard deviations were subsequently analyzed using fuzzy logic model. Fuzzy Logic (FL) is a multivalued logic that allows intermediate values to be defined between conventional evaluations such as true/false, yes/no, high/low, and the like. Fuzzy systems are an alternative to traditional notions of set membership and logic that has its origins in the ancient Greek philosophy (Hellmann, 1965). The fuzzy membership function, which was adopted model in this study, is specified and presented as follows:

$$\mu(X) = \begin{cases} 0: Y(x) \leq 3.6 \\ 0.05 + [1 + ((Y(x) - 3.6)/\text{st. dev}))^{-2}]^{-1} \ \ldots\ldots\ldots Y(x) \geq 3.6 \end{cases}$$

Where, membership function is $\mu(X)$, the mean value is Y(x) and Standard deviations (dev) were calculated descriptively using the PASW in order to compute the membership function value (average extent of uptake of e-learning). The extent of uptake of e-learning has been explained subjectively without fact based data leading to uncertain situation. With this the first specific research objective was designed in order to handle such situation using fuzzy logic membership function. The uncertainty situation is due to insufficient variables in literature used to ascertain the extent of uptake of e-learning in the Tanzanian context. This study established variables such as awareness, availability, accessibility, attitudes, and frequency of using e-learning for ascertaining the extent of uptake of e-learning in the Tanzanian context. Thus, fuzzy membership function was an appropriate technique for handling such a situation.

In the second specific objective: descriptive frequencies, which were complemented by the t-test analysis technique, were employed to assess the effectiveness of e-learning in learning, teaching, and administrative activities. The data were collected from three category of respondents namely students, academic staff and the management staff. Employing t-test, effectiveness of e-learning was assessed using data from two groups of respondents (students and academic staff). The groups used were controlled (respondents who are not using e-learning) and treated (respondents who are using e-learning) in order to assess e-learning effectiveness. The descriptive analysis was employed to determine the means of the groups. This was done on students and academic staff separately. Thus, the t-test, one-way Analysis of Variance (ANOVA) and a form of regression analysis are mathematically equivalent and yield the same results. However, ANOVA and regression analysis with dummy are more complex and are suited to a wide range of practical problems as opposed to t-test analysis (Trochim, 2006).

In this regard, the t-test analysis particularly an independent sample t-test technique as a parametric test was employed to assess whether there is statistically significant different of means among the two groups. The parametric test in this study was used for the following reasons: First, it is assumed that if there is an adequate total sample size of at least 20 and if the data are normally distributed, parametric tests can be used with Likert scale ordinal data (Jamieson, 2004). Second, with actual examples using real and simulated data, parametric tests are generally more robust than nonparametric tests (Norman, 2010; Derric and white, 2016). Third, parametric tests tend to give "the right answer" and are sufficiently robust to yield largely unbiased answers that are acceptably close to "the truth" when analyzing Likert scale responses (Norman, 2010). In this study, several Likert-type items were grouped into a "survey scale," and then a total score and a mean score for the scale items for students and academic staff separately were calculated as supported by Sulivan and Artiro, (2013). It is suggests that if any real world application has a five point Likert scale, which is designed to have a perceived variable or scores in numeric, then the analyst may proceed with parametric approaches (De Winter and Dodou, 2010). Based on the aforementioned justifications, parametric tests such as independent samples t-test supplemented by descriptive analysis were employed to assess the effectiveness of e-learning in teaching and learning.

4.11.1 Preliminary Tests on Factor Analysis

In the third specific research objective: factor analysis (FA) is a statistical multivariate analysis technique, which is used to establish interrelationships among a large number of variables and for confirming these variables in terms of their common underlying dimensions. The main objective of FA particularly the use of Principal Component Analysis (PCA) is to find a way of condensing the information contained in a number of original variables into a smaller set of variables with a minimal loss of information (Hair *et al*., 2006). In addition, FA precisely explains how variables are correlated with each other by keeping only those variables that have large corresponding Eigenvalue in a single factor. Since this study labelled each factor having at least 3 variables as recommended by Tabachnick and Fidel (2007),

the factor analysis was performed on several grounds. First, the study employed variables that are subjected FA, and each had at least 3 observations, and this is within the recommended range of a minimum of 3 and a maximum of 10 observations (Comrey and Lee, 1992). Second, the study used the sample size of 400 and the recommended sample size for FA as a factor analysis is at least 300. Third, FA as a factor analysis technique was employed to reduce the number of variables by creating new composite variables for each factor (Isaga, 2012). Fourth, factor analysis through PCA was used to assess the convergence validity and composite reliability for each construct as presented in section 5.5.1 in chapter Five as well as homoscedasticity and sample adequacy as shown for each construct in the following subsection 4.11.1.1 – 4.11.1.6.

4.11.1.1 Factor analyses for Technological Construct

The results for data set adequacy test for items of technological construct are presented using KMO and Bartlett's test as shown in Table 4.4. From the analysis, the Kaiser-Meyer-Olkin (KMO) value was greater than 0.5 and that of the Bartlett's Test of Sphericity was significant ($p < 0.05$). This indicates that the initial conditions for employing factor analysis are met, as there is adequate homoscedasticity and sample adequacy in technological construct.

Table 4.3: KMO and Bartlett's Test for items of Technological Construct

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.808
Bartlett's Test of Sphericity	Approx. Chi-Square	481.452
	Df	10
	Sig.	.000

The Screen plot for technological construct Figure 4.1 complements the **KMO** and Bartlett's Test analysis result as the Eigenvalue shows the appropriateness of the items in the technological construct as explained in Chapter Five.

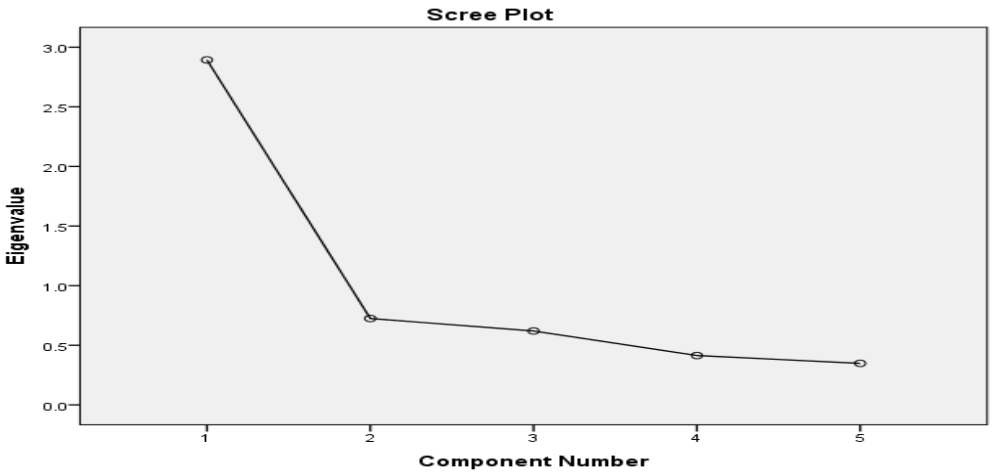


Figure 4.2: Eigenvalue for Technological construct

4.11.1.2 Factor Analyses for User Construct

The results for data set adequacy test for items of User construct are presented using KMO and Bartlett's test as shown in Table 4.5. From the analysis, the KMO value was greater than 0.5 and that of the Bartlett's Test of Sphericity was significant ($p < 0.05$). This indicates that the initial conditions for employing factor analysis are met, as there is adequate homoscedasticity and sample adequacy in user construct..

Table 4.4: KMO and Bartlett's Test for Items of User Construct

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.778
Bartlett's Test of Sphericity	Approx. Chi-Square	305.750
	Df	10
	Sig.	.000

The Screen plot for user construct Figure 4.2 complements the **KMO** and Bartlett's Test analysis result as the eigenvalue shows the appropriateness of the items in the user construct as explained in Chapter Five.

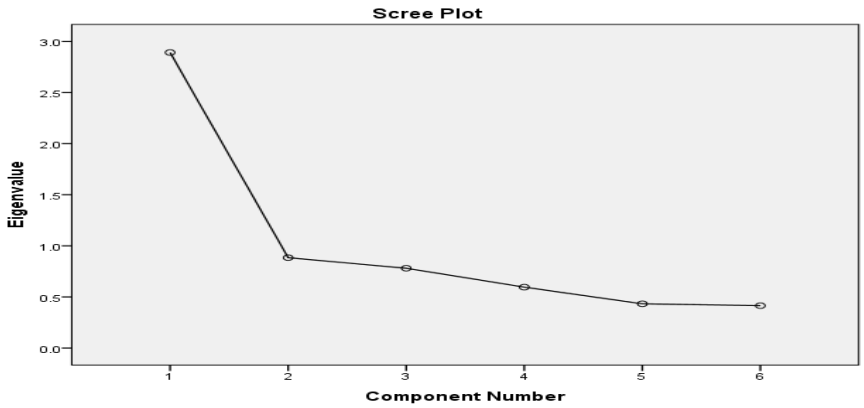


Figure 4.3: Eigenvalue for User Construct

4.11.1.3 Factor Analyses for Pedagogical Construct

The results for data set adequacy test for items of Pedagogical construct are presented using KMO and Bartlett's test as shown in Table 4.6. From the analysis, the KMO value was greater than 0.5 and that of the Bartlett's Test of Sphericity was significant ($p < 0.05$). This indicates that the initial conditions for employing factor analysis are met, as there is adequate homoscedasticity and sample adequacy in pedagogical construct.

Table 4.5: KMO and Bartlett's Test for Items of Pedagogical Construct

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.740
Bartlett's Test of Sphericity	Approx. Chi-Square	326.624
	Df	6
	Sig.	.000

The Screen plot for pedagogical construct Figure 4.3 complements the **KMO** and Bartlett's Test analysis result as the eigenvalue shows the appropriateness of the items in the pedagogical construct as explained in Chapter Five.

Figure 4.4: Eigenvalue for pedagogical construct

4.11.1.4 Factor Analyses for Institutional Construct

The results for data set adequacy test for items of Institutional construct are presented using KMO and Bartlett's test as shown in Table 4.7. From the analysis, the KMO value was greater than 0.5 and that of the Bartlett's Test of Sphericity was significant ($p < 0.05$). This indicates that the initial conditions for employing factor analysis are met, as there is adequate homoscedasticity and sample adequacy in institutional construct.

Table 4.6: KMO and Bartlett's Test for Items of Institutional Construct

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.792
Bartlett's Test of Sphericity	Approx. Chi-Square	509.899
	df	6
	Sig.	.000

The Screen plot for institutional construct Figure 4.4 complements the **KMO** and Bartlett's Test analysis result as the eigenvalue shows the appropriateness of the items in the institutional construct as explained in Chapter Five.

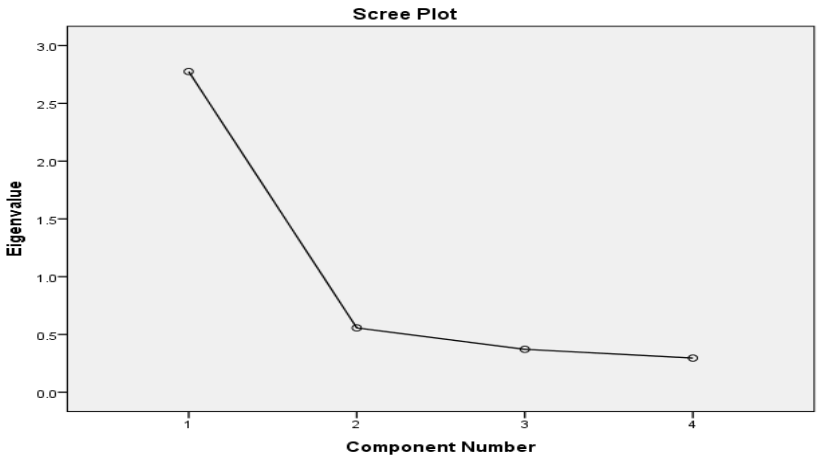


Figure 4.5: Eigenvalue for Institutional Construct

4.11.1.5 Factor Analyses for Social Construct

The results for data set adequacy test for items of social construct are presented using KMO and Bartlett's test as shown in Table 4.8. From the analysis, the KMO value was greater than 0.5 and that of the Bartlett's Test of Sphericity was significant ($p < 0.05$). This indicates that the initial conditions for employing factor analysis are met, as there is adequate homoscedasticity and sample adequacy in social construct...

Table 4.7: KMO and Bartlett's Test for Items of Social Construct

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.787
Bartlett's Test of Sphericity	Approx. Chi-Square	566.642
	Df	10
	Sig.	.000

The Screen plot for social construct Figure 4.5 complements the **KMO and Bartlett's Test** analysis result as the eigenvalue shows the appropriateness of the items in the social construct as explained in Chapter Five.

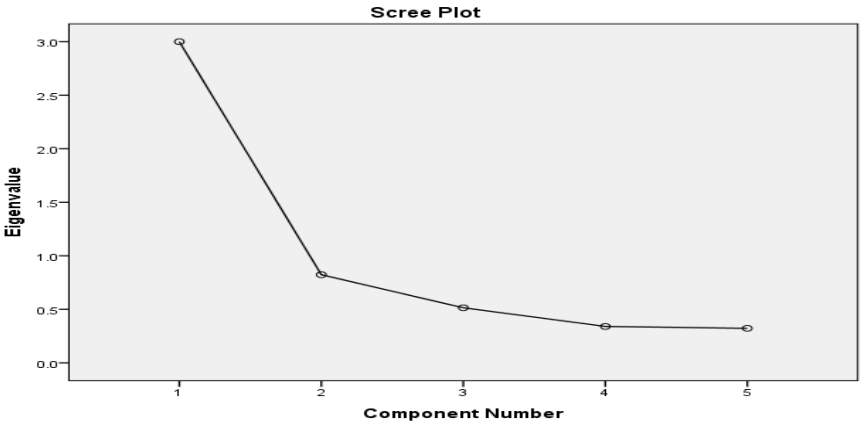


Figure 4.6: Eigenvalue for Social Construct

4.11.1.6 Factor Analysis for Environmental Construct

The results for data set adequacy test for items of environmental construct are presented using KMO and Bartlett's test as shown in Table 4.9. From the analysis, the KMO value was greater than 0.5 and that of the Bartlett's Test of Sphericity was significant ($p < 0.05$). This indicates that the initial conditions for employing factor analysis are met as there is adequate homoscedasticity and sample adequacy in environmental construct.

Table 4.8: KMO and Bartlett's Test for Items of Environmental Construct

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.794
Bartlett's Test of Sphericity	Approx. Chi-Square	381.634
	Df	6
	Sig.	.000

The Screen plot for environmental construct Figure 4.6 complements the **KMO** and Bartlett's Test analysis result as the eigenvalue shows the appropriateness of the items in the environmental construct as explained in Chapter Five.

Figure 4.7: Eigenvalue for Environmental Construct

4.11.2 Developing and Validating E-learning Implementation Model

This study employed structural equation modelling as multivariate analysis technique in the development and validation of e-learning implementation model in order to address the fourth specific research objective. The modelling stages including validation process achieved were explained in the following paragraphs and complemented by Figures 4.8 and 4.9.

4.11.2.1 Modelling Stages in SEM

In the fourth specific research objective: having established the conceptual framework in Figure 3.8 and the relationships of independent and dependent variables, this conceptual framework serves as the basis for the development of e-learning implementation model using SEM. In this study, modelling process was accomplished through seven stages as supported by Hair *et al.*(2006). These stages include 1) developing a conceptual framework presented in Figure 3.8, 2) constructing a path diagram of causal relationship based on the conceptual framework developed, and 3) developing measurement model using path diagram. Others include 4) testing assumptions of SEM, 5) validating measurement model validity using direct technique, 6) specifying structural model (e-learning implementation model), and 7) validating structural model (e-learning implementation model) validity using direct technique. Figure 4.7 shows the decision flowchart encompassing all the activities followed and completed in each stage

during the development of (structural model) e-learning implementation model and the results were presented stage by stage in Chapter Five in sections 5.7 through 5.10.

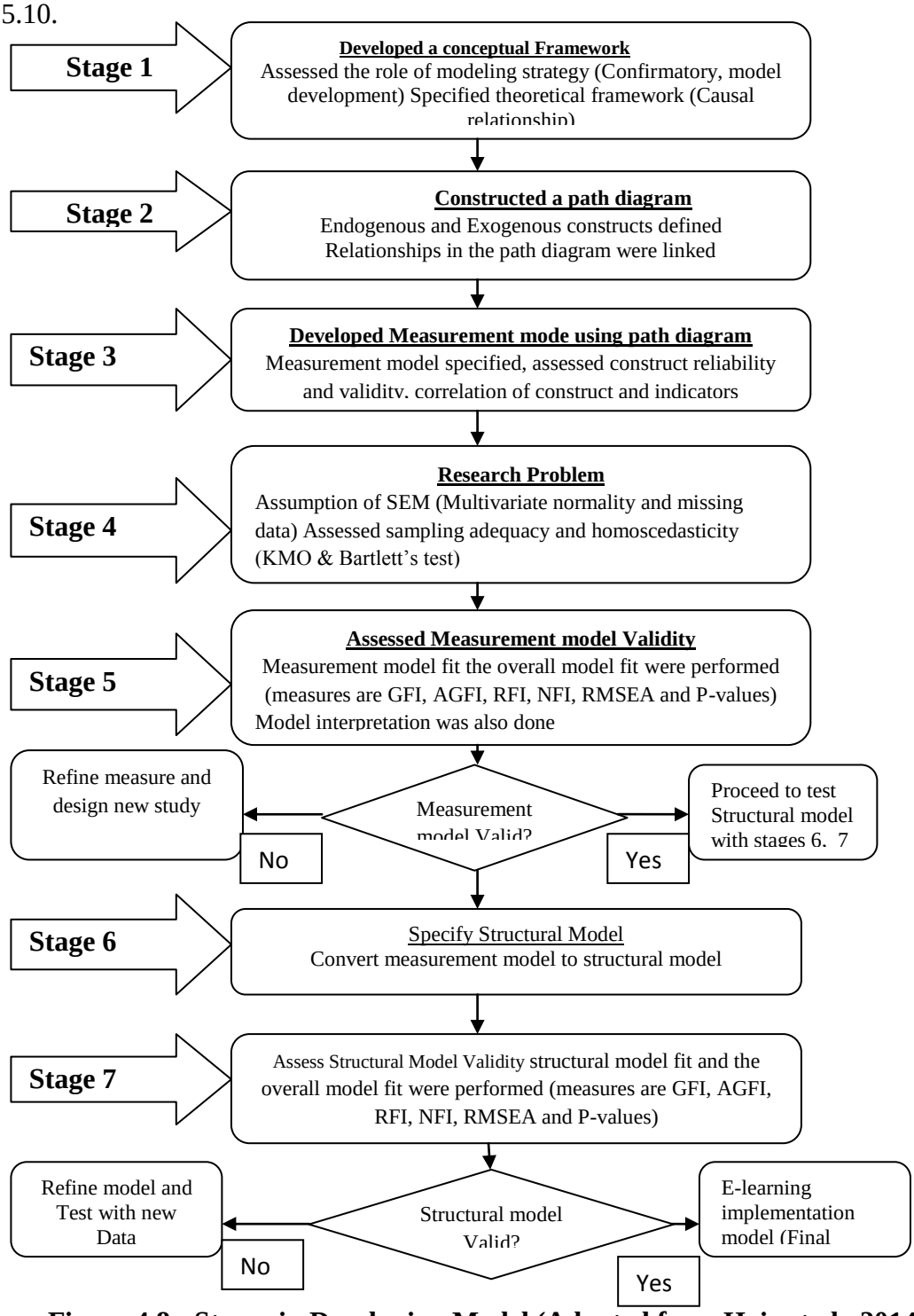


Figure 4.8: Stages in Developing Model (Adapted from Hair et al., 2014)

4.11.2.2 The Process of validating Measurement Model Using CFA

Confirmatory Factor Analysis (CFA) is part of the structural equation modelling (SEM) technique that determines the correlations among observed variables as well as latent variables. Being part of Structural Equation Modelling (SEM) the confirmatory Factor Analysis establishes and validates the Measurement Model using direct technique in a decision flowchart with several stages as indicated in Figure 4.9. It confirms how each latent variables (Factors) relates to its observed variables (indicators) and confirm their relationship by explaining as to what extent the observed variables contribute to their respective latent variables. The focus is on ascertaining the number and nature of latent variables that describe the causal chain (variation and co-variation) within a numbers of observed variables. In this study, CFA was used to confirm the factors that influence e-learning implementation in Tanzanian universities.

The use of SEM particularly the Confirmatory Factor Analysis is more advantageous over multiple regressions because the former guarantees accurate estimation of the indirectness of the dependent variables on all independent variables. Second, it has both measurement model and structural model. SEM is also appropriate if the study has multiple constructs and each construct is presented by multiple variables (Hair *et al*., 2006). Figure 4.8 indicates the analysis of measurement model using confirmatory factor analysis. Specifically, Figure 4.8 describes the procedure on how CFA provided confirmatory test of the measurement theory. Measurement theory in this study specified how the measured variables logically and systematically represent latent variables (constructs) involved in a conceptual framework in Figure 3.8. Testing measurement theory was done by validating the measurement model through assessing model fitness and goodness of model fit (GoF) and whose results were presented in Chapter Five in sections 5.7 and 5.8.

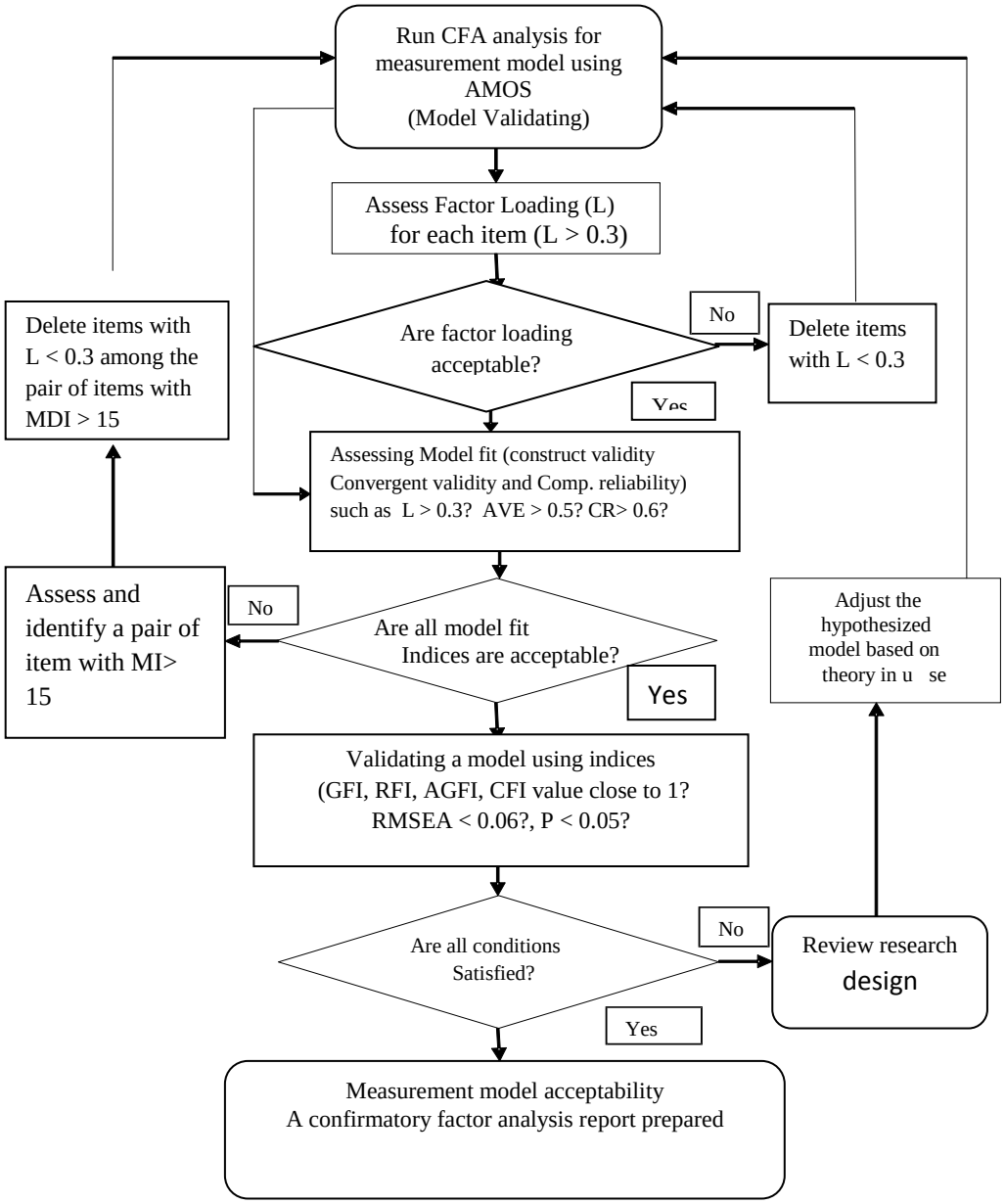


Figure 4.9: The Decision Flowchart for Validating Measurement Model (Adapted from Hair et al. 2014)

4.12 Validity and reliability of Instrument and Data

In order to address validity and reliability in this study, a researcher considered two aspects of validity and reliability issues. First, validity and reliability of the instruments or tools used in data collection were addressed clearly. Second, the validity and reliability of data were also considered during the analysis stage. Thus, categories and types of validity and reliability issues addressed in this study and the manner they were achieved are explained in the following paragraphs.

4.12.1 Validity Measure

Validity in research means the degree to which a gauge appropriately represents the concept of the study (Isaga, 2012). It is the extent the measured variables represent the study concept (Hair *et al*., 2014). The validity issues were considered in this study to ensure that the instruments were used to measure what they were intended to measure and evaluate the quality of the study essentially for the findings to be utilised.

Internal Validity refers to how well a study is done, especially whether it avoids confounding among independent variables. In this study, the *internal validity* of instrument was achieved using criterion validity in the questionnaire. The items used in the questionnaire in this study were actually constructed to measure the events, intended to be measured. There was a pre-testing of the instruments, which improved the validity of the instruments for data collection in the main study. In the case of *validity of study findings*, the independent variables (items) measured against dependent variables were well known to reduce confounding among variables as this study has a cause and effect relationship. The study also used CFA to develop a measurement model for explaining the co-variations to see if all the items measured were valid to the respective construct.

Construct validity (Theoretical Validity): refers to the degree to which a set of *measured variables* actually represent the theoretical *latent construct* they are designed to measure (Tabachnick and Fibell, 2007; Hair *et al.,* 2014). Construct

Validity involves generalizing from a particular program or measure to the *concept* of that program or measure. Construct validity of instrument was achieved by adapting and employing questionnaires that were used in the previous studies. In addition, theoretical validity of the study findings was achieved when the concepts from the theories that guided this study were well known and clearly operationalized into variables or measures. Convergence validity of the construct was achieved by assessing the factor loading of the construct items using CFA. Items with factor loading of 0.3 or above were considered to be convergent valid (Kline, 2005; Tabachnick and Fibell, 2007). Items with factor loading of lower than 0.3 were dropped and they were not considered for total aggregated into respective constructs (Tabachnick and Fibell, 2007; Hair et al., 2014)

Ecological Validity: to ensure statistical validity of the study findings, the study ensured that the findings will be applicable and generalized in other universities from countries with similar characteristics to those in Tanzania and that the sample data are representative. This has been achieved by employing large sample size, and by using the mixture of probability and non-probability sampling techniques and questionnaire in data collection.

Statistical Validity: is the extent to which the conclusions drawn from a statistical test are accurate, reliable, and agreed with statistical and scientific principles (Hair *et al.*, 2014). This has been achieved in this study by employing large sample size and the appropriate analysis techniques in each specific research objective, which were employed to analyze the data.

4.12.2 Reliability of Instrument and Data

Reliability is the level of consistency among several measurements of variables (Isaga, 2012). It is the extent the results are consistent and the total populations under study are accurately represented. Thus, a measure is said to be reliable if it can produce similar results when it is repeatedly measuring the same object. To ensure reliability of the instrument, the study adopted questionnaires, which were used by similar previous studies. The adopted questionnaires were modified to fit the current

study and thereafter they were pre-tested as described detailed in subsection 4.8.1.1 in order to achieve excellence in reliability. In the case of reliability of the study findings, this study employed Cronbach's alpha to establish internal consistency on the data collected (Cronbach, 1951). The following is a Cronbach's basic equation for alpha according to Kuder and Richardson (1937) and which is commonly used to measure reliability (i.e., internal consistency) of data: $\alpha = n/n-1$ (1− sum of Vi /Vtest). Where: n = number of questions, Vi = variance of scores on each question and Vtest = total variance of overall scores (not %'s) on the entire test. If Vtest is large, the alpha also becomes large. High alpha, which is caused by high variance, is good.

The common widely used measure of the reliability of a scale is Cronbach's alpha (Njenga, 2011). Cronbach's alpha is a measure of internal consistency reliability, with values of between 0 and 1; and the lower the Cronbach's alpha the shorter the scale which is being used or the less the commonalities of the items. Generally, Cronbach's alpha values of 0.90 or greater are excellent and acceptable for high value tests, while values of 0.70 to 0.90 are considered acceptable/good and appropriate for medium value tests, and the Cronbach's alpha values of below 0.5 are considered unacceptable (Dornyei, 2003; Peterson, 1994). In this study, the cronbach's alpha value was 0.950, which indicate that the scale is excellent, reliable, and acceptable for high-stake tests as shown in Table 4.10.

Table 4.9: Shows Reliability Statistics Using Cronbach's

Construct	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Technological	.815	.8151	68
User	.773	.7732	68
Pedagogical	.788	.7881	68
Institutional	.851	.8509	68
Social	.828	.8281	68
Environmental	.817	.8171	68

4.13 Ethical Considerations

This study complied with the ethical principles in research involving human subjects. Privacy and secrecy issues were considered and guaranteed. For any respondent who

participated in this study the following were addressed: privacy of participation, voluntary nature of participation and informed consent of the respondents to participate in providing information. Consequently, no information or identities of the individuals were revealed in written or other communication. Furthermore, the purpose of the research was specified at the introductory part of the questionnaire declaring that the data collected would be considered for academic purposes only and not otherwise. Further, there was a maximization of likely benefits of the study and minimizing probable harm. Harm is related to exposing the identity of the respondents and discussing what the respondents assumed to be private.

Informed consent involves creating awareness among the respondents towards the purpose of the study, possible dangers, and their right to withdraw from the study (Leedy and Ormrod, 2005). Relevant permission was obtained before conducting the study, which includes obtaining the introductory letter and research clearance from the Mzumbe University. Additionally, research clearance was also obtained from the target areas. Moreover, the intention of this study was clearly clarified throughout the data collection exercise. Generally, both written and oral consent was obtained before and during data collection.

4.14 Chapter Summary

Chapter Four describes in detail the methodology adopted in this study. In summary, the study was carried out in eight purposively selected universities (UDSM, SUA, MUST, UoI, SJUT, SUZA, ZU and OUT) in Tanzania. A cross section survey with quantitative approach that takes positivism philosophy was employed for this study. The study population consisted of students, academicians, ICT experts, and staff from management respondents. The study sample obtained through a four-stage sampling (including purposive, multistage, stratified random and simple random sampling techniques). Data were collected using structured questionnaire and physical checklist, and analyzed using SPAW with AMOS software (using Fuzzy logic multivalued model, t-test, Factor analysis and SEM multivariate analysis technique). Data quality control measures that were taken into account are described.

Generally, it is evident that in the light of the methodology provided, the research was conducted objectively because the study area was properly selected; and the sample size was sufficient and representative of the target population. Procedures for development and validation of e-learning implementation model were clearly described. Finally, reliability and validity of data and instrument were presented and fairly improved to explain the quality of this study; and that both scientific and ethical standards were prudently observed.

CHAPTER FIVE

PRESENTATION OF RESULTS

5.1 Introduction

This chapter presents the results of the study starting with characteristics of the respondents. This is followed by the results for each specific research objective - the extent of e-learning uptake, the effectiveness of e-learning, and the factors that influence the implementation of e-learning. Finally the chapter points out the results of the development of e-learning implementation model.

5.2 Characteristics of Respondents

Relevant characteristics, which were identified in this study, include demographics such as sex, age, field of specialization, work experience, level of education, and staff ranks. These provided an overview about the appropriateness of the study population. Respondent with a particular characteristic was also expected to have some influence on e-learning implementation.

5.2.1 Demographic Characteristics of Students

The results of the study in Table 5.1 show that there were more (66%) male than were female (34%) students. There were more students in first year of study (38.1%) followed by those second year students (28.2%), fourth year (18.2%) and third year (15.5%). There were more students specializing in arts and Social Sciences (34%) followed by those in Biological Sciences (24%) and Applied Sciences (18%).

Table 5.1: Distribution of Students by demographic characteristics

1. Sex	Frequency (N)	Percent (%)
Male	193	66
Female	98	34
2. Year of study		
Year 1	111	38.1
Year 2	82	28.2
Year 3	45	15.5
Year 4	53	18.2
3. Area of Specialization		
Physical Science	36	12
Applied science	53	18
Arts and Social science	100	34
Business	26	9
Mathematics	6	2
Biological sciences	70	24

5.2.2 Demographic Characteristics of Academic Staff

The results in Table 5.2 indicate that 44.8percent of academic staff were in the rank of Assistant Lecturer followed by Lecturer (27.6%) and Tutorial Assistants (22.4%). Associate Professors (3.4%) and full Professors (1.7%) were very few. In terms of sex, more than half (63.8%) of academic staff were males as opposed to (36.2%) female academic staff. Based on the area of specialization, there were more academic staff (43.1%) specialized in arts followed by of academic staff (19%) specialized in business, followed by those specialized in other disciplines. In terms of age, more than half (58.6%) of the academic staff were aged between 30 and 40 years followed by those aged between 41 and 50 years (27.6%).

Table 5.2: Distribution of Academic Staff by Demographic Characteristics

		Frequency (N)	Percent (%)
1.	Academic staff Ranks		
	Tutorial Assistant	13	22.4
	Assistant Lecturer	26	44.8
	Lecturer	16	27.6
	Associate Professor	2	3.4
	Professor	1	1.7
2.	Sex		
	Male	37	63.8
	Female	13	36.2
3.	Specialization		
	Arts and social science	25	43.1
	Biological Science	5	8.6
	Applied science	8	13.8
	Physical Science	9	15.5
	Business	11	19.0
4.	Age		
	Below 30	6	10.3
	30 – 40	34	58.6
	41 – 50	16	27.6
	Above 50	2	3.4

5.2.3 Demographic Characteristics of ICT Experts

The results in Table 5.3 indicate that there were more (71%) male than were female ICT experts. Majority (53%) of ICT experts were aged between 30 and 40 years. The results show further that most (56%) of the ICT experts had work experience of 5 years or less.

Table 5.3: Distribution of ICT Experts by Demographics Characteristics

	Frequency (N)	Percent (%)
1. Gender or Sex of ICT Expert		
Male	24	71
Female	10	29
2. ICT Expert Age Groups		
Below 30 Years	13	38
30 - 40 Years	18	53
41 - 50 Years	2	6
Above 50 Years	1	3
3. Experience in ICT facilities and Platforms		
Below 5 Years	19	56
5 - 10 Years	12	35
Above 15 Years	3	9

5.3 Extent of E-learning Uptake

The first specific research objective of this study was to ascertain the extent of current e-learning uptake in the Tanzanian universities. This subsection presents the results from fuzzy logic model and t-test analysis supplemented by frequencies. The analysis based on the responses from students, academic staff, ICT experts, and the management.

Mean and standard deviations of each variable were used in the fuzzy logic model to estimate the membership functions in terms of percentage. Based on Alshaher (2014), the extent of e-learning uptake is high if $x \geq 50$ percent. The level of e-learning uptake for each variable measured on students and academicians is shown in Table 5.4 and that of ICT experts is shown in Table 5.5. The comparisons of the means for e-learning uptake among students and academicians are presented in Table 5.7. Table 5.8 shows the results of t-test analysis to indicate whether the differences in the mean scores of e-learning uptake between the two groups were statistically significant.

The findings show that all fuzzy logic values were below 50 percent. It is deduced from the results in Table 5.4 that the least represented variable was attitude towards e-learning with the average extent of 15 percent.

Table 5.4: The Extent of E-learning Uptake among Students and Academicians

	STUDENTS			**ACADEMIC STAFF**			**AVERAGE OF UPTAKE LEVEL**
Variables	**Mean**	**Standard Deviation**	**Uptake Level in%**	**Mean**	**Std Deviation**	**Uptake Level in%**	
Awareness of E-learning							
Awareness on computer usage	4.23	0.88	39.00	3.98	1.00	18.00	28.50
Flexibility using e-learning	4.01	0.97	20.00	3.62	1.14	5.00	12.50
Online academic materials	4.08	0.93	26.00	3.55	1.14	5.00	15.50
Participation on online courses	3.64	1.08	5.00	3.97	0.88	20.00	12.50
Online library resources	3.07	1.36	18.00	3.53	1.31	5.00	11.50
Average	3.81	0.83	**22.00**	3.73	1.09	**10.00**	**16.00**
Accessibility of E-learning							
Easy access to computers	4.10	1.14	21.00	3.76	1.13	7.00	14.00
Access to computer internet	4.04	1.10	19.00	3.88	0.94	13.00	16.00
Access to online time table	3.93	1.21	12.00	3.53	1.03	5.00	8.50
Submit and receive feedback on online assignments	3.47	1.40	6.00	3.55	1.26	5.00	5.50
Access university information Online	4.38	0.99	43.00	2.64	1.25	42.00	42.50
Online academic results	4.59	0.82	64.00	3.78	1.11	8.00	36.00
Average	4.09	1.11	**28.00**	3.52	1.12	**13.30**	**20.60**
Availability of E-learning facilities & platforms							
Functioning Computer labs	3.68	1.30	5.00	3.12	1.11	21.00	13.00
Internet connectivity	3.86	1.09	10.00	4.24	0.68	52.00	31.00

	STUDENTS			ACADEMIC STAFF			AVERAGE OF UPTAKE LEVEL
Variables	**Mean**	**Standard Deviation**	**Uptake Level in%**	**Mean**	**Std Deviation**	**Uptake Level in%**	
Online group discussion	3.13	1.32	16.00	3.88	1.29	10.00	13.00
Online assign and exams	3.41	1.30	7.00	3.07	1.32	19.00	13.00
Online materials from instructors	2.78	1.37	32.00	3.66	1.31	5.00	18.50
Online library resources	3.73	1.20	6.00	3.40	1.42	19.00	12.50
Average	3.43	1.05	**13.00**	3.56	1.14	**21.00**	**17.00**
Attitude towards E-learning							
Experience using e-learning	4.18	1.01	30.00	3.34	1.19	10.00	20.00
Perception using e-learning	3.95	1.04	15.00	3.84	4.19	5.00	10.00
Preference on e-learning	3.76	1.05	7.00	3.78	1.08	8.00	6.5.00
E-learning enhances practice	4.03	0.99	21.00	3.91	0.96	14.00	17.50
Usefulness of e-learning	4.08	1.05	22	3.97	0.92	19.00	20.5
Average	4.00	1.03	**19**	3.77	1.67	**11.00**	**15.00**

The low level of e-learning uptake was also revealed among ICT experts. This was measured using availability of e-learning facilities and platforms as shown in Table 5.5. The average extent of e-learning uptake among ICT experts was found to be 20.5 percent for the availability of e-learning facilities and 54 percent for the availability of e-learning platforms.

Table 5.5: The Extent of E-learning Uptake among ICT Experts

Variables	Mean	Standard Deviation	Membership Function	Level of Availability of E-learning Facilities in %
Availability of E-learning facilities				
Online library system	2.85	1.05	0.39	39.0
Online centralized system	2.35	1.13	0.60	60.0
Centralized database system	3.03	1.27	0.22	22.0
Online registration system	3.65	1.01	0.05	5.0
Online results processing system	4.00	0.99	0.19	19.0
Computers	3.79	0.69	0.12	12.0
Electricity backup system	3.62	0.92	0.05	5.0
Domain Name severs	3.59	0.89	0.05	5.0
Web severs	3.24	0.96	0.17	17.0
Mail –POP	3.24	0.92	0.18	18.0
Mail - SMTP	3.09	1.06	0.24	24.0
Proxy Sever	3.18	1.00	0.20	20.0
Average	**3.30**	**0.99**	**0.205**	**20.5**
Availability of E-learning Platforms				
Blackboard	2.47	1.08	0 .57	57.00
QStutor	3.24	0.99	0.17	17.00
Moodle	2.38	0.82	0.74	74.00
Web LMS	2.59	0.89	0.61	61.00
ATutor	2.76	1.16	0.40	40.00
My Tutor	2.47	0.96	0.63	63.00
Midflash online training	2.47	1.16	0.54	54.00
uLearning	2.38	0.95	0.67	67.00
Average	**2.29**	**1.00**	**0.54**	**54.00**

5.3.1 Awareness of E-learning

The results in Table 5.4 show that the average e-learning uptake level among students and academicians based on awareness is 16 percent. Students were aware on computer usage by 39 percent followed by online academic materials by 26 percent. Academicians were aware on the online courses by 20 percent followed by awareness of computer usage by 18 percent. These results show that the average

level of e-learning uptake on the aspect of students and academicians' awareness towards e-learning was below the threshold of the cutting fuzzy value, amounting to 50 percent (Alshaher, 2014).

5.3.2 Accessibility of E-learning

The results in Table 5.4 show that the average extent of uptake of e-learning among students and academic staff was 20.6 percent for accessibility of e-learning. It is deduced from the results that students use e-learning more to access online academic results, and this was by 64 percent above the threshold cutting of fuzzy logic value compared to 43 percent of online information. Academicians had more access to online information, which accounted for 42 percent above half of the threshold compared to the rest of the variables. However, the results in Table 5.6 indicate the average level of frequency of using e-learning facilities and platforms by 7 percent of the management staff. The results indicate further that 50 percent of the management staff reported that e-learning facilities and platforms had 5-10 years since their implementation.

5.3.3 Availability of E-learning Facilities and Platforms

The availability of e-learning platforms and facilities among students and academicians has an average uptake level of 17 percent. The results in Table 5.4 show that availability of functioning computer laboratories (5%) and online library (6%) had very low extent of e-learning uptake among students. The availability of internet connectivity was 52 percent above the threshold of fuzzy logic value compared to the availability of functioning computer laboratories (21%). Availability of e-learning facilities and platforms among students and academicians is also depicted among ICT experts in Table 5.5.

The results in Table 5.5 show that the average level of availability of e-learning facilities was 20.5 percent less than a half of the threshold (50%) among ICT experts. The results show further that only centralized systems were available at the level of 60 percent exceeding the threshold of 50 percent. In the same Table 5.5, the results

show further that the average level of availability of e-learning platforms was 54 percent above a half of the threshold of 50 percent. Based on the results in Table 5.5, the least popular and adopted e-learning platforms in Tanzanian universities were QStutor and ATutor with extent of 17 percent and 40 percent respectively. The results in Table 5.6 show that (55.6%) of the management staff reported that the availability of e-learning facilities was average.

5.3.4 Attitudes towards E-learning

Attitude towards e-learning is another variable that was used in measuring the extent of current e-learning uptake in Tanzanian universities. The average uptake of e-learning level among students and academicians was 15 percent (see Table 5.5). The results show that students' experience in using e-learning had an uptake level of 30 percent compared to usefulness of e-learning of 22 percent.

The extent of e-learning uptake was also assessed among the management staff from Tanzanian universities. Table 5.6 shows the results based on the availability of e-learning facilities, duration since implementation of e-learning as well as the frequency of using e-learning. The results show that 55.6percent of the management staff reported low level of availability of e-learning facilities in Tanzanian universities followed by 22.2 percent of the management staff who reported high level of availability of e-learning facilities. The study results indicate further that 50percent of the management staff reported that e-learning facilities and platform were 5.10 years old since their implementation in most of the Tanzanian universities. These findings suggest that e-learning concept is still new in Tanzania. The study results in Table 5.6 also indicate that 66.7percent of the management staff agreed that the frequency of using e-learning was low. The results were also presented in detail in the previous subsections 5.3.3 and 5.3.2.

Table 5.6: Show the Extent of E-learning Uptake among of Management Staff

Level of Availability of E-learning facilities	Frequency	Percent (%)
Very Low	1.00	5.60
Low	10.00	55.6
Average	2.00	11.1
High	4.00	22.20
Very High	1.00	5.60
Total	18.00	100.0
Duration since Implementation of E-learning and platforms		
Below 5 Years	2.00	11.10
5 -10 Years	9.00	50.00
11 - 20 Years	6.00	33.30
Above 20 Years	1.00	5.60
Total	18.00	100.00
Level of frequency of using e-learning		
Not often	12.00	66.7
Average	2.00	11.1
Often	1.00	5.60
Very Often	3.00	16.70
Total	18.00	100.00

The comparison in terms of e-learning uptake level among students and academic staff who participated in this study as indicated in Table 5.7 was achieved by comparing their means using t-test. Prior to running the T-test, the means of e-learning uptake for each group were compared. The average means of e-learning uptake for students and academicians from each variable are indicated in Table 5.7. The results indicate that the mean scores for the two different groups of e-learning users are close to each other.

Table 5.7: Means for E-learning Uptake among Students and Academic Staff

Students and Academic Staff Group	No. of Items	Mean	Std. Deviation	Std. Error Mean
Students	4	3.832	1.000	0.13573
Academic Staff	4	3.645	1.000	0.13573

Accordingly, t-test was used to test whether differences in the mean scores of e-learning uptake between these two groups are statistically significant. The results in Table 5.8 show that the p-value is greater than 0.05, meaning that there is no statistical significant difference in the e-learning uptake among user groups (students and academicians).

Table 5.8: T-test on E-learning Uptake among Students and Academic Staff

	Levene's Test for Equality of Variances		t-test for Equality of Means				
	F	*Sig.*	*t*	*df*	Sig. (2-tailed)	Mean Difference	Std Error
Equal variances assumed	0.000	1.000	-2.35	16.000	0.23	-0.187	0.04675
Equal variances not assumed			-2.35	16.000	0.23	-0.187	0.04675

5.4 Effectiveness of E-learning on Teaching and Learning in Tanzanian Universities

The second specific research objective of the study was to assess the effectiveness of e-learning on teaching and learning activities in Tanzanian universities. In order to assess the effectiveness of the implementation of e-learning, a Likert scale 1 (Declined a lot) to 4 (improved a lot) with multiple items was used. The results in Table 5.9 show that 44.42percent of the respondents indicated "just improved" followed by 28.46percent who indicated "improved a lot scale" compared to the rest scales. The scale items in each group (students who use and who not use e-learning) were groped separately and their means were calculated and shown in Table 5.11.

Table 5.9: Effectiveness of E-learning based on Students' Responses (n = 291)

Variables Measured in Learning	Response					
	Declined a lot	Just declined	No change	Just improved	Improved a lot	Total
Satisfaction on knowledge and skills acquisition	9	10	33	161	78	291
Effective learning using computer connected to the internet	13	17	46	145	70	291
Self confidence on accessing online library	12	20	53	127	79	291
Academic performance on continuous assessment	6	12	49	113	111	291
Academic performance on end of semester examination	19	19	80	115	58	291
Satisfaction on online learning compared to traditional learning	16	24	65	127	59	291
Motivation on online assignments and examinations	12	8	43	134	94	291
Self esteem on accessing academic results	4	24	45	129	89	291
Motivations through collaborations	7	11	32	146	95	291
Motivation on using internet on learning	15	8	29	99	140	291
Confidence on using social networks	19	30	78	126	38	291
Total response	132	183	553	1422	911	3201
Response Rate in %	**4.12**	**5.72**	**17.28**	**44.42**	**28.46**	**100**

Similarly, the results show that majority (45.40%) of the respondents indicated "just improved a lot" followed by 33.90 percent who indicated "improved a lot." The findings suggest that despite the low extent of e-learning uptake, e learning had significance effect on teaching among academic staff in Tanzania universities, which implemented e-learning even though in an *ad hoc basis*. The scale items in each group (academic staff who use and who not uses e-learning) were groped separately and their means were calculated and shown in Table 5.12.

Table 5.10: The Effectiveness of E-learning Teaching based on Academic staffs' Responses (n = 58)

Variables to measured in teaching	Response rate				Total
	Declined a lot	Just declined	Just improved	Improved a lot	Total
Satisfaction on knowledge and skills acquisition	4	2	32	20	58
Effective teaching using computer connected to the internet	1	8	26	23	58
Self confidence on accessing online library	0	10	26	22	58
Satisfaction in teaching using e-learning	3	12	28	15	58
Motivation using e-learning tools for online assignment and exams	7	7	17	27	58
Self esteemed on accessing online students results	4	5	29	20	58
Motivation through collaboration using e-learning	10	10	28	10	58
Motivation on using internet in teaching	1	9	31	17	58
Confidence on using social networks	6	9	20	23	58
Total responses	36	72	237	177	522
Response Rate in %	**6.89**	**13.79**	**45.40**	**33.90**	**100**

The results in Tables 5.11 and 5.12 show that there are statistical difference in the means among students and academic staff respectively. Table 5.9 indicates students' responses rate from the group that is not using e-leaning and that which uses e-learning. The results in Table 5.11 revealed that there is a statistically significant difference in the means in terms of effectiveness of using e-learning among students who are using and those who are not using e-learning. The results also show that there is a statistical significant difference in the means among academic staff.

Table 5.11: Mean of Responses from Students

Controlled and treated Group		No. items	Mean	Std. Deviation	Std. Error Mean
Responses	Declined a lot (Not using e-learning)	11	78.9091	26.98316	8.13573
	Improved a lot (using e-learning)	11	212.0909	26.98316	8.13573

Table 5.12: Mean of Responses from Academic Staff

Controlled and treated groups		No. items	Mean	Std. Deviation	Std. Error Mean
Response	Declined a lot (Not using e-learning)	9	22.6667	7.51665	2.50555
	Improved a lot (using e-learning)	9	35.3333	7.51665	2.50555

T-test was used to compare the effectiveness of the implemented e-learning in teaching and learning activities among students and academic staff. The responses are summarized in two groups (e-learning declined a lot and e-learning improved a lot) for comparison. There were two groups of users who declined a lot (not using e-learning) and who improved a lot (using e-learning). The results in Table 5.13 show that there is a significant statistical difference between the two means as 2-tailed < 0.05. This suggests that there is a significant effect on using e-learning in learning and teaching among students in Tanzanian universities. Similarly, the results in Table 5.14 reveal a significant statistical difference between the two means as 2-tailed < 0.05.

Table 5.13: Effectiveness of E-learning in Learning among Students using T-test

	Levene's Test for Equality of Variances		t-test for Equality of Means				
	F	*Sig.*	*t*	*df*	Sig. (2-tailed)	Mean Difference	Std Error
Equal variances assumed	0.000	1.000	-2.35	20.000	0.01	-133.18182	11.50566
Equal variances not assumed			-2.35	20.000	0.01	-133.18182	11.50566

Table 5.14: Effectiveness of E-learning in Teaching and Learning among Academic Staff using T-test

	Levene's Test for Equality of Variances		t-test for Equality of Means				
	F	*Sig.*	*t*	*df*	Sig. (2-tailed)	Mean Difference	Std Error
Equal variances assumed	0.000	1.000	-3.575	16.000	0.03	-12.66667	3.54338
Equal variances not assumed			-3.575	16.000	0.03	-12.66667	3.54338

The results in Table 5.15 show the extent that the implemented e-learning has improved teaching, learning, and other educational activities. When the respondents were asked whether the current e-learning improve teaching and learning, 22.2percent said that the improvement was average. Based on the percentage aggregates of the respondents in these results, e-learning has improved the teaching and learning activities among Tanzanian universities. Concerning the effectiveness of e-learning on students' performance, 38.9 percent of the respondents indicated that the performance was effective; 38.9 percent indicated that the performance was very effective; and few, that is 5.6 and 16.7percent of the respondents indicated performance as being not highly improved and "not improved respectively.

Table 5.15: Effect of E-learning based on Responses from Management

Extent to which current e-learning has improved teaching and learning					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not very improved	3	16.7	16.7	16.7
	Not improved	9	50.0	50.0	66.7
	Average	4	22.2	22.2	88.9
	Improved	2	11.1	11.1	100.0
	Total	18	100.0	100.0	
Extent to which e-learning has affected students' performance					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Effective	1	5.6	5.6	5.6
	Somehow	3	16.7	16.7	22.2
	Effective	7	38.9	38.9	61.1
	Very Effective	7	38.9	38.9	100.0
	Total	18	100.0	100.0	

When the Management staffs were asked about the effectiveness of e-learning in various aspects of educational activities, over 50percent of the respondents indicated that e-learning was effective for various educational activities as deduced in Table 5.16. However, 55percent of the respondents indicated that e-learning had no effect on the rate of students' enrolments. This result is consistent with the t-test results from the groups that were not using and those that were using e-learning among academic staffs and students (see Tables 5.13 and 5.14). In addition, the respondents cited e-learning as having high significant influence on teaching and learning (77.8%) followed by library services (72.2%).

Table 5.16: Effectiveness of E-learning on Various Aspects based on Management Responses

	Yes		**No**		**Total**	
Effectiveness of e-learning on various aspects	N	%	N	%	N	%
Teaching and learning	14	77.8	4	22.2	18	100
Research	11	61.1	7	38.9	18	100
Student registration	12	66.7	6	33.3	18	100
Library services	13	72.2	5	27.8	18	100
Communication	10	55.6	8	44.4	18	100
Rate of student enrolment	8	44.4	10	55.6	18	100
Management of student records	13	72.2	5	27.8	18	100

5.5 Factors Influencing E-learning Implementation

The third specific research objective aimed at determining the factors influencing e-learning implementation in Tanzanian universities. First, factor analysis particularly PCA was done in order to find a way of condensing the observed variables (items) into a smaller set of latent variables with a minimal loss of information. Factor analysis was also done to determine the correlation of each observed variable with a specific latent variable measured. Secondly, the analysis of measurement model was done in order to confirm each observed variable into latent variable using confirmatory factor analysis (CFA) by assessing the model fitness. The overall measurement model was developed based on the results from each individual latent variable such as technologies, users, pedagogies, and institutions, social, as well as

environment based variables with their observed variables (items). Thirdly, the analysis of structural model was made in order to assess or test the influence of each latent variable with the observed variables on the e-learning implementation level using SEM.

5.5.1 Factor Analysis

Factor analysis particularly principle component analysis (PCA) was employed to analyze various factors including technologies, users, pedagogies, institutions, social and the environment; and the results are presented in the subsequent subsections.

5.5.1.1 Technological Construct

The results in Table 5.17 indicate that all variables (items) have a significant correlation with technological construct, which they measured; and these were considered for the sum aggregation in the technological construct. The first component had eigenvalue of greater than one and had 57.87percent (which is above 50%) of the variance. The results show further that all the items loaded were above 0.5 and they were loaded as one component of technological construct. The findings suggest that the initial conditions for employing the factor analysis are met, and then all the items were combined to measure technological construct.

Table 5.17: Total Variance Explained and Component Matrix for Technological Construct

Total Variance Explained					
Component	Initial Eigen values			Component Matrix	
	Total	% of Variance	Cumulative %	Items	Component 1
1	2.893	57.865	57.865	Capability of e-learning….	0.629
2	0.725	14.495	72.36	Availability of e-learning..	0.790
3	0.62	12.393	84.753	Availability interactive and engaging e-learning	0.755
4	0.414	8.281	93.034	Availability of user friendly e-learning..	0.805
5	0.348	6.966	100	Accessibility of e-learning platforms..	0.810
Extraction Method: Principal Component Analysis					

5.5.1.2 User Construct

All variables (items) show a significant correlation in user construct that measured it. The five items were considered for factor analysis and confirmed construct validity and internal reliability with user construct as explained in Chapter Four. From the results in Table 5.18, only the first two components had eigen value of greater than one and explained 62.935percent (which is above 50%) of the variance. All the items were loaded above 0.5 and were loaded as one component of user construct. The results suggest that the items were aggregated into one component and were appropriate for measuring user construct.

Table 5.18: Total Variance Explained and Component Matrix for User Construct

Total Variance Explained

Component	Initial Eigen values			Component Matrix	
	Total	% of Variance	Cumulative %	Items	Component 1
1	2.892	48.195	48.195	User motivation using on-line learning to accomplish task….	0.720
2	.884	14.740	62.935	User satisfaction through experience with e-learning…..	0.732
3	.781	13.012	75.947	Lose of confidence in using e-learning..	0.508
4	.596	9.928	85.874	Self esteem in using e-learning….	0.661
5	.433	7.214	93.089	User motivation using e-learning for discussion	0.792
6	.415	6.911	100.000	Self confidence to perform well assignment and exam….	0.706

Extraction Method: Principal Component Analysis

5.5.1.3 Pedagogical Construct

Table 5.19 shows the items in which the pedagogical construct measured. The findings show that only the first component had eigen value of greater than one and had 60.959percent (which is above 50%) of the variance as shown in Table 5.17. Therefore, the results suggest that all the items were loaded above 0.5 and as one component of pedagogical construct. In addition and as per the correlation matrix, the results indicate that all the items were significantly correlated and were

considered for the sum aggregation in the pedagogical construct. This suggests that the items were valid for factor analysis and were therefore suitable for measuring the pedagogical construct.

Table 5.19: Total Variance Explained and Component Matrix for Pedagogical Construct

Total Variance Explained					
Component	Initial Eigen values			Component Matrix	
	Total	% of Variance	Cumulative %	Items	Component 1
1	2.438	60.959	60.959	Training strategy in the of subject of e-learning	0.770
2	.640	15.989	76.947	Ability of user to integrate e-learning and content	0.780
3	.546	13.651	90.598	Training prior e-content and material	0.807
4	.376	9.402	100.000	Ability of user to relate e-learning and learning strategy	0.765
Extraction Method: Principal Component Analysis					

5.5.1.4 Institutional Construct

From the results in Table 5.20, only the first component had eigen value of greater than one and explained 69.380percent (which is above 50%) of the variance. All the items were loaded above 0.5 and as one component of institutional construct. The results indicate further that all the variables (items) showed a significant correlation with the institutional construct which they measured. Therefore, the items were appropriate for factor analysis and were suitable for measuring institutional construct.

Table 5.20: Total Variance Explained and Component Matrix for Institutional Construct

Component	Initial Eigen values			Component Matrix	
	Total	% of Variance	Cumulative %	Items	Component 1
1	2.775	69.380	69.380	Budget to support e-learning activities	0.778
2	.557	13.929	83.309	Availability of ICT policy…	0.877
3	.372	9.293	92.602	University commitment to implement and use e-learning	0.844
4	.296	7.398	100.000	Management to support user in applying e-learning	0.836

5.5.1.5 Social Construct

All variables (items) as shown in Table 5.21 had a significant correlation with social construct, which they measured. The results show that only the first component had eigen value of greater than one and had 69.380percent (which is above 50%) of the variance. All the items were loaded above 0.5 and as one component of social construct. Therefore, the items were aggregated and suitable for measuring social construct.

Table 5.21: Total Variance Explained and Component Matrix for Social Construct

Component	Initial Eigen values			Component Matrix	
	Total	% of Variance	Cumulative %	Items	Component 1
1	3.000	59.997	59.997	Application of social networks in learning	0.635
2	.823	16.462	76.459	Productive relationship using e-learning	0.812
3	.514	10.289	86.748	Increase status/image among users due to e-learning	0.799
4	.340	6.802	93.550	Increase prestige on interacting and using e-learning	0.812
5	.322	6.450	100.000	Increase corporations among users due e-learning	0.800

5.5.1.6 Environmental Construct

From the results in Table 5.22, only the first component had eigen value of greater than one and explained 64.550percent (which is above 50%) of the variance, all the items were loaded above 0.5 and as one component of environmental construct. The findings show that the items, which were aggregated as one, had significant correlation with environmental construct, which they measured. This suggests that the items were suitable to measure environmental construct.

Table 5.22: Total Variance Explained and Component Matrix for Environmental Construct

Component	Initial Eigen values			Component Matrix	
	Total	% of Variance	Cumulative %	Items	Component 1
1	2.582	64.550	64.550	Availability of internet services…	0.796
2	.564	14.088	78.638	Availability and sustainable electricity…	0.808
3	.431	10.777	89.415	Availability of bandwidth from ISP…..	0.804
4	.423	10.585	100.000	Availability of ICT section/dept/directorate….	0.806
Extraction Method: Principal Component Analysis					

5.6 Development and Validation of Measurement Model using CFA

The analysis of measurement model was done by assessing convergent validity, internal reliability, and the model of fit analyses using Confirmatory Factor Analysis (CFA) as the procedures explained in Chapter Four. The results for each construct were presented in the subsequent paragraphs. Based on these results, the measurement model, which was developed using a path diagram, was used to depict the relationship between the unobserved and the latent variables.

5.6.1 Technological Construct

Technological characteristics construct was measured using five items. The results of the construct assessment are presented in Table 5.23. Five items were loaded above 0.5, and the results indicate that the items are good measures of technological

characteristics construct as they provide good convergent validity. The items include capability of e-learning (loaded by 0.518), availability of e-learning (loaded by 0.741), e-learning interactivity (loaded by 0.702), usability of e-learning (loaded by 0.775), and accessibility of e-learning (loaded by 0.782). In assessing the internal reliability, a Cronbach's alpha of 0.815 was obtained. The value indicates good internal reliability and consistence of the technological construct. Therefore, if the technological construct is successfully adopted in other studies and in different contexts, it may produce similar results. The model of fit for the technological construct was assessed using several indices as presented in Table 5.23. The results indicate that the model of fit of the construct is good as all indices are within the suggested values close to 1. Therefore, the items of technological characteristics construct were measured with inconsequential errors and were confirmed to measure the technological construct.

Table 5.23: Model Fit for Technological Characteristics

Cronbach Alpha 0.815						
Model of Fit	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI	RAMSEA
Default model	.822	.644	.856	.700	.850	.005
Saturated model	1.000		1.000		1.000	
Independence model	.000	.000	.000	.000	.000	10.60

Recommended values: NFI, RFI, IFI, TLI and CFI should be close to 1 and $0 \leq$ RMSEA ≤ 0.1 (Hooper, Coughlan and Nullen, 2008; Kline, 2005)

5.6.2 User Characteristics Construct

Six items which were loaded above 0.3 were used to measure user construct. The result indicates that the items are good measures of user characteristics construct as they provide good convergent validity. The measured items include motivation on using e-learning (loaded by 0.692), user satisfaction (loaded by 0.707), self efficacy loaded (by 0.409), self esteem (loaded by 0.581), motivation to learn (loaded by 0.770), and user confidence (loaded by 0.643). In assessing the internal reliability, a Cronbach's alpha of 0.773 was obtained. The value indicates good internal reliability

and consistence of the user construct. Therefore, if the user construct is successfully adopted in other studies and in different contexts, it may produce similar results. The model fit for the user construct was assessed using several indices as presented in Table 5.24. The results indicate that the fit of the construct is good as all indices are within the suggested values close to 1. Therefore, the items of user characteristics construct were measured with minor errors and confirmed to measure user construct.

Table 5.24: Model Fit for User Characteristics

Cronbach alpha 0.773						
Model of fit	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI	RAMSEA
Default model	.753	.589	.809	.665	.799	.0071
Saturated model	1.000		1.000		1.000	
Independence model	.000	.000	.000	.000	.000	10.450

Recommended values: NFI, RFI, IFI, TLI and CFI should be close to 1 and $0 \leq$ RMSEA ≤ 0.1 (Hooper, Coughlan and Nullen, 2008; Kline, 2005)

5.6.3 Pedagogical Construct

Four items, which were loaded above 0.6, were used to measure pedagogical construct, and the results indicate that the items are good measures of pedagogical characteristics construct as they provide good convergent validity. The measured items with their loading weighs include training strategy (loaded by 0.690), e-learning and e-contents (loaded by 0.687), training on e-learning (loaded by 0.747) and e-learning and learning strategy (loaded by 0.65). In assessing the internal reliability, a Cronbach's alpha of 0.788 was obtained. This value indicates good internal reliability and consistence of the pedagogical construct. Therefore, if the pedagogical construct is successfully adopted in other studies and in different contexts, it may produce similar results. The model of fit for the pedagogical construct was assessed using several indices as presented in Table 5.25. The fit of the construct was found to be good as all the indices were within the suggested values close to 1. Therefore, the items of pedagogical characteristics construct were measured with inconsequential errors.

Table 5.25: Model Fit for Pedagogical Characteristics

Cronbach alpha 0.788						
Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI	RAMSEA
Default model	.945	.835	.951	.850	.950	.0067
Saturated model	1.000		1.000		1.000	
Independence model	.000	.000	.000	.000	.000	10.340

Recommended values: NFI, RFI, IFI, TLI and CFI should be close to 1 and 0 ≤ RMSEA ≤ 0.1 (Hooper, Coughlan and Nullen, 2008; Kline, 2005)

5.6.4 Institutional Construct

Four items, which were loaded above 0.6, were used to measure institutional construct, and the result indicates that the items are good measures of institutional characteristics construct as they provide good convergent validity. The measured items with their loading weighs include budget to support e-learning (loaded by 0.683), ICT policy (loaded by 0.834), university commitment (loaded by 0.794), and management support (loaded by 0.768). In assessing the internal reliability, a cronbach's alpha of 0.851 was obtained. The value indicates good internal reliability and consistence of the institutional construct. Therefore, if the institutional construct is successfully adopted in other studies and in different contexts, it will produce similar results. The model fit for the institutional construct was assessed using several indices as presented in Table 5.26. The fit of the construct was found to be good as all the indices were within the suggested values close to 1. Therefore, the items of institutional characteristics construct were measured with negligible errors.

Table 5.26: Model Fit for Institutional Characteristics

Cronbach alpha 0.851						
Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI	RAMSEA
Default model	.967	.902	.971	.913	.971	.0056
Saturated model	1.000		1.000		1.000	
Independence model	.000	.000	.000	.000	.000	10.800

Recommended values: NFI, RFI, IFI, TLI and CFI should be close to 1 and 0 ≤ RMSEA ≤ 0.1 (Hooper, Coughlan and Nullen, 2008; Kline, 2005)

5.6.5 Social Construct

Five items, which were loaded above 0.5, were used to measure social construct, and the results indicate that the items are good measures of social characteristics construct as they provide good convergent validity. The items measured and their loading weighs include application of social networking sites (loaded by 0.572), productive relationship through e-learning loaded by (0.719), high status/image through e-learning loaded by 0.749, prestigious through e-learning (loaded by 0.778), and corporation through e-learning (loaded by 0.761). In assessing the internal reliability, a cronbach's alpha of 0.828 was obtained. The value indicates good internal reliability and consistence of the social construct. Therefore, if the social construct is successfully adopted in other studies and in different contexts, it will produce similar results. The mode fit for the social construct was assessed using several indices as presented in Table 5.27. The findings indicate that the fit of the construct is good as all the indices were within the suggested values close to 1. Therefore, the items of social characteristics construct were measured with inconsequential errors.

Table 5.27: Model Fit for Social Characteristics

Cronbach alpha 0.828						
Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI	RAMSEA
Default model	.894	.789	.902	.803	.901	.0063
Saturated model	1.000		1.000		1.000	
Independence model	.000	.000	.000	.000	.000	10.540

Recommended values: NFI, RFI, IFI, TLI and CFI should be close to 1 and $0 \leq$ RMSEA ≤ 0.1 (Hooper, Coughlan and Nullen, 2008; Kline, 2005)

5.6.6 Environmental Construct

Four items, which were loaded above 0.7, were used to measure environmental construct, and the results indicate that the items are very good measures of environmental characteristics construct as they provide very good convergent validity. The items measured and their loading weighs include availability of ICT

section/unit (loaded by 0.731), availability of high bandwidth (loaded by 0.728), sustainability of electricity (loaded by 0.713), and availability of internet connectivity (loaded by 0.713). In assessing the internal reliability, a cronbach's alpha of 0.828 was obtained. The value indicates good internal reliability and consistence of the social construct. Therefore, if the environmental construct is successfully adopted in other studies and in different contexts, it will produce similar results. The model fit for the environmental construct was assessed using several indices as presented in Table 5.28. It was noted that the fit of the construct is good as all the indices were within the suggested values close to 1. Therefore, the items of environmental characteristics construct were measured with inconsequential errors**.**

Table 5.28: Model Fit for Environmental Characteristics

Cronbach alpha 0.817						
Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI	RAMSEA
Default model	.981	.942	.986	.957	.986	0.0050
Saturated model	1.000		1.000		1.000	
Independence model	.000	.000	.000	.000	.000	10.900

Recommended values: NFI, RFI, IFI, TLI and CFI should be close to 1 and $0 \leq$ RMSEA ≤ 0.1 (Hooper, Coughlan and Nullen, 2008; Kline, 2005)

5.7 Summary of Development and Validation of Measurement Model

This section presents a summary of results of confirmatory factor (CFA) analysis. The section presents the measurement model developed and validated using direct estimation technique as depicted in Figure 5.8. The results show how the observed variables contributed to latent variables and confirmed by CFA for model of fit. The extent of interrelationship and co-variation among the latent constructs were also examined. The latent constructs (factors) which were confirmed include technological, pedagogical, user, institutional, social, and environmental constructs as indicated by oval images while the observed variables are represented by rectangular images.

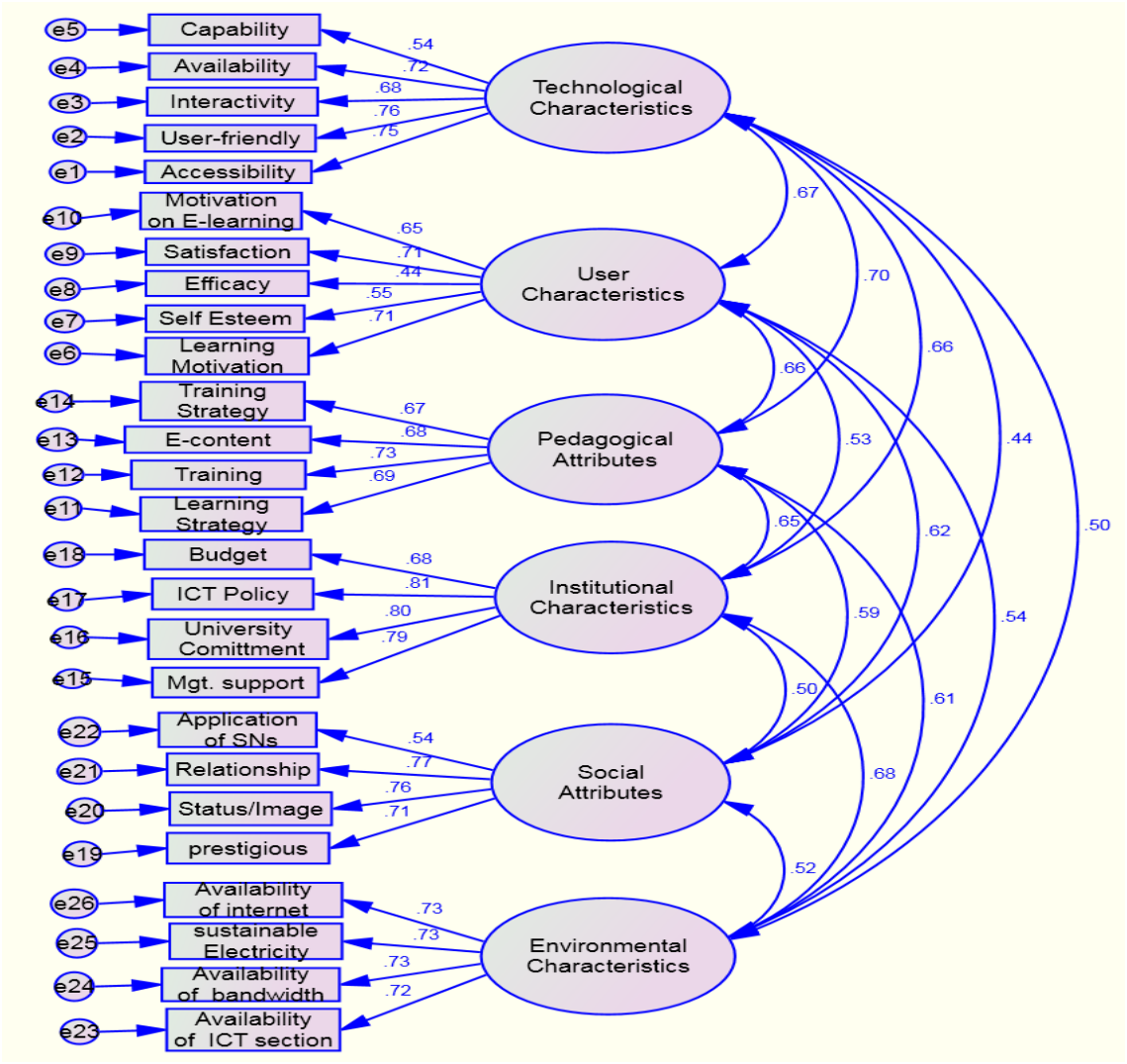


Figure 5.1: Measurement Model Developed using CFA

The results in Figure 5.1 show that all the observed variables were loaded above 0.6 that indicate high contribution to the unobserved variables with acceptable level of construct validity. The results show further that there is a good relationship among latent variables as all items of the covariance were above 50percent except social characteristics and technological characteristics, which were 44percent. Table 5.26 complements the results in Figure 5.1.

The results in Appendix A, confirm further specifically, the validity of the relationship between the observed variables and latent constructs in terms of convergent and discriminant validity using PCA. For instance, the Average Variance

Extracted (AVE) for each of the latent sub-constructs along the diagonal exceeded the threshold of 0.5, which confirms the convergent validity of the measurement items. Additionally, the measurement model demonstrated adequate evidence of discriminant validity given that the AVEs exceeded the respective shared variances (see values above the diagonal in Table A, presented in Appendix A in Page 201).

Before developing structural model, the measurement model was validated under statistical and theoretical principle as recommended by Hair *et al*. (2014) in order to reveal its validity. This stage was critical for a researcher to get experience of the measurement model developed and provided feedback, which led towards the improvements of the structural model to be developed as a final product. The results in Table 5.29 reveal that the model of fit as the RMSEA is between 0.6 and 0.8. The results indicate further that the model has goodness of fit (GOF) as the GFI, CFI, and AGFI were 0.92, 0.93, and 0.90 respectively, which are acceptable goodness of fit. The P-value is significant with 0.000 as recommended. The results show that the CLOSE is not acceptable as it is smaller than the recommended 0.5. Therefore, the rest of the indices indicate that the model is better in explaining the interrelationship between latent variables and measurable indicators as well as the correlations among the latent variables. In this case, there is no need of modifying the indices.

Table 5.29: Measurement Model of Fit Summary

Model	NPAR	CMIN	DF	P	RMSEA	CFI	PCLOSE	GFI	AGFI
Default model	67	587.085	284	.000	.060	.930	.006	.920	.900
Saturated model	351	.000	0					1.000	
Independence model	26	3509.838	325	.000	10.800	.184	.000	.269	.211

Recommended value for model fit: GFI, AGFI and CFI close to 1, $0 \leq RMSEA \leq 0.1$ (Hooper, Coughlan and Nullen, 2008; Kline, 2005)

5.8 Development and Validation of E-learning Implementation Model using SEM

The third specific research objective of this study was to determine the factors influencing e-learning implementation level. Further, the study assesses the influences of each latent (factor) with the observed variables on e-learning implementation level. The SEM particularly, Confirmatory Factor Analysis (CFA) was used to develop and test structural models for each factor to show how each of the factors influence the level of e-learning implementation. Figures 5.2, 5.6, 5.7, 5.8, 5.9, and 5.10 illustrate the results of the influence of Technological, Users, and Institutional, Pedagogical, Social, and Environmental factors respectively with their observed variables on e-learning implementation level. The results in Tables 5.30, 5.31, 5.32, 5.33, 5.34 and 5.35 complement the results presented in the preceding models.

5.8.1 Technological Factor and E-learning Implementation Level

Results in Figure 5.2 indicate that the factor loadings for capability of e-learning, availability, e-learning interactivity, usability and accessibility of e-learning were above 0.3; and that the items are good measures of technological characteristics construct. The findings in Figure 5.2 show further that, Technological characteristics influence the number of e-learning users (as 1 standard deviation of technological characteristics causes 0.72 of standard deviation to increase the number of e-learning users). Technological characteristics influence the frequency of using e-learning (as 1 standard deviation of technological characteristics causes 0.44 standard deviation to increase frequency of using e-learning). Technological factors influence availability of ICT infrastructure (as 1 standard deviation of technological characteristics causes 0.69 standard deviation to increase the availability of ICT infrastructure). Technological characteristics influence motivation of e-learning users (as 1 standard deviation of technological characteristics causes 0.41 standard deviation by increasing motivation of e-learning users).

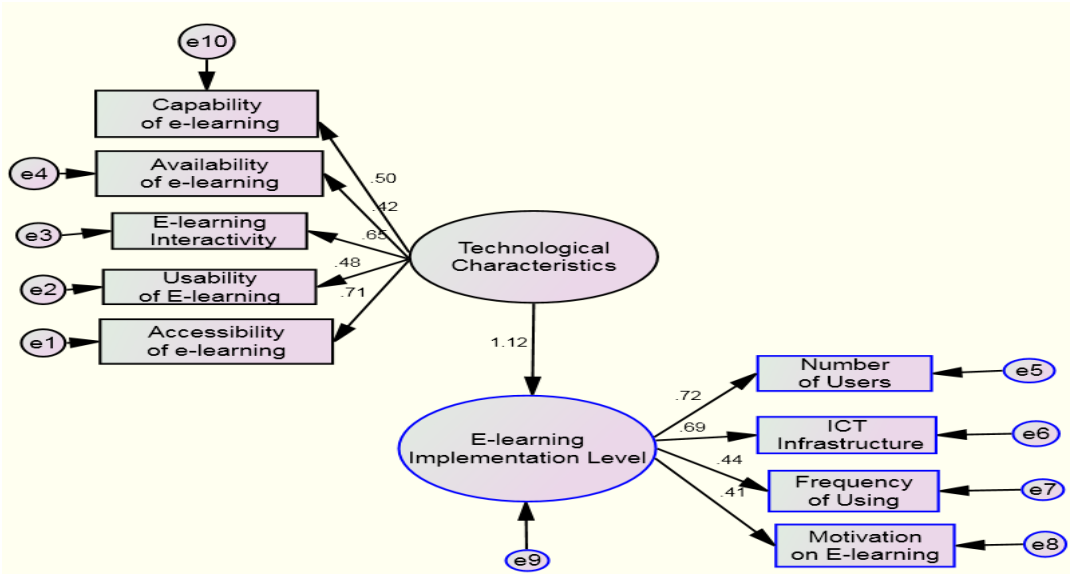


Figure 5.2: Influence of Technological Factor on E-learning Implementation Level

The findings in Table 5.30 show that technological characteristic have positive significant influence on the level of e-learning implementation ($p < 0.05$). The findings show further that technological characteristics directly improve the e-learning implementation by 1.12percent, by increasing the number of e-learning users, the frequency of using e-learning, ICT infrastructures, and motivation among e-learning users.

Table 5.30: Regression Weights of the Technological Construct on E-learning implementation

Indicators of e-learning implementation		Construct	Standardized regression weight	P-Values	Unstandardized regression weight	
Number of e-learning users	<….	Technological	.72	0.000	1.00	.062
Frequency of using	<….	Technological	.69	0.000	0.60	.059
ICT infrastructure	<….	Technological	.44	0.000	0.98	.061
Motivation of using	<….	Technological	41	0.000	0.58	.060

5.8.2 User Factor and E-learning Implementation Level

Figure 5.3 shows that the factor loading for user confidence, self-efficacy, motivation on using e-learning (user experience), motivation on learning, and self esteem on e-learning was above 0.3. The results show that the items are good measures of user characteristics construct. The results in Figure 5.3 show further that user characteristics influence the number of e-learning users (as 1 standard deviation of user causes 0.63 standard deviation to increase number of e-learning users). User characteristics influence the frequency of using e-learning (such that, 1 standard deviation of user construct causes 0.52 of standard deviation by increasing frequency of using e-learning). User characteristics influence availability of ICT infrastructure (as 1 standard deviation of user causes 0.68 standard deviation to increase the availability of ICT infrastructure). User characteristics influence motivation of e-learning users (as 1 standard deviation of technological causes 0.49 standard deviation by increasing motivation of e-learning users). Table 5.31 complements the presentation of the findings revealed in Figure 5.3

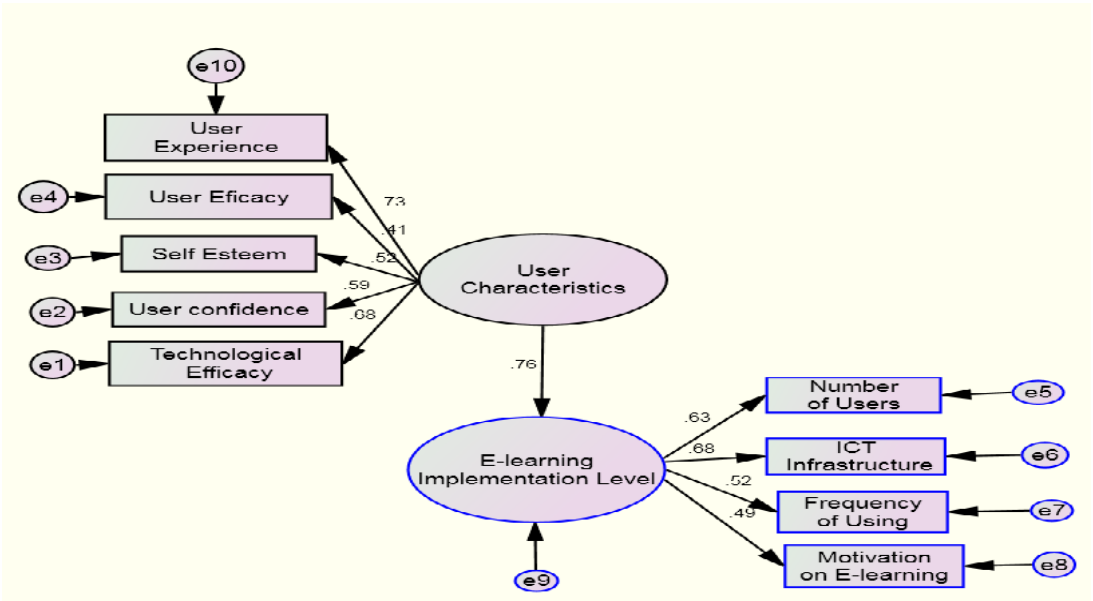


Figure 5.3: Influence of User Factor on E-learning Implementation.

The results in Table 5.31 indicate that user' characteristics have positive significant influence on the level of e-learning implementation ($p < 0.05$). This indicates that user's characteristics improve the level of e-learning implementation in universities. The results show further that user characteristics directly improve the implementation of e-learning by 76percent, by increasing the number of e-learning users, the frequency of using e-learning, ICT infrastructures, and motivation among e-learning users.

Table 5.31: Regression Weights of the User Construct on E-learning Implementation

Indicators of e-learning implementation level	Construct	Standardized regression weight	P-Values	Unstandardized regression weight	S.E
Number of e-learning users	<…. Users	.63	0.000	1.00	.062
Frequency of using	<…. Users	.52	0.000	0.81	.059
ICT infrastructure	<…. Users	.68	0.000	1.10	.061
Motivation of using	<…. Users	.49	0.000	0.82	.060

5.8.3 Pedagogical Factor and E-learning Implementation Level

The results in Figure 5.4 show that the factor loading for e-learning and learning strategy, e-learning training, and integration of e-learning and e-content, training on e-learning strategies was above 0.5 and that the items are very good measure of the construct of pedagogical characteristics. The results in Figure 5.4 show further that pedagogical characteristics influence the number of e-learning users (as 1 standard deviation of pedagogical attribute cause 0.72 of standard deviation by increasing the number of e-learning users). Pedagogical characteristics influence the frequency of using e-learning (as 1 standard deviation of pedagogical characteristics cause 0.50 of standard deviation by increasing the frequencies of using e-learning). Pedagogical characteristics influence the availability of ICT infrastructure (as 1 standard deviation of pedagogical characteristics cause 0.63 standard deviation by increasing the availability of ICT infrastructure). Pedagogical characteristics influence the motivation of e-learning users (as 1 standard deviation of pedagogical characteristics cause 0.45 of standard deviation by increasing motivation of e-learning users).

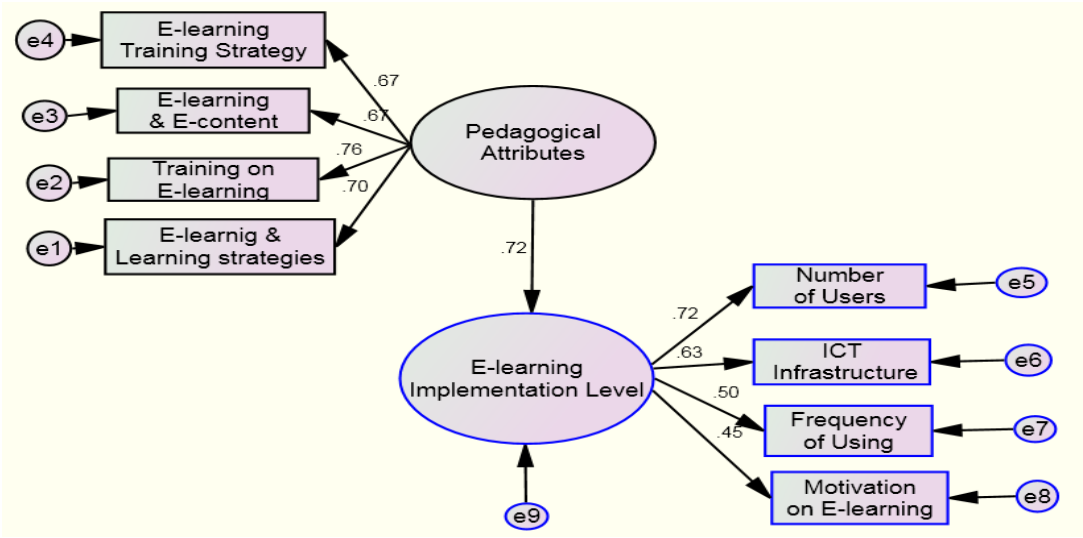


Figure 5.4: Influence of Pedagogical Factor on E-learning Implementation

The results in Table 5.32 show that pedagogical characteristics have positive significant influence on the level of e-learning implementation ($p < 0.05$). The study findings show that the factor loading was above 50percent in each factor, improving the level of e-learning implementation in universities. The findings show further that pedagogical characteristics directly improve the e-learning implementation by 72percent, by increasing the number of e-learning users, the frequency of using e-learning, the ICT infrastructures and motivation among e-learning users.

Table 5.32: Regression Weights of the Pedagogical Construct on E-learning Implementation

Indicators of e-learning implementation level		Construct	Standardized regression weight	P-Values	Unstandardized regression weight	S.E
Number of e-learning users	<….	Pedagogical	.72	0.000	1.00	.062
Frequency of using	<….	Pedagogical	.50	0.000	.67	.059
ICT infrastructure	<….	Pedagogical	.63	0.000	.89	.061
Motivation of using	<….	Pedagogical	.45	0.000	.64	.060

5.8.4 Institutional Factor and E-learning Implementation Level

The results in Figure 5.5 indicate that the factor loadings for e-learning budget, availability of ICT policy, university commitment, and management support on e-learning activities were above 0.3. This implies that the items were very good measures of institutional construct. The results in Figure 5.5 show further that, Institutional characteristics influence the number of e-learning users (as 1 standard deviation of user causes 0.73 standard deviation to increase the number of e-learning users). On the other hand, institutional characteristics influence the frequency of using e-learning (as 1 standard deviation of institutional construct lowers the frequency of using e-learning by 0.48 of standard deviation). In addition, institutional characteristics influence the availability of ICT infrastructure (as 1 standard deviation of institutional construct causes 0.65 standard deviation by decreasing the availability of ICT infrastructure). Institutional characteristics influence motivation of e-learning users (as 1 standard deviation of institutional characteristics causes 0.44 of standard deviation by lowering motivation of e-learning users).

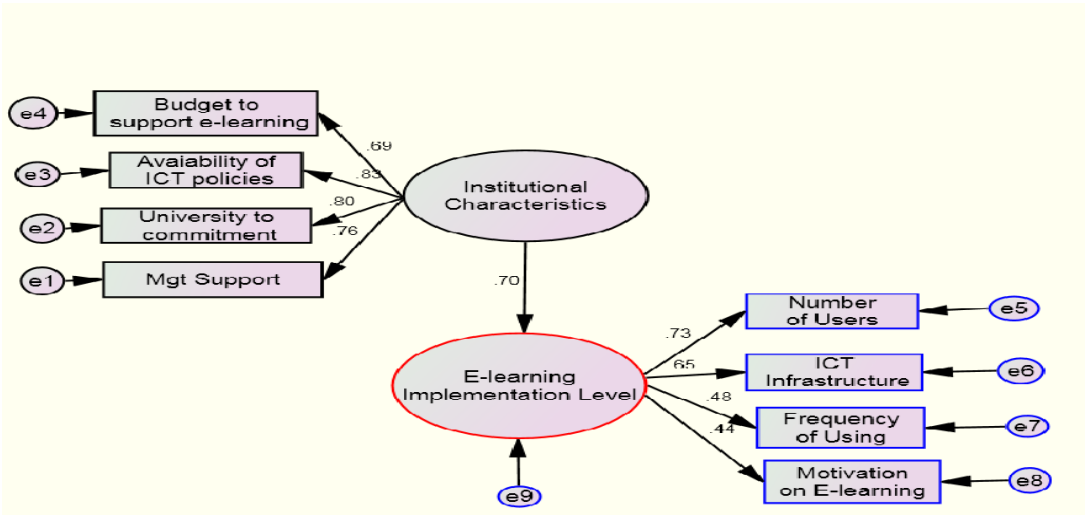


Figure 5.5: Influence of Institutional Factor on E-learning Implementation

The results in Table 5.33 show that institutional characteristics have positive significant influence on the level of e-learning implementation ($p < 0.05$). The results show further that the factor loading was above 50percent in each item for improving the level of e-learning implementation in universities. The results also show that

institutional characteristics directly improve the e-learning implementation by 72percent, by increasing the number of e-learning users, the frequency of using e-learning, ICT infrastructures, and motivation among e-learning users.

Table 5.33: Regression Weights of the Institutional Construct on E-learning Implementation

Indicators of e-learning implementation level		Construct	Standardized regression weight	P-Values	Unstandardized regression weight	S.E
Number of e-learning users	<….	Institutional	.73	0.000	.1.00	.062
Frequency of using	<….	Institutional	.48	0.000	.65	.059
ICT infrastructure	<….	Institutional	.65	0.000	.91	.061
Motivation of using	<….	Institutional	.44	0.000	.63	.060

5.8.5 Social Factor and E-learning Implementation

The results in Figure 5.6 indicate that the factor loadings for the application of social networks, productive relationships, status/image, and prestige towards e-learning activities were above 0.5. Moreover, the items were good measures of social construct. The findings in Figure 5.6 show further that social characteristics influence the number of e-learning users (as 1 standard deviation of users causes 0.64 of standard deviation by increasing the number of e-learning users). Social characteristics influence the frequency of using e-learning (as 1 standard deviation of social characteristics increase the frequency of using e-learning by 0.56 of standard deviation). In addition, social characteristics influence the availability of ICT infrastructure (as 1 standard deviation of users causing 0.61standard deviation by increasing the availability of ICT infrastructure). Social characteristics influence the motivation of e-learning users (as 1 standard deviation of social characteristics causes 0.54 of standard deviation by raising the motivation of e-learning users).

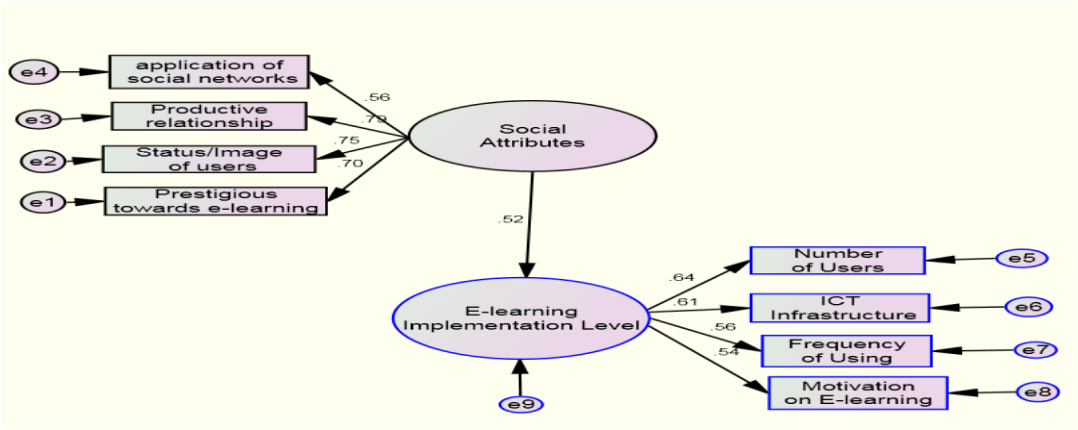


Figure 5.6: Influence of Social Factor on E-learning Implementation

The results in Table 5.34 indicate that social characteristics have positive significant influence on the level of e-learning implementation ($p < 0.05$). The results show further that the factor loading was above 50percent in each item for improving the level of e-learning implementation in universities. The results also show that social characteristics directly improve the e-learning implementation by 72percent by increasing the number of e-learning users, the frequency of using e-learning, ICT infrastructures, and motivation among e-learning users.

Table 5.34: Regression Weights of the Social Construct on E-learning Implementation

Indicators of e-learning implementation level	Construct	Standardized regression weight	P-Values	Unstandardized regression weight	S.E
Number of e-learning users	<…. social	.64	0.000	1.00	.060
Frequency of using	<…. social	.56	0.000	.864	.059
ICT infrastructure	<…. social	.61	0.000	.985	.061
Motivation of using	<…. social	.54	0.000	.876	.062

5.8.6 Environmental Factor and E-learning Implementation Level

The results in Figure 5.7 indicate that the factor loadings for availability of ICT sections/directorate, availability bandwidth, sustainability of electricity, and availability of internet connectivity were above 0.5. In addition, the items were very good measures of environmental construct. The findings in Figure 5.7 show further

that environmental characteristics influence the number of e-learning users (as 1 standard deviation of environmental causes 0.68 of standard deviation by increasing the number of e-learning users). Environmental characteristics also influence the frequency of using e-learning (as 1 standard deviation of environmental characteristics increases the frequency of using of e-learning by 0.53 of standard deviation). Environmental characteristics also influence the availability of ICT infrastructure (as 1 standard deviation of environmental causes 0.63 standard deviation by increasing the availability of ICT infrastructure). Environmental characteristics influence motivation of e-learning users (as 1 standard deviation of environmental characteristics causes 0.49 of standard deviation by raising motivation of e-learning users).

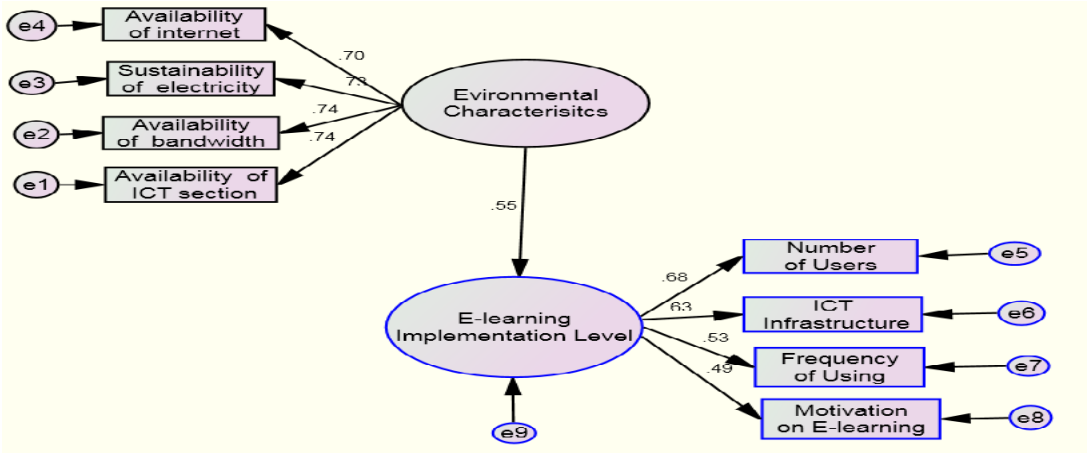


Figure 5.7: Influence of Environmental Factor on E-learning Implementation

The results in Table 5.35 indicate that environmental characteristics have positive significant influence on the level of e-learning implementation ($p < 0.05$). The results show further that the factor loading was above 50percent in each item for improving the level of e-learning implementation in universities. The results also show that environmental characteristics directly improve the e-learning implementation by 72 percent, by increasing the number of e-learning users, and the frequency of using e-learning, ICT infrastructures and motivation among e-learning users.

Table 5.35: Regression Weights of the Social Construct on E-learning Implementation

Indicators of e-learning implementation level		Construct	Standardized regression weight	P-Values	Unstandardized regression weight	S.E
Number of e-learning users	<….	Environmental	.68	0.000	.471	.060
Frequency of using	<….	Environmental	.63	0.000	.525	.059
ICT infrastructure	<….	Environmental	.53	0.000	.469	.061
Motivation of using	<….	Environmental	.49	0.000	426	.062

5.9 Validation of E-learning Implementation Model Using Direct Method

The fourth specific research objective was to develop a model for effective and successful e-learning implementation. This section presents the result of the validation of overall model in the path diagram built by SEM to indicate the relationship between the latent variables as independent variables and the level of e-learning implementation as the dependent variable using direct techniques. The model developed has two parts: the measurement model and the structural model. The results show exactly the extent to which each factor has positive significant influence on the level of e-learning implementation among Tanzanian universities. The determined factors and their relationships in a model were considered as the best way of implementing e-learning among Tanzanian universities.

The results in Figure 5.8 show that all the items measured have loading factor above 30percent. The results show further that the standardized regression weights for (interrelationship among latent variables) technological, user, pedagogical, institutional, social, and environmental construct is at least 30percent. All the constructs have positive influence on the level of e-learning implementation except institutional construct, which is found to have negative influence on the level of e-learning implementation. Technological construct was found to have the highest influence on the level of e-leaning implementation by 34percent loading factor as opposed to other constructs. However, the results show further that, institutional construct influences the level of e-learning implementation by -10percent.

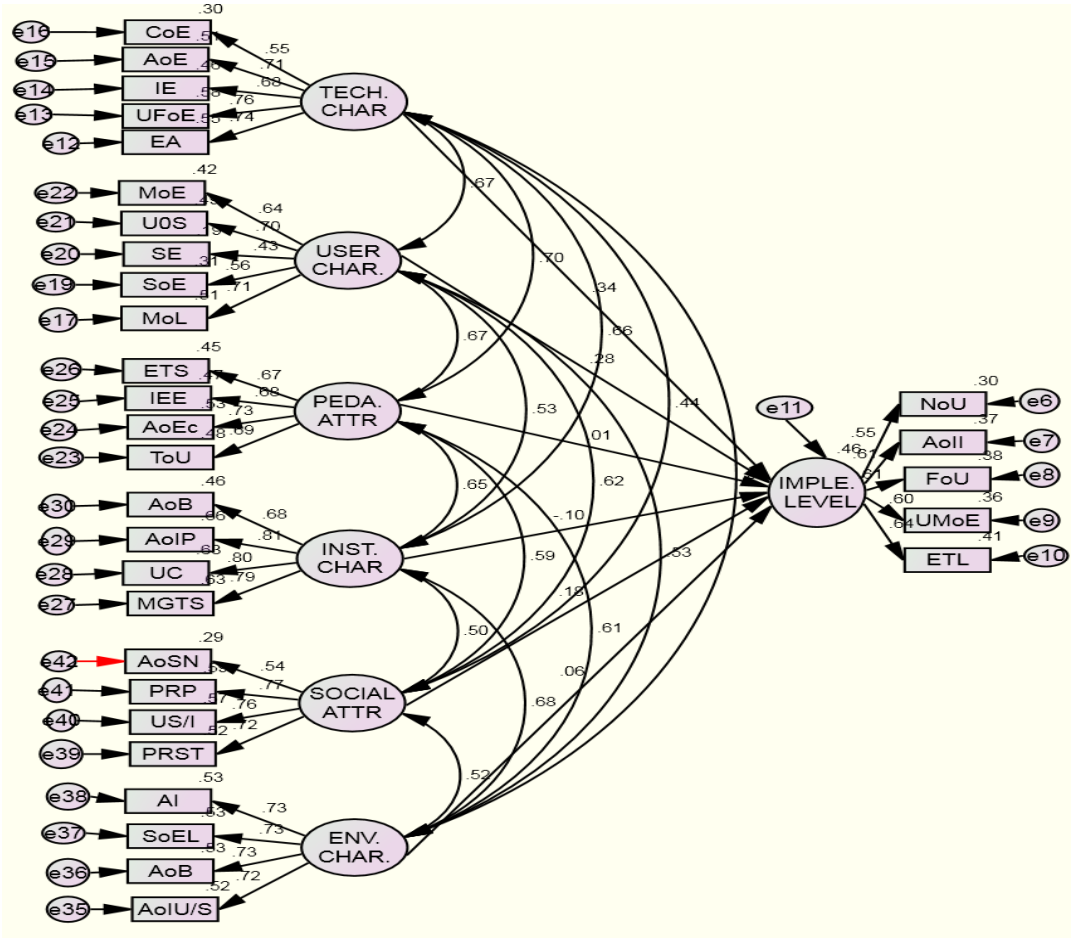


Figure 5.8: E-learning Implementation Model: Analysis of Field data (2018)

Keywords: CoE – Capability of E-learning; AoE – Availability of E-learning platforms and facilities; IoE - User interaction on E-learning; UoE - User friendly on using E-learning; EA – E-learning Accessibility; MoE – Motivation of users to use E-learning; UoS – User satisfactions towards using e-learning; SE – Self efficacy of users towards e-learning; SoE – Self esteem on using e-learning; MoL – User motivation on learning/teaching using e-learning; ETS - Availability of e-learning training strategies; IEE - Integrations of E-learning and E-content; AoEc – Availability of e-contents; ToU - Availability of user training on using E-learning; AoB - Availability of budget for e-learning; AoIP – Availability of ICT policy; UC – University commitment towards e-learning; MGTs – Management supports e-learning; AoSNs – Availability of Social Networking sites; PR – Productivity relationships among users; US/I – Status/Image of users; PRST – Prestigious of users towards using e-learning; AI - Availability of Internet connectivity; SoEL – Sustainability of electricity; BA – Bandwidth availability; AU/S – Availability of ICT units/sections.

Based on the modelling stages outlined in the methodological chapter in subsection 4.10.3, the developed model using SEM was validated from theoretical and statistical point of view adhering to scientific principles (i.e. statistical, internal, and theoretical validity were achieved). The model was correctly specified and the estimation process was not constrained by identification problems. The results for the developed model were tested for their validity based on the following guidelines: offending estimates, measurement model fit (model fit and goodness of fit); structural model fit (model fit and goodness of fit), and the overall model fit (model fit and goodness of fit) as presented in the next paragraphs.

Based on the offending estimates, the findings show that there is no nonsensical or theoretical inconsistence in the estimates in both measurement model and the structural as a final model. For instance, there are no negative error variances and the standard errors are not much larger. The goodness of fit (GOF) value (0.92) revealed in the measurement model predicted goodness of fit (GOF) value of about 0.98 acceptable revealed in the structural model that presents the influence between independent variables and e-learning implementation level. Generally, the closer the structural model GOF to the measurement model the better the structural model fit because the measurement model fit provides an upper hand to the GOF of a conventional structural model.

Other indices were also used as the criteria for validating the model. The results of goodness of fit are presented in Table 5.36. The results of the model fit in Table 5.36 indicate that all the values such as GFI, AGFI, RFI, CFI, RMSEA, and P-values qualify to explain the model of fit. The results indicate further that, all the values of GFI, AGFI, RFI, and NFI were close to 1. The value of root mean square estimate approximation (RMSEA) was 0.057 acceptable and the average approximately chi-square was 374.208 acceptable.

Table 5.36: E-learning Implementation Model fit summary

Model	CMIN	DF	P-VALUE	CMIN/DF	GFI	AGFI	RFI	NFI	CFI	RMSEA	IFI
Default model	803.839	413	.000	1.946	.980	.920	0.780	.804	.960	.057	0.89
Saturated model	.000	.000								0.164	
Independence model	4097.104	465	.000	8.811	.264	.264		0.00			
	Recommended value for model fit: GFI, AGFI, NFI, RFI, IFI, TLI and CFI close to 1, $0 \leq RMSEA \leq 0.1$ (Hooper, Coughlan and Nullen, 2008; Kline, 2005)										

5.10 Chapter Summary

Chapter Five presented and interpreted the results of this study in accordance with the specific research objectives, the conceptual framework as well as the assumptions of data analysis techniques. The results on demographic characteristics indicate there were more male (66%) than female students. Also, there were more students specializing in arts and social sciences (34%) than those specialized in other disciplines. The chapter indicates further that there were more Assistant Lecturers (44%) in Tanzanian universities than were in other ranks. In case of ICT experts, the results show that there were (71%) male than female experts.

In the first specific research objectives variables including awareness, attitudes, availability, and accessibility of e-learning were used to ascertain the extent of e-leaning uptake. The results indicate that the average extent of e-learning uptake among students and academicians is about 17.5 percent low. Similarly, the results indicate further that the extent of e-learning uptake among ICT expert is 37.25 percent low. Generally, 55percent of the management staff reported low level of availability of e-learning platforms and facilities and 66.7percent of the management staff agreed that the frequency of using e-learning was low.

In the second specific objective, the effectiveness of e-learning in teaching and learning was assessed using t-test analysis technique among students and academic staff. The results show that there is a statistical significant difference among the means of the two groups (who are using e-learning and those not using e-learning) as p-value < 0.05. This suggests that there is a significant effect on using e-learning in teaching and learning in Tanzanian universities. Further, the average of 77.8percent of the management staff reported that e-learning was effective in influencing students' performance and in teaching and learning practices.

In the third specific objective, the factors influencing e-leaning implementation were determined. The results show that technological (112%), pedagogical (72%), user (76%), institutional (70%) environmental (55%), and social characteristics (52%) had significant influence on the implementation of e-learning in Tanzanian universities when assed individually. The results show further that there is goodness fit (GFI = 0.92 and CFI = 0.93) of a measurement model as the basis for developing e-learning implementation model (structural model).

In the fourth specific research objective, the e-learning implementation model was developed and validated with six interrelated factors collectively as shown in Figure 5.8. The results in a model indicate that all factors for every single standard deviation of an increase of each factor (technological, pedagogical, user, social and environmental) led to a significant increase of (0.34, 0.01, 0.28, 0.18 and 0.06) the level of e-learning implementation except institutional characteristics which were found to decrease the level of e-learning implementation by of -0.1.

CHAPTER SIX

DISCUSSION OF RESEARCH FINDINGS

6.1 Introduction

This chapter presents the discussion of the study findings based on the presentation and interpretations of the results and the experience gained during the current study. The discussion based on the theories and findings of previous similar studies. For clarity purposes, the discussion is organized according to the specific research objectives.

6.2 Demographic Characteristics of Respondents

Majority of the previous studies and theories explained the importance of demographic characteristics of the respondents on e-leaning implementation, its uptake, and effectiveness. These characteristics provide the demographic descriptions of the sample; and they were expected to have some influence on the e-learning implementation, uptake, and effectiveness. These findings are consistent with the theory of UTAUT, which was developed by Venkantesh (2003). The findings of this study show that male students are more likely to use e-learning than is the case with female students. However, the findings of this study contradict the findings of studies by other scholars (e.g. Volman *et al*., 2005; Zhu *et al*., 2009; Vrielink, 2007) which indicate that both male and female students have almost equal perception towards e-learning implementation and usage. The contrast is because, as would be expected, the survey sample in this study was more dominated by male students than was by female students. This is also usual since the enrolment of male students is higher than that of female students in Tanzanian Universities (MoEVT, 2003). In addition, although the questionnaires were directly administered to both male and female students, often female students were hesitant in providing responses. The dissimilarity of findings is also due to cultural and context differences where the study was conducted as argued in the study of Njenga (2011) and the theory of UTAUT.

The findings of the study revealed that there were more students specialized in arts and social sciences than those specialized in other disciplines. These findings suggest that there would be a significant difference in the perception towards e-learning implementation and usage among students from various specializations. However, the findings from previous studies reported that there were no significant differences on the perceptions towards e-learning implementation and usage among students from different specializations (Agboola, 2006 and Karimi and Ahmed, 2013). The contradiction is because, in practice, this is usual since in the majority of universities in Tanzania there are more Arts and Social Sciences students as opposed to other areas of specialization (TCU, 2017).

Concerning academic ranks**,** the surveyed sample of this study was dominated by Assistant Lecturers as opposed to other ranks. These findings are somewhat similar to the statistics of academic staff, which indicate that there were more academic staffs are in the rank of Assistant Lecturer. The findings indicate that there are few Associate and Full Professors in Tanzanian universities. This can partly be explained by the fact that the present status of academic staff in Tanzanian universities is led by Assistant Lecturers (TCU, 2015). The findings of this study suggest further that most respondents were in the active age group of 30-40 years and who were capable of undertaking a wide range of academic activities and adopting new technologies including e-learning. These findings are similar to the findings in other studies (e.g. slam *et al*., 2011; Kavaliauskiene *et al*., 2012; Kavaliauskiene and Valunas, 2012; Taha, 2014) which reported that e-learning usage has been revealed to have low rate on Associate Professors, Professors, and Tutorial Assistants.

Generally, from the findings of this study, majority of the academic staff are young. This trend is not astonishing for Tanzanian universities as the statistics from TCU (2015) indicates that the other age groups of academic staff have very few members. Since using e-learning in teaching requires only commitment, knowledge, computer skills as well as effective practice, it can be concluded that those academic staff with more than 40 years are not competent in using e-learning technology. This is also revealed in the findings from previous studies and theories (e.g. Venkatesh, 2003;

Al-shabab, 2007; Lwoga and Komba, 2015) that show that the age of academic staff has significant influence on the usage of e-learning in teaching.

Regarding the age and experience of ICT experts, the findings of this study show that majority of ICT experts were 40 years of age. Further, there were more (71%) male ICT experts than were female experts. This implies that more male students are taking science courses including ICT related courses as opposed to female students. These findings are consistent with the theory of UTAUT developed by Venkantesh (2003) which indicates that male students are more likely to use e-learning than is the case with female students.

Concerning ICT experiences, the findings of this study show that most ICT experts had work experience of less than 5 years. The reason is that ICT is relatively new field and that older generation did not study it. And that, ICT experts who are older than 40 years and have less experience are unable to readjust themselves to overcome the challenges of new technologies. ICT experts with less experience have low capability and have low motivation in supporting and providing advice on the implementation and usage of e-learning. The possible explanations based on the theory of UTAUT to support the findings of this study is that ICT experts with high experience on ICT issues have the qualification and have been dealing with e-learning services within the learning context for quite a long time. The findings from previous studies also indicate strongly that ICT experts with high experience have significant influence on the implementation of e-learning (Sun and Zhang, 2006; Liao and Lu, 2008; Chiu *et al*., 2009; Zhu *et al*., 2009; Islam *et al*., 2011; Vlamos, 2013)..

6.3 Extent of E-learning Uptake in Tanzanian Universities

Ascertaining the extent of current e-learning uptake in Tanzanian universities was very imperative not only because of presenting significant idea after accomplishing the research, but also because of providing understandable status of e-learning context in Tanzanian universities using factual based data. These facts therefore, draw attention among many universities, stakeholders, and policy makers to realize

and justify their investment by considering that the ICTs and related educational technologies change every now and then. Thus, there is a need of knowing what is happening in this regard. This leads us to the first research objective and addresses the corresponding research question, which states "*What is the extent of e-learning uptake in Tanzanian universities?"* To answer this question, the study findings were confined to responses from students, academic staff, ICT experts, and the management to ascertain the current extent of e-learning uptake with different variables as follows.

6.3.1 Awareness towards E-learning

The findings of this study revealed that, awareness on e-learning is a very crucial factor for successful e-learning uptake among students and academic staff. The other way of improving e-learning uptake would be providing proper training to students and lecturers on the benefits of using the e-learning technologies (Njenga, 2011; Taha, 2014). Awareness among university students and academic staff can be created through printed leaflets, posters, university web site, social media, and library catalogues (Lwoga and Komba, 2015).

Despite the importance of awareness of e-learning technologies among students and academic staff, the findings of this study indicate that the average extent of current e-learning uptake among students and academic staff is low by 16percent. Accordingly, there is evidence that user's awareness is low leading to low level of e-learning uptake among students and academic staff in Tanzanian universities. This has been supported by the theory of DOI (Roggers, 1995) which holds that users should be aware of the technology before the implementation of e-learning. Being aware of e-learning makes users interested in using the technology effectively in searching and upgrading their knowledge (Yacob *et al.*, 2012)

Low level of e-learning uptake has been attributed to lack of clear descriptions of benefits and usefulness as well as functions and knowledge on how to use e-learning among e-learning users before applying the technology. Similar observations are made by other studies including that of Kayode *et al.*, (2014). In line with these

findings, some students cited knowledge, experience, training and accessibility to the technology in relation to online courses, others cited lack of confidence in using the technology in education (Weber, 1996). Therefore, in view of the findings of this study, students and academic staffs' awareness needs to be created prior to e-learning implementation. User skills, training, and participation on how to use e-learning facilities and platforms are essential for users in dealing with the e-learning environment and which in turn increases the motivation and hence accessibility and frequency of usage.

6.3.2 Accessibility of E-learning

The findings of this study revealed that e-learning accessibility has significant influence on implementation of e-learning which in turn improves the extent of e-learning uptake (Tarus and Gichayo, 2015; Zhu and Mugenyi, 2015; Taha, 2014). This has been noted in developing countries especially Tanzania, Kenya, and Uganda where factors of e-learning implementation rely on computer and Internet availability and accessibility only (Zhu and Mugenyi, 2015).

Despite the importance of e-learning accessibility as revealed in various studies, the average level of e-learning uptake in terms of its accessibility among students and academic staff is still low by 20.6percent. These findings indicate that the average level of e-learning accessibility among both students and academicians is lower than the threshold of 50percent (Alshaher, 2014). In line with a study by Kisanjara (2014), the findings show that only 97.5percent of students responded negatively saying that they do not have enough online printers which are directly connected to their computers. Furthermore, 70percent of the students said they do not have access to computer with necessary software installed as well as internet connectivity. Similar findings are reported in a study by Idris and Osman (2017) who revealed that in developing countries, most students and academic staffs do not have their own computers. Difficulties in accessing computers affect negatively the e-learning uptake. Unequal access to online teaching and learning are reported to have led to inequality among the socio-economic groups within the society (Idris and Osman,

2017). Similar findings are also reported elsewhere that despite the efforts made in implementing various e-learning solutions in Africa universities the extent of e-learning accessibility is reported to be low across the continent (Ssekakubo et al., 2011).

Internet speed and reliable access as well as limited ICT and e-learning infrastructure which lead to inadequacy access to e-learning are also critical factors in this context (Tarus and Gichayo, 2015; Othman and Musa, 2012; Ndume *et al*., 2008). The findings of this study showed further that there is a relationship between learning and accessible e-learning facilities and platforms. For example, Zayat (2016) revealed that though the majority (nearly 85%) of students who have access to the internet in the study sample said that they believed there is a strong relationship between learning and technology. This suggests that in most Tanzanian universities, e-learning is still a new phenomenon leading to low extent of e-learning accessibility. It can be concluded from the findings of this study that if Tanzanian universities are to adopt and implement e learning successful then, a lot of improvement is done for the accessibility of ICT and e-learning infrastructure to ensure high level of using e-learning in teaching and learning.

6.3.3 Availability of E-learning

Previous studies (e.g. Zhu and Mugenyi, 2015; Tarus and Gichayo, 2015; Lwoga and Komba, 2015) in line with the findings of this study have indicated that availability of ICTs including e-learning facilities and platforms play a vital role in uplifting e-learning implementation. Moreover, it increases the extent of e-learning uptake for successful teaching and learning process. For instance, Berhanu (2010) caution that implementation of e-learning without acknowledging the availability and setting up the required ICT infrastructure including e-learning facilities and platforms compromise e-learning uptake.

Regardless of the notable role of availability of e-learning facilities and platform, the findings of this study suggest that there is poor availability of e-learning platforms and facilities in most Tanzanian universities. These findings show further that

inadequate availability of e-learning platforms and facilities in turn influence the status of e-learning by lowering the extent of its uptake among students and academic staff by 17.15percent. In contrast with the findings of the current study, a study by Lashayo and Gapar (2017) revealed, for example that the uptake of e-learning in terms of availability of e-learning platform and facilities is 67percent higher in Tanzanian universities. The findings by Lashayo and Gapar (opcit) are dissimilar to the results of the current study in the sense that the study covered only three (3) universities as opposed to eight (8) universities used in this study. The findings of other studies (e.g. Tarus and Gichayo, 2015; Zhu and Mugenyi, 2015; Ecke, 2011) are consistent with the findings of this study that developing countries such as Kenya, Tanzania, and Uganda still face a lot of challenges including lack of availability of ICT facilities and platforms while implementing e-learning for high extent of uptake. Therefore, it can be concluded that the average level of e-learning uptake is also significantly influenced by the availability of e-learning facilities and platforms.

6.3.4 Attitudes towards E-learning

One of the most important factors affecting effective and efficiency e-learning uptake in teaching and learning is the attitude of students and academic staff (Liaw *et al*., 2007). The findings of this study indicate that students' and academic staff's attitudes have significant influence towards successful e-learning uptake. Similar findings are reported in the previous studies (e.g. Fageeh, 2011; Zewayed *et al*., 2011). Fageeh (2011) points out that, students and academic staff's attitudes towards e-learning influence the level of e-learning uptake particularly in teaching and learning. Attitude also enhances users' readiness of e-learning uptake as a mode of learning. The low level (15%) of e-learning uptake among students and academic staff revealed in the findings of this study was because other academic staff have negative attitude towards the technology resulting from fear of losing control and quality of teaching if they used e-learning platforms and facilities. This is supported by the findings of Idris and Osman (2017).

In addition, the findings of this study show that the low level of e-learning is caused by lack of e-learning resources, perception, and preferences in using e-learning in various universities, and which could help students and academic staff to have positive attitude towards e-learning. Furthermore, other study findings (e.g.Idris and Osman, 2017) observed that lack of experience in using e-learning platforms and facilities results into negative attitude towards e-learning among e-learning users. Similar findings are reported by Robertson *et al*. (1996) who point out that users' perceptions, experience, and usefulness of e-learning were the factors which were found to influence users' attitude towards e-learning uptake in the education context. This is also confirmed in the theory of TPB, which insists that positive attitude creates intension to use e-learning among users. These findings suggest that students and academic staffs' attitudes towards e-learning would help users and decision makers to implement and develop successful e-learning. Therefore, it can reasonably be concluded that high level of e-learning uptake and its successful implementation are influenced by factors such as experience, preference, usefulness, and perceptions among students and academic staffs.

In general, the findings of this study have revealed that there is low (17.15%) e-learning uptake among students and academic staff as explained in the preceding paragraphs. There is no statistically difference in e-learning uptake among the respondents. These findings correlate with the findings from a study by Ndonje (2015). In contrast with the findings of this study, the findings of an earlier study (e.g. Taha, 2014) revealed a statistically significant difference between students and academic staff in their perceptions towards technological factors. The findings in a study by Taha (2014) are contrastive because the study used a methodology, which led to subjective opinions from students and academic staff. In this view, a study by Sepahpanah *et al.* (2015) and the theory of TPB postulate that there is a strong positive correlation between the level of e-learning uptake and users' attitude toward e-learning.

6.4 Effectiveness of E-learning on Teaching and Learning Activities

Assessing the effectiveness of e-learning on teaching, learning, and other educational activities in Tanzanian universities was very essential. This process provides a clear picture and justifies the status of investment made on implementing e-learning. The findings of this study serve as the basis for decision making by stakeholders of e-learning implementation in either to continue investing heavily or finding an alternative way of successful and effective implementation of e-learning. This leads to the second specific research objective. In addressing this objective, the study findings were confined to the responses of students, academic staff, and the management as follows.

Based on *Teaching and learning activities* as it is presented in Chapter Five, the findings in this study indicate a significant effect of e-learning in educational activities especially on teaching and learning in Tanzanian universities. These findings are in line with the findings reported in other studies (e.g. Smith and Hardaker, 2000; Rodgers, 2001; Rodgers, 2007; Al-Alak and Alnawas, 2011; O'Donnell, 2012). For instance, a study by Smith and Hardaker (2000) suggests that effective online interaction was found to have a positive and statistically significant effect on performance. Rogers (2004) observed that students' perceptions towards e-learning were positive, with 79percent of the respondents saying that e-learning positively affected their study by raising their performance. Olson (2011) recommended that the use of e-learning should effectively enhance students' learning through acquisition of knowledge and skills. O'Donnell (2012) indicates that academic staff and students were of the opinion that the use of e-learning in higher education can effectively transform teaching and learning. Others studies with similar findings include DeWitt (2000), Risinger (1998), Falvo (1994),and Thompson *et al.* (1991) who agreed that the internet usage has significant influence on teaching and learning.

Concerning *administration activities* as presented in Chapter Five, the findings of this study revealed that e-learning has a significant effect on the administrative activities. While the effect of e-learning in academic arena globally may be determined by some universal characteristics, it is rational to argue that there are other characteristics that might determine the effectiveness of e-learning socially and environmentally. For instance, in this study when the management was interviewed about the extent to which the current e-learning influenced administration activities, the majority said that there is a positive effect of e-learning on administration activities in the education settings. Specifically, the findings of this study indicate that e-learning has a significant effect on research management, student registration, communication, and management of students' records. This is consistent with the findings of a study conducted by Olson (2011) in Tanzania, which showed that e-learning has a positive effect on teaching, learning, and administration activities.

In addition, other studies with similar findings include Weller (2007), Oproiu and Chicioreanu (2012), Oproiu (2014), and Harand (2015). For instance, a study by Weller (2007) revealed that the use of virtual learning environment (VLE) platforms improved content management, collaboration, and course management which significantly enhanced educational activities. It can therefore be concluded that e-learning has a significant effect despite the current low level (17.15%) of e-learning uptake in Tanzanian universities.

6.5 Factors Influencing E-learning Implementation

Ideally, one of the issues, which universities should consider as part of education reform, is e-learning implementation. Various studies (see in Njenga, 2014; Tarus *et al*., 2015; Tarus and Gichayo, 2015) revealed that careful attention and great efforts are needed as the preconditions for efficient and effective implementation of e-learning. According to Cox (2010), e-learning will be successfully adopted in universities if and only if students, academic staff, ICT experts, and the management are considered in the implementation process. Notwithstanding the notable importance of e-learning implementation, factors that guarantee successful and

effective implementation process are not uniform. The existing factors that influence e-learning implementation depend on the type of technology, potential adopters, and their unique contexts (Rogers, 2003). In this case, the findings of this study addressed the specific research objectives and the discussion of the findings is based on the following determining factors and their observed variables.

6.5.1 Technological Characteristics

The findings of this study revealed that, capability of e-learning; availability of e-learning facilities and platforms, strong interaction, user friendliness of e-learning, and accessibility are among the critical and most significant e-learning characteristics for successful and effective implementation of e-learning. These variables indicated a good measure of technological construct and play a significant role in assisting e-learning implementation among users as they have loading factors of above 0.3. This is consistent to the factor loading suggested by DiStefano *et al.* (2009) which should be at least 0.3 for the observed variables in the confirmatory factor analysis. It is further deduced from the findings of this study that technological construct has direct positive influence on the level of e-learning implementation. Such technological characteristics ought to be sufficient to sustain a large population of users who access e-learning. These findings are similar to the findings in other studies (e.g. of ESIB, 2003; Tarus and Gichayo, 2015).

For example, according to Tarus and Gichayo (2015) lecture halls and halls of residence should have networks and Internet connectivity to facilitate accessibility of e-learning. Availability and capability of LMS platforms as imperative tools for student administration, tracking, and delivery of e-learning education courses should be user friendly and interactive. Similar observations are made by ESIB (2003) who emphasizes that institutions that provide e-learning must make sure that all facilities and platforms which are required including internet connectivity and computers are available and adequate, capable, and interactive. Based on the findings of this study, it is therefore concluded that if the university is committed to choose the technology

with good characteristics it is likely to improve the e-learning implementation status by 1.12percent, which in turn will improve the e-learning implementation.

6.5.2 Institutional Characteristics

It is evident from the findings of this study that pertinent and operational ICT policy, availability of budget, the support of top management, and commitment towards e-learning implementation are vital institutional characteristics. For instance, the findings of this study indicate that the factors loading were above 0.30 in each of the institutional characteristics. It is therefore apparent that institutional characteristics have direct significant influence on e-learning implementation by 70percent when measured individually.

Based on the findings of this study, the institutional characteristics have negative direct influence on the level of e-learning implementation as measured collectively with other factors in the model. These findings are in contrast with the findings in other studies (e.g. Awidi, 2008; Mapuva, 2009; Munguatosha *et al*. 2011; Tarus and Gichayo, 2015) which found that institutional characteristics have significant influence on the level of e-learning implementation. The contrast in the findings is because other previous studies used homogeneous respondents and insufficient sampling technique, which led to biasness as supported by (Sunder et al., 2007).

As observed by Tarus and Gichayo (2015), ICT Policy provides a guideline and direction for e-learning implementation in universities. According to their findings, sufficient budgetary distribution was critically required to support the implementation of activities such as deployment and maintenance of the e-learning platform and facilities and training of users on how to use e-learning. Similar observations are made by Awidi (2008) who reveals that the institutions must have defined strategic plans that spell out ICT policies that support e-learning implementation strategies. In line with previous research findings, Mapuva (2009) also observe that commitment from institutional management is also found to be an influential factor in facilitating the implementation of e-learning within the universities.

6.5.3 Pedagogical Characteristics

It is evident from the study findings that availability of e-learning training strategies and e-contents, integration of e-learning, and e-content and user training learners' support are important and good measures of pedagogical construct. The findings of this study revealed further that relevant training of academic staff on e-learning skills for instance would enable them develop and integrate e-learning content and e-content for quality e-learning. In addition, e-learning training increases motivation, confidence, awareness, and experience in using such technology. The findings of this study suggest further that in order for user training on e-learning usage to be efficient and effective there should be an e-learning training strategy for guidance. This is consistent with the findings from a study by Mtebe and Raisamo (2014), Taha (2014) and Zhu and Mugenyi (2015).

The findings from the study by MoE in Bahrain (2007) indicated that students prefer e-contents and e-lessons which were developed by multimedia, and which enhance the importance of e-learning in knowledge acquisition. According to Mtebe and Raisamo (2014), academic staff should establish excellent course contents that convene planned educational benefits and which are relevant to learners' knowledge, skills, and capability in order to exploit e-learning use and raise learners' satisfaction with e-learning. Similar observation are made by Tarus and Gichayo (2015) who point out that course quality has positive influence on learners' satisfaction towards e-learning use. Taha (2014) indicates that 73.3percent of the students in the sample reported that the integration of e-learning with e-lessons and e-content positively influenced student's interaction as well as exchange of ideas and skills.

6.5.4 User Characteristics

The findings of this study indicate that the items were a good measure of user construct. The critical measures were users' confidence, self efficacy, motivation on learning, motivation on using e-learning (user experience), and self esteem on e-learning. The findings show further that user characteristics have significant influence on the level of e-learning implementation within universities. The findings

of this study are consistent with the findings of previous studies (e.g. Selim 2007; Taha, 2014, Iskander, 2013). According to Engelbrecht (2005), user characteristics play a vital role in e-learning implementation models; however, many models become unsuccessful and ineffective due to lack of appropriate user characteristics in universities. Specifically, the findings confirm that users' attitudes (self-efficacy, self-esteem, motivation on learning and confidence), and user motivation (experience) have significant influence on the success of e-learning implementation (Taha, 2014). Reiterating the finding of the current study, the findings in a study by Luskin and Hirsen (2010) reveal an interrelationship among user characteristics. For instance, self-efficacy and motivation towards e-learning usage are two of the most relevant characteristics of user experience, which include motivation to learn, satisfaction, enjoyment, and confidence as outcomes of successful e-learning implementation.

In view of the foregoing discussion, considerable attention should be given to e-learning users (students and academic staff) as they are the primary stakeholders who are directly affected by the e-learning in the educational context. Attitudes, awareness, experience, and motivation should be created among e-learning users prior to using the technology. Seminars, workshops, and training should be carried out regularly as e-learning technologies change every now and then. Failure to do so, e-learning becomes useless. As observed by Iskander (2013), e-learning was hardly ever used by students and was responded by a significant number of students as not valuable due to failure to consider appropriate user characteristics in the implementation plan.

6.5.5 Social Characteristics

Social factors play a vital role in the implementation of e-learning in the education context. The variables tested and considered to measure social construct in this case were application of social networks, productive relationships, status/image, and prestige towards e-learning activities. The findings of this study indicate that social characteristics improve the level of e-learning implementation in universities. The

findings from this study are similar to the findings reported in a study by Munguatosha *et al*. (2011) and that of Buc and Divjak (2016)

Specifically, Munguatosha *et al*.(2011) point out that one variable of social factors such as applicability of social networking sites enables universities to achieve social aspects of learning and this is in line with social constructivist learning theory (Vygotsky,1978). For example, social software tools facilitate teaching and learning collaboratively, participating in an online forum, chatting and sharing relevant contents (Awodele *et al*., 2009; Alexander, 2008; Ryan *et al*., 2011). In the same vein, the seventh dimension in Khan's (2001) model addressed the social assortment, taking into account different characteristics of variety of users of e-learning such as online learners.

In contrast to the above findings, the findings from a study by Al-adwan and Smedley (2012) indicate that working independently was unpopular. For instance, they argue that about 62percent of the students indicated that face-to-face interaction with lecturers was a vital part of their learning and of improving their status and prestige. Similar findings are reported by Schwartzman (2001) whose findings are consistent with the findings from a study by Al-adwan and Smedley (2012) who reveal that students who use e-learning continually in their learning might face difficulties in creating social productive relationship, their social skills as well as behaviours.

Following these discussions, it is reasonable to conclude that social factors were inadequately considered in e-learning implementation in many studies and models. Likewise, there empirical studies on e-learning implementation in addressing social issues in the context of Tanzanian universities are lacking. This study fills this knowledge gap by including social factors as a contribution in developing a model for implementing e-learning in Tanzania context

6.5.6 Environmental Characteristics

One of the key important factors and which is considered, as a primary base for e-learning implementation is environmental characteristics as postulated by a theory of DOI**.** Keller *et al.* (2007) defines e-learning as 'learning which is facilitated online through network technologies', it is a learning whose learning contents and activities are delivered via the internet, intranet/extranet, audio/video; in other words, via the environment consisting of hardware, software, and personnel'. In this case, without ICT infrastructures, e-learning can hardly ever take place. The e-learning environment in this study considered ICT infrastructures that include internet connectivity, adequate bandwidth, local or wide area networks with hardware and software, and sustainable e-electricity as well as personnel from ICT units/department. The findings of this study presented in Chapter 5 reveal that factor loadings for availability of ICT sections/directorate, availability of bandwidth, sustainability of electricity, and availability of internet connectivity are good measures of environmental construct as loaded above 0.3.

The previous studies on e-learning implementation (e.g. Henderson, 2005; Kavaliauskierie, 2011; Othman and Musa, 2012; Amandu, Muliira, and Fronda, 2013; Zhu and Mugenyi, 2015) supported these findings. For example according to Zhu and Mugenyi (2015), the implementation of e-learning relies on many factors including computer hardware and software LAN, Internet availability and accessibility as well as cross-cutting issues such as electricity. As observed by Berhanu (2010), the implementation of e-learning without recognizing cross cutting issues and providing conducive environment for ICT infrastructure and without efficient support are likely to jeopardize the level of e-learning implementation. Similar observations are made by Othman and Musa (2012) who reveal that availability of high bandwidth leads to reliable access of e-learning platforms and facilities are considered crucial factors in e-learning implementation. Despite the important contributions of environmental aspects on e-learning implementation, such factors were inadequately exhausted in various e-learning implementation studies and models. Further, there is also limited empirical evidence on the influence of

environmental characteristics particularly the ICT infrastructure on the level of e-learning implementation in developing countries, Tanzania in particular. This study therefore addressed environmental characteristics as a way of filling this gap and of contributing to the body of knowledge in the area under investigation.

6.6 E-learning Implementation Model

Developing adequate and successful e-learning implementation model in Tanzanian universities was deemed crucial. The structural model developed and validated using SEM particularly CFA as presented in Figure 5.8 in Chapter Five serves as e-learning implementation model.

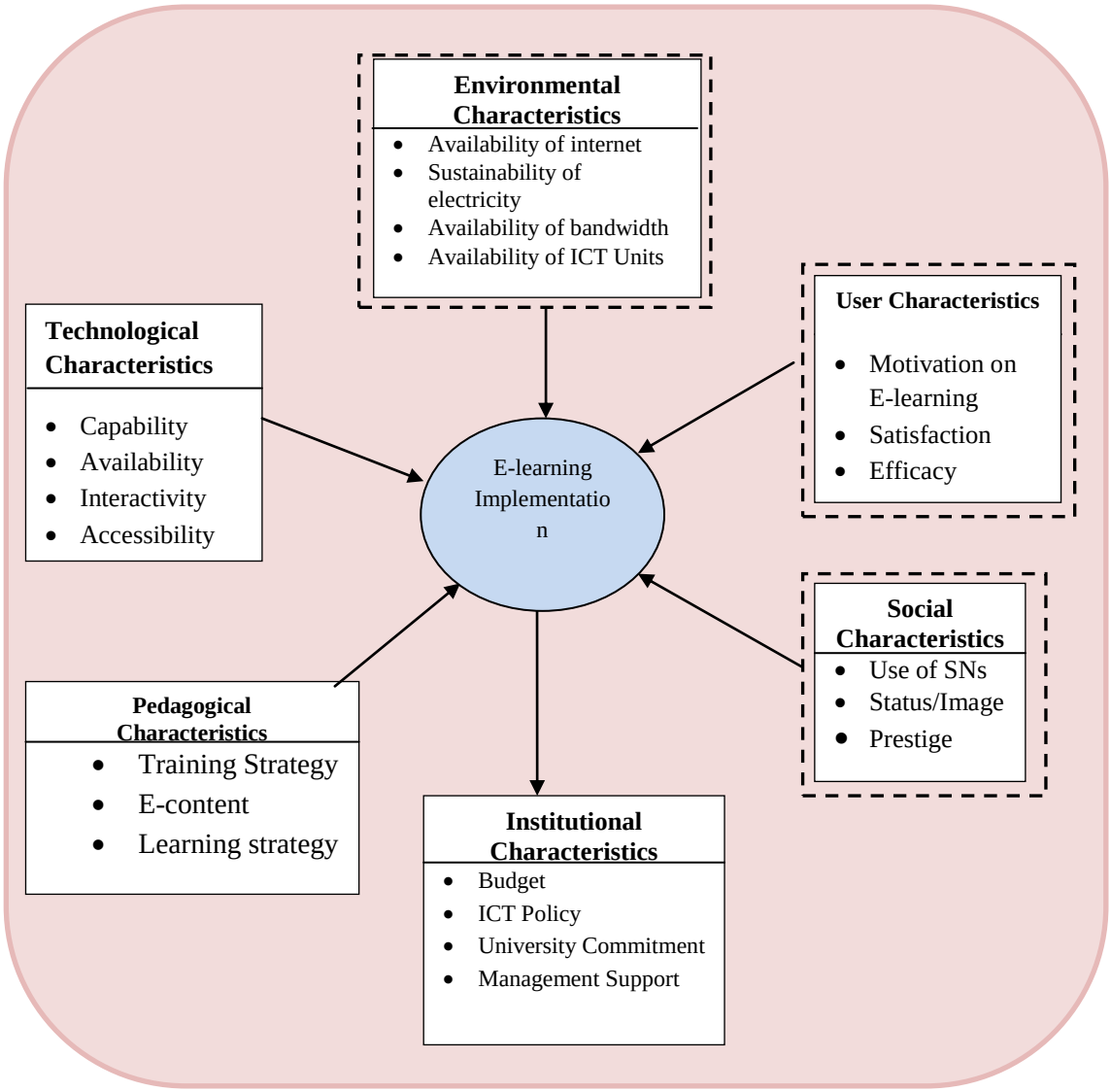


Figure 6.1: E-learning Implementation Model

Descriptions: In the model presented in Figure 6.1, direct single arrows show positive influence of factors on e-learning implementation. An arrow with the head pointing to the instructional factor shows negative influence of institutional factor on e-learning implementation. The dotted rectangle boxes indicate the new factors contributed by this study. These were found to influence significantly e-learning implementation. However, these factors were not considered in the previous existing similar e-learning implementation models reviewed in Chapter Three.

The e-learning implementation model (the direct output from AMOS software presented in Figure 5.8) of this study is summarized and presented in Figure 6.1 complemented in Table 6.1. The development procedure was clearly described in Figure 4.8 in subsection 4.11.2 in Chapter Four. In mechanics, the loading weights in Figure 5.8 represent the amount of change of the dependent variable (e-learning implementation level) per single unit of change of each independent factor. From the model it implies that for every single standard deviation of an increase in technological, user, pedagogical, social and environmental factor, the level of e-learning implementation is increased by 34, 28, 1, 18 and 6 percent respectively (See Figure 5.8 and the summary in section 5.10). The result revealed further that for every single standard deviation of an increase in institutional factor; the level of e-learning implementation is decreased by 10percent. Thus, technological, user, pedagogical, social and environmental factors significantly influence e-learning implementation level except institutional factor as depicted in Figure 6.1.

Previous studies (i.e. Khan, 2005; Dabbagh, 2005: Njenga, 2011; Madar and Willis, 2014; Tarus and Gichayo, 2015) revealed the importance of developing models. However, the unified models is lacking in these studies. Lack of uniformity of a model is concerning the unique context where it was developed for, potential adopters, the technology itself and factors that influence the implementation of e-learning (Njenga, 2011). In this regard, the findings of this study are consistent with the findings from previous studies as follows: the main factors that informed the e-learning implementation models are technological characteristics, user characteristics, pedagogical characteristics, institutional characteristics, social characteristics, and environmental characteristics. Each of these has measurable variables as shown in Figure 6.1 and complemented by Table 6.1. Based on the foregoing discussion, successful e-learning implementation model, which is developed and validated as shown in Figure 5.8 and summarized in Figure 6.1, adheres to the characteristics of each factor as narrated in Table 6.1. In addition, Table 6.1 describes the variables in each factor, and their effect and proposes the intervention that the universities in Tanzania have to adopt and apply for improving e-learning implementation

Table 6.1: Developed Model with Factors Influencing E-learning Implementation Level

Dimension	Variable	Effect	Proposed Intervention
Technological	*Capability of e-learning* *Availability of e-learning* *User interaction on e-learning* *User friendly on using e-learning* *E-learning Accessibility*	*High capability of e-learning will lead to high uptake* *High availability of e-learning facilities and platform will lead to successful implementation* *Easy interaction with e-learning facilities and platforms will lead to high uptake* *High perception of ease of use will lead to high e-learning uptake high implementation level* *High accessibility of e-learning will lead to high extent of e-learning uptake in turn increase implementation level*	*Before implementation the university should rank the e-learning in five criterions: - If it is available to high level. If e-learning is capable and compatible with the current way of teaching and learning.* *If it is user friendly and allows interaction easily. These characteristics lead into high level of implementation in turn the extent of its uptake will increase too.*
User	*Motivation of users to use E-learning* *User satisfactions* *Self efficacy of users towards e-learning* *Self esteem on using e-learning* *User motivation on learning/teaching*	*Availability of outside rewards and recognition in using e-learning, there will be the possibility of higher extent of e-learning uptake* *If User becomes satisfied on using e-learning, then there will be high level of e-learning uptake.* *High extent of self-efficacy will lead to high extent of e-learning uptake* *User appreciation on using e-learning will definitely lead to sustainable usage in turn lead to high implementation level* *If e-learning usage motivate user to learn/teach effectively, then will influence e-learning implementation level positively*	*Everlasting support and strengthening the e-learning skill through training to provide clear efficacy, motivation satisfaction and appreciations among e-learning users and encourage by building self-assurance in using e-learning in teaching and learning process*
Pedagogical	*E-learning training strategies* *Integrations of E-learning and E-content* *Availability of e-contents*	*If there are strong training strategies on e-learning skills, then there will be high extent of e-learning uptake leading to high level of its implementation* *A well integration of e-learning and e-contents leads to high e-learning implementation* *Development and availability of adequate e-contents will lead to high implementation of e-learning*	*Showcasing the training strategies, regular training, availability of e-content and integration of e-learning and e-content are important. This help to make sure that, all task and related to e-learning aspects are trained to provide confidence and*

Dimension	Variable	Effect	Proposed Intervention
	User training on using E-learning	*Availability of regular training on how to use e-learning will lead to high extent of e-learning uptake in turn increase level of e-learning implementation*	*perception to minimize the knowledge gap among users*
Institutional	*Availability of budget for e-learning* *Availability of ICT policy* *University commitment towards e-learning* *Management supports*	*Availability of adequate financial budget with the university will lead to successful e-learning implementation at high level* *Operational national and cascaded university ICT policy will lead to positive and high level e-learning implementation* *Clear commitment from management for e-learning could lead to high Implementation* *Clear support from management for e-learning could lead to high Implementation*	*Legitimization and formalization of e-learning implementation for example-through formation of conducive ICT policies and procedures, financial budgeting to support Implementation, alignment of e-learning to core business of the university and establish commitment and support from the management.*
Social	*Availability of Social Networking sites* *Status/Image of users* *Prestigious of users*	*If e-learning encompasses the use of social networking sites, for user to interact and collaborate will increase extent of e-learning uptake* *If an individual thinks that e-learning influence their status positively academically and socially then there will be high extent of uptake* *User Prestigious in using e-learning facilities and platforms in learning will lead to high extent of e-learning uptake*	*At the early stages of e-learning implementation, management should describe the influence of social networking sites and other e-learning software to users so that they known and feel that through e-learning they can gain prestige and their status can change. This could make them using e-learning sustainably.*
Environmental	*Availability of Internet connectivity* *Sustainability of electricity* *Bandwidth availability*	*Sustainable and adequate internet connectivity will lead to high level of e-learning implementation* *Sustainable and adequate electricity will lead to high level of e-learning implementation in turn create sustainable e-learning uptake* *High level of availability of bandwidth will lead to high level of implementation in turn create*	*The university should make sure that environmental characteristics in relation to e-learning implementation are well prepared. For example-make sure that ICT infrastructure and e-learning facilities and platforms are in place for supporting e-learning implementation exercise*

Dimension	Variable	Effect	Proposed Intervention
		sustainable e-learning uptake	
	Availability of ICT units/sections	*Availability of committed ICT unit/department or directorate to plan, manage and oversee all activities related to ICT will lead to positive e-learning implementation*	

Lack of understanding of the variables/factors that might bring significant contribution to e-learning implementation decreases its uptake in Tanzanian universities. Otherwise, the investments in the e-learning technologies, efforts, and initiatives made would be ineffective. The revealed effectiveness of these investments would be a loss of important resources that could have been applied better in teaching and learning initiatives. Knowing the factors that contribute to e-learning implementation is one thing, having a model or guidance to the kind of interventions required for effective and successful e-learning implementation is quite another and significant.

The model developed shows that there is a significant correlation/relationship among these factors as shown in Figure 5.8, which accounts for a mode fit. From the developed model, it is deduced further that all the factors including technological characteristics, users, pedagogical, social, and environmental factors significantly influence the level of e-learning implementation in the universities in Tanzania and in other universities with similar characteristics particularly in the developing countries. These findings support the findings in a study by Tarus and Gichayo (2015) which found that technological and pedagogical factors significantly improve e-learning implementation. The findings in other studies (e.g. Malik. 2010; Mbarek and Zaddem. 2013; Maina and Nzuki, 2015) found that social, environmental, and user characteristics significantly influence e-learning implementation. Similar findings are reported in other studies (Rosenblit and Gros, 2011; Kituyi and

Tusubira, 2013; Taha, 2014) who found that environmental factors are very important in speeding and raising e-learning implementation.

In contrast, the findings of previous studies conducted in Kenya and Uganda by Njenga (2011), Tarus and Gichayo (2015), indicated negative influence of institutional characteristics on the level of e-learning implementation. Significant contradiction is based on insufficient sampling unit and homogeneous sample used by the studies referred to here as supported by Saunder *et al*. (2007). For instance, a study by Zhu and Mugenyi (2015) covered two (2) public universities in Kenya and Uganda while a study by Tarus and Gichayo (2015) covered only three (3) public universities in Kenya. In this situation, it is difficult to get reliable data of generalizing their findings. In addition, collecting data from a very confined sampling unit leads to inaccurate and invalid data particularly on the implementation of e-learning or any other new technology. It is noticeable that some universities are ahead of others in terms of implementation of e-learning despite that all these universities are in the same country.

6.6.1 Model Validation

The findings of this study depicted from the model presented in Figure 5.14 suggest that all the observed variables contribute strongly to each of the unobserved variables (factors) as they have loading weight of above 0.4. According to DiStefano *et al.* (2009), the recommended factor loading for a good relationship between the observed and the unobserved variable is at least 0.3. In this case, all the observed variables are good measure of unobserved variables as shown in Figure 5.1 in Chapter Five. It can be deduced further from the findings that all the unobserved (latent variables) have acceptable correlation among them. Scholars (e.g. Anderson and Gerbing, 1988; Bagozz and Yi, 1988; Coromina, 2014) suggest that the correlation between each item and its construct is at least 0.5 while that among items from the same construct is at least 0.3. This is the evidence of reliability among the constructs used to influence the level of e-learning implementation as the correlations among each other are at least 0.5.

Moreover, the information in the left part (measurement model) in Figure 5.1 in Chapter Five, suggests that all the independent variables have a relationship with the dependent variable (E-learning Implementation level). This has been attributed to the fact that the standardized regression weight for (independent variables) technological, user, pedagogical, institutional, social, and environmental constructs were considered. This is in line with the findings of studies by Barclay *et al.* (1995) and Hair *et al.(*2014) who revealed that the standardized factor loading for reflective indicator is 0.7, but 0.5 is considered to be acceptable. It is acknowledged therefore that the results confirm the existence of the model of validity and fitness under theoretically and statistical principles based on the results of different indices as described in the following paragraphs.

The findings of this study depicted in Table 5.36 in Chapter Five indicate that all the values such as GFI, AGFI, RFI, NFI, RMSEA and P-values qualify for explaining the model fit based on the reasonable sample size used for SEM analysis in this study, which is 291, and the criterion of various indices. For instance, Ho and McDonald (2002) suggest that if the sample size is in the range of 237-330 then the acceptable root mean square estimate approximation (RMSEA) should be in the range of 0.05 - 0.08 and the recommended P-values for significance should be .000. On the same vein, the value of indices such as GFI, AGFI, NFI, RFI and IFI should be close to 1 (Hooper *et al.,* 2008; Kline, 2005). The model has acceptable co-variations, as supported by Fornnell and Larker (1981) that, the covariance of above 50percent is acceptable for convergence validity of a model. The RAMSEA is within the range as suggested by scholars such as Hu and Bentler (1999) and Yu (2002). From the study findings, the goodness of model fit (GOF is 0.866) of measurement model is less that the goodness of model fit (GOF is 0.98) for conversional structural model as a final model as supported by Hair *et al*. (2014) and Hair *et al*. (2006). With this evidence, it is worth concluding that the model validity was tested and accepted based on statistical and theoretical principles. The next subsection describes the comparisons of the current e-learning implementation model with the existing similar models.

6.6.2 Comparison of Current Model with Existing Similar Models in terms of Validity

Table 6.2 demonstrates the validity of the developed model (i.e. e-learning implementation model) by comparing with some existing similar models in literature. From the findings of this study as presented in Table 6.2, in the last row, all values are at high level of acceptability compared to other values in e-learning adoption model developed in the study of Lashayo *et al.,* (2018) and e-learning acceptance model developed in the study of (Bashir, 2018). For instance, in the construct validity, the comparative fit indices (CFI) of the current model is (0.96) higher than the rest CFIs of the e-learning adoption model and e-learning acceptance model. The goodness of-fit index (GFI) of the current model is also observed to be (0.98) higher than other GFIs of the e-learning acceptance model and e-learning adoption model. In the case of convergence validity and reliability tests, the findings of this study show that the average variance extracted (AVE) value in the current e-learning implementation model was (0.659) higher and at acceptable level as opposed to the AVEs of the previous similar existing models. Furthermore, the composite reliability (CR) value of the current model was (0.84) which was also found to be at the highest acceptable level than the CR values of the existing similar models as shown in Table 6.2. Thus, based on this comparison in terms of validity tests, Table 6.2 reveals that, the existing similar e-learning models are adequate. However, the level of validity in the current developed e-learning implementation model is extremely high leading to high acceptability level as opposed to other similar previous models under statistical and scientific principles.

Table 6.2: Comparison of validity tests of the current model to existing similar models

Existing similar E-learning Models	Construct validity tests			Convergent Validity and Reliability tests		
	CFI> 0.90	GFI > 0.95	RMSEA< 0.08	AVE> 0.5	CR	Level of acceptance
E-learning adoption model (Lashayo *et al*, 2018)	0.94	0.89	0.061	>0.54	0.79	Adequate
E-learning acceptance model (Bashir, 2018)	0.901	0.82	0.064	>0.58	0.67	Adequate
E-learning implementation model (Current study)	0.96	0.98	0.057	>0.659	0.84	Extremely adequate

6.7 Chapter Summary

Chapter Six, discussed the study findings in relation to the research questions, the theoretical and empirical review, and the conceptual framework and the methodology used in this study. Information covered includes demographic characteristics of respondents, the extent of e-learning uptake, effectiveness of e-learning on teaching and learning activities and factors influencing e-learning implementation. The demographic characteristics were found to play a vital role in influencing e-learning uptake leading to effectiveness of e-learning in teaching and learning. It was also found further from the discussion that all factors including technological, user, pedagogical, social, and institutional influence e-learning implementation.

Other items of discussion were the model developed and validated under statistical and theoretical principles. The validity of the model developed in this study was compared to the validity of the existing similar models and discussed. The findings suggest that the developed e-learning implementation model is more valid and acceptable statistically and theoretically.

CHAPTER SEVEN

SUMMARY, CONCLUSIONS, RECOMMENDATIONS, LIMITATIONS AND IMPLICATIONS

7.1 Introduction

The chapter is divided into five main parts. The first part presents the summary of the results and findings followed by the conclusion reached. The chapter also presents limitations of the study and the manner in which these limitations were addressed in order to achieve the objective of the study. The chapter provides recommendations on the potential areas for further researches. The chapter also presents the implication of the study in terms of theoretical and practical implication.

7.2 Summary

The aim of the study was to contribute to the understanding on how e-learning can be successfully implemented to improve its current uptake and effectiveness in teaching and learning. The main objective as stated in Chapter One, was to develop a model for improving e-learning implementation in Tanzanian universities and hence increase its uptake and effectiveness in teaching and learning activities

From the results, it has been established that the current e-learning uptake is lower (by 17.5percent among students and academic staff and 37.25percent among ICT experts) than the threshold of 50percent of fuzzy logic value in Tanzanian universities. In spite of the low uptake, there is significant effect of e-learning in the teaching and learning related activities in Tanzanian universities. Regarding the factors and e-learning implementation, it was revealed that technological, users, pedagogical, social and environment have significant influence on e-learning implementation. This study has made significant contribution to the body of knowledge by adding factors such *as social, environmental and user characteristics (*See Figure 6.1*)* which were inadequately addressed in most of the similar existing e-learning implementation models. The current study therefore, developed a model for improving implementation of e-learning in Tanzanian universities.

7.3 Conclusions

This study has investigated modelling e-learning implementation in eight (8) out of thirty (33) Tanzanian universities with the aim of developing a model for improving implementation of e-learning in Tanzanian universities. The study was guided by four specific objectives: one, to ascertain the extent of the current e-learning uptake in the Tanzanian universities; two, to assess the effectiveness of e-learning on teaching and learning activities in Tanzanian universities; three, to determine factors influencing e-learning implementation; and four, to design and validate a model for improving implementation of e-learning. The respondents were students, academic staff, management staff, and ICT experts. The Tanzanian universities and others universities from countries with similar characteristics will use the developed model. Table 6.1 describes and summarizes each factor with influence/effect on e-learning implementation. In addition, the Table proposes the intervention to improve e-learning implementation in Tanzanian universities.

Based on first specific objective, previous studies have ascertained and explained the extent of e-learning uptake subjectively leading to uncertainty situation. The previous studies focused on the availability of e-learning facilities and platforms. Variables such as awareness, attitude, accessibility, and frequency of use of e-learning have been inadequately addressed as they are equally important to certain the extent of e-learning uptake. These variables are interdependent and have been considered together in this study to ascertain the extent of e-learning uptake. The extent of e-learning uptake in each variable was found to be below the fuzzy logic membership function value amounting to 50percent as recommended by Alshaher (2014). The average e-learning uptake was 16percent for awareness, 20.6percent for accessibility, 17percent for availability, and 15percent for attitude towards e-learning. The findings also show that there is no statistically significant difference of e-learning uptake among students and among academicians as the p-value (0.23) > 0.05 as presented in Chapter Five. Therefore, it worth to conclude that e-learning uptake in Tanzanian universities is low by 17.15percent among students and academicians and 37.25percent among ICT experts.

In relation to the second objective, which sought to assess the effectiveness of e-learning on teaching and learning activities in Tanzanian universities, the results show that, information for effectiveness of e-learning in teaching and learning was limited in the body of knowledge in Tanzanian universities. This information was revealed by this study and identified as critical in stakeholder's decisions in all of the universities in Tanzania as e-learning is still at an infancy stage in developing countries. When assessing the effectiveness of e-learning usage by students and academic staff in teaching and learning related activities, e-learning was reported as effective in educational technology for improving teaching and learning related activities. This was revealed by data from e-learning stakeholders in each university (i.e. student, academic staff and a member of the management's team) as respondents. The current e-learning uptake revealed in this study is a signal that e learning is effective in the education activities. The p-value (0.03) < 0.05 implies that there is a statistically significant difference in the mean between the means of the two groups (users who are using and those who are not using e-learning). It is enough to conclude that e-learning is effective among the group that uses e-learning in teaching and learning.

Regarding the third objective, which sought to determine factors influencing e-learning implementation in Tanzanian universities, the finding of this study leads to the conclusion that the determined factors (including technological, users, pedagogical, social and environmental) significantly influenced e-learning implementation model by increasing users, motivation, increased ICT infrastructures and frequency of using e-learning. This study contributed to the body of knowledge by adding other factors such as environmental, social and user, which were inadequately addressed in the existing e-learning implementation models. However, the institutional characteristics have revealed negative influence on e-learning implementation. It is fair to conclude that, in the context of Tanzania, majority of the universities are lagging behind in e-learning implementation because of lack of priority, awareness, commitment, adequate policies, and funds to support e-learning. Additionally, the clear concept of e-learning and its effectiveness in education context is not well known among the top management within universities.

The fourth objective sought to design a model for improving implementation of e-earning in Tanzanian universities. It was observed that, the model fit explained and supported e-learning implementation in universities in Tanzania and in other similar countries. This implies that, the developed model will guide and assists the successful implementation process of e-learning in Tanzanian universities through capturing the influential factors from wide dimensions as shown in Figure 6.1 and summarized in Table 6.1 in Chapter Six. The consideration of the development and validation reflected the inadequate e-learning implementation and lack of adequate and successful implementation model as the main contribution made by this study.

7.4 Limitation and Recommendations

This section presents both limitations and recommendation. Limitations and the means of overcoming them have been clearly pointed out. Further, the section outlines recommendations in line with the limitations revealed in the current study.

7.4.1 Limitation of the study

This study, attempted to develop a model for improved e-learning implementation in Tanzanian universities in order to increase its uptake and effectiveness in teaching and learning activities. The research design, therefore, focused on addressing this specific problem in the Tanzanian universities. Thus, the findings in this study may first not apply to other universities in other countries with different characteristics or even to other institutions such as colleges and secondary schools , which are not focused in this study in the Tanzania context.

Second, this study used four-year period to establish the status of e-learning in order to develop the model for its implementation. However, the four-year period is too short to allow the researcher to collect in depth information about the implementation of e-learning in each university in Tanzania. For example, we were not able to compare e-learning implementation status and coming up with common concerns, which could require visiting the site more than once, and capture time change. Longer period would have helped to gather some in-depth information based on time

change about e-learning implementation status and taking on board factors from wide dimensions even before developing the model.

Third, this study used a combination of theories to explain the e-learning implementation in Tanzanian universities. There is no comprehensive theory yet to inform on the manner in which e-learning implementation and delivery can be understood and optimized (Newton and Ellis, 2006). This has been a noticeable gap in theories, which makes it necessary for future studies to fill it. The theories provided inadequate information in explaining the e-learning implementation due to insufficient causal chain explanation of some of the factors.

Fourth, the developed e-learning implementation model was validated under statistical and theoretical principles using data gathered from eight (8) Tanzanian universities and therefore the findings may be specific only to the context of Tanzanian universities and other countries that have similar characteristics

7.4.2 Recommendations from the Study

Based on the conclusion and limitation from the findings of this study, a number of recommendations have been considered in terms of policy and further studies.

7.4.2.1 Policy Recommendations

It is recommended that, in order to increase the extent of e-learning uptake, Tanzanian universities should consider raising users' awareness towards e-learning through conducting training and sensitization. Creating awareness could increase accessibility and raise positive attitude among students and academicians towards e-learning. Awareness increases the ability of e-learning users of accessing the available e-learning facilities and platforms effectively and efficiently and thereby increasing productivity in teaching and learning.

In this study, several factors have shown positive effects on e-learning implementation. Such factors include technological, users, pedagogical, social and the environments. However, institutional characteristics have shown negative effects

on the level of e-learning implementation as shown in subsections 7.2 and 7.1. It is recommended that the government through responsible ministries should establish adequate national ICT policy, which specifically explains the issue of e-learning including formulation of e-learning policy and strategies of implementing e-learning in Tanzanian universities.

7.4.2.2 Recommendations for Further Studies

This study developed and validated e-learning implementation model and found out that it is important as it adheres to scientific principles (i.e. achieved internal, statistical, and theoretical validity). Future studies may test this model empirically using data from universities with different characteristics and other institutions such as secondary schools and colleges from other countries.

It is recommended that further studies may focus on comparing e-learning implementation levels among Tanzanian universities to reveal the reasons and concerns for their differences before empirically testing the model developed by the current study.

It is recommended that, similar further studies should be conducted in the areas that are not focused by this study design. These include, among others applicability of the findings in this study to colleges including teachers training colleges.

It is also recommended that future studies may consider spending longer periods using longitudinal survey design. Such designs may help to unveil what was not unveiled in this study.

Lastly, this research employed a combination of three theories to explain e-learning implementation; it is recommended that further research should go beyond this by developing adequate and appropriate theory of explaining e-learning implementation using inductive approach.

7.5 Implication of the Study

The study came out with theoretical and practical significant contributions in knowledge. The theoretical contributions are presented first, followed by the contribution based on practical implications.

7.5.1 Theoretical Implication

This study has several theoretical implications. First, the factors in the developed model play a significant role in e-learning implementation in developing countries particularly in Tanzanian universities. Recently, e-learning implementation researchers have realized that factors influencing e-learning implementation have only been studied in an elementary way using inadequate factors. For this reason, there was a need of research in developing and validating theoretical models that focus on adequate, successful, and effective e-learning implementation (Kahiigi *et al*., 2013 and Iskander, 2013). Specifically, it is very crucial to study factors influencing e-learning implementation related to teaching, learning, and administration performance in a particular environment rather than focusing on general factors (Njenga, 2011). This study focused on Technological characteristics, user characteristics, Institutional characteristics, social characteristics, pedagogical characteristics, and environmental characteristics that are related closely and logically to each other and to the level of e-learning implementation. By developing and validating a model that includes all these interrelated factors, this study has contributed to a better theoretical understanding of the factors of e-learning and that the influence explain the level of e-learning implementation in Tanzanian universities as supported by Hair *et al.* 2014

Secondly, with regard to the factors of e-learning implementation our study added Environmental, user and social factors that were inadequately addressed in previous theories, models, and studies as supported by Taha (2014). For this reason, the study contributes to the existing body of knowledge by indicating that environmental characteristics (availability of internet connectivity, bandwidth, availability of ICT unit/directorate, sustainable electricity), social characteristics (social networking

sites, prestigious, social image/status and self esteemed), and user characteristics influence e-learning implementation. These variables were inadequately considered in the previous models and studies.

Thirdly, the present study is valuable in developing a model for successfully implementing e-learning in Tanzanian universities. Previous researches and studies in developed countries have empirically supported the importance of the factors of e-learning implementation. This research adds to this body of knowledge by developing a measurement model that shows how these factors are related to each other in similar contexts in Tanzanian universities. By studying these relationships and the influence of each factor on the level of e-learning implementation, we can gain understanding of the e-learning implementation in the contexts where empirical researches on the topic are inadequate. Indeed, the main contributions emerging from our empirical results show that certain factors of e-learning do matter when explaining its implementation level.

7.5.2 Practical Implication

The study findings present many practical implications. First, these findings provide understanding among e-learning stakeholders including the government, university educators, policy makers, and users. Stakeholders become well informed about the extent of the current e-learning uptake, and its effectiveness in relation to the total investment made in the implementation of e-learning. The universities through top management would use this information to make decisions on improving the uptake level and realize success. For example, this study found that ICT policy; training, commitment, and management support influence negatively the level of e-learning implementation. Thus, the universities and policy makers should take into consideration prior user training, reformulate adequate ICT policy, and be committed and supportive to e-learning implementation within universities. In the case of Tanzanian universities, the findings of this study indicate that these institutional characteristics are inadequate and thereby discourage students and academic staff from using e-learning effectively and efficiently.

Secondly, these findings inform stakeholders to provide e-learning training strategies, for the pertinent environmental and social matters, which both academic staff and students can relate to, and work contentedly and feel proud about, have self-esteemed and increase their status/image. Thirdly, stakeholders should create an appropriate environment including the infrastructures such as internet connectivity, bandwidth, sustainable electricity, as these were found to serve as primary factors for e-learning implementations.

Finally, the study developed and validated e-learning model successfully, specifying causal relationships to the manner in which factors contribute to e-learning implementation level. Decision makers in the Ministry of Education should adopt this model to provide adequate support for implementing e-learning successfully and improve performance among academic staff and students in their professional activities. In particular, they can have a clear vision of implementing an attractive, conducive, and positive meaningful learning environment and achieve a suitable, successful, effective, and sustainable e-learning environment.

REFERENCES

Abu, A. A. (2014). *Toward Mobile Learning Deployment in Higher Education: A thesis acceptance of e-learning technology* (Unpublished doctoral dissertation).Retrievedfromhttp://www.scholar.lib.vt.edu/theses/available/etd. ../dissertation Ronda Henderson.pdf. Pp, 1-160.

Aftab, J. Khan, A .H and Sarwar, H. (2019). Critical Factors Which Impact on Students' Satisfaction. A Study of e-learning Institutes of Pakistan: Asian Journal of Distance Education Volume 14, Issue 2, 2019.

Agboola, A. K. (2006). Assessing the Awareness and Perceptions of Academic Staff in Using E-learning Tools for Instructional Delivery in a Post-Secondary Institution: A Case Study. The Innovation Journal: The Public Sector Innovation Journal, Vol. 11(3), pp. 1-12.

Ahmad, N., Quadri, N.N., Mohamed R. N. Q & Mohammad M. A.(2018).Relationship Modeling of Critical Success Factors for Enhancing Sustainability and Performance in E-Learning: Sustainability **2018**, 10, 4776; doi:10.3390/su10124776.

Ajzen, I. (1991). The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes, 50* (2), 179-211.

Akkoyuklu, B. and Soylu, M. Y. (2006). A study on students‟ views on blended learning environment. *Turkish Online Journal of Distance Education*, 7(3), pp-23-38: ISSN 1302-6488.

Al-Adwan, A., and Smedley, J. (2012). *Implementing e-learning in the Jordanian Higher Education System: Factors affecting effect.* International Journal of Education and Development using Information and Communication Technology (IJEDICT*)*, 2012, Vol. 8, Issue 1, pp. 121-135.

Allen, I.E and Seaman, J. (2008). *Staying the Course: Online Education in the United States.* Pp. 1-23.

Alexander, B. (2008). ‘‘Social networking in higher education’’, available at http://net.educause.edu/ir/ library/pdf/PUB7202s.pdf (accessed 11 November 2016).

Al-Alak, B. A. and Alnawas, I. A. M. (2011) *‘Measuring the acceptance and adoption of e-learning by academic staff’, Knowledge Management and E Learning*, 3(2), pp. 201–221.

Ali, T. *et al*. (2013). *Factors Affecting Students' Acceptance of E-learning Environments in Developing Countries: A structural Equation Modeling* Approach: International Journal of Information and Education Technology, Vol. 3, No. 1, pp. 54-59.

Algahtani, Awadh A., (2010). " The Effectiveness of Using E-learning, Blended Learning and Traditional Learning on Students' Achievement and Attitudes in a Course on Islamic Culture: an Experimental study", Doctor Thesis, Durham University, pp. 53-58.

Alshaher, A. F. (2013). The *McKinney 7s Model Framework for E-Learning System Readiness Assessment*. International Journal of Advances in Engineering & Technology, Nov. 2013. ©IJAET ISSN: 22311963. Vol. 6, Issue 5, pp. 1948-1966.

Amandu, G. M., et al., (2013). *Using Moodle e-learning platform to foster student self-directed learning: Experiences with utilization of the software in undergraduate nursing courses in a Middle Eastern University*. Procedia: Social and Behavioral Sciences, 93, 677–683.

Anderson, J.C., & Gerbing, D.W. (1988), *Structural equation modeling in practice: A review and recommended two-step approach. Psychological Bulletin*, 103(3), 411 423.

Angelo, C & Wema, E. (2010). Availability and usage of ICTs and e-resources by livestock researchers in Tanzania: Challenges and ways forward**.** *International Journal of Education and Development using Information and Communication Technology (IJEDICT)*, Vol. 6, Issue 1, pp. 53-65.

Bagozzi, R.P., & Yi, Y. (1988). On the evaluation of structural equation models. Journal of Academy of Marketing Science, 6(1), 74–94.

Andersson, A. & Grönlund, Å. (2009). A conceptual framework for elearning in developing countries: A critical review of research challenges. *The Electronic Journal on Information Systems in Developing Countries*, *38*(8), 1–16.

Andrew, F. (2009). *Modeling the Environment* (2nd edition). Island Press, Washington D.C.

Andrews, R. and Haythornthwaite, C. (Eds.) (2009). *Handbook of E-learning research*: Los Angeles: Sage: pp.1-105.

Arrigo, M. (2005). *'E-Learning Accessibility for blind students'*, pp. 1–5.

Awidi, T. (2008). *Developing an e-learning strategy for public universities in Ghana. EDUCAUSE Quarterly Magazine*, Volume 31, Number 2.

Awodele, O. et al. (2009), *''University enhancement system using a social networking approach: extending e-learning''*, Issues in Informing Science and Information Technology, Vol. 6 No. 1, pp. 269-83.

Bagozzi, R. P. (2007). *The Legacy of the Technology Acceptance Model and a Proposal for a Paradigm Shift*: Journal of the Association for Information Systems, 8, pp.244-254.

Bakhtiari, S and Shajar, H (2011). *Globalization and Education: Challenges and Opportunities.*Availableonlineathttps://www.researchgate.net/publication/24262 1870. Accessed on 15/10/2018.

Balancing Act (2014). Teaching Process: The 6th International Conference Edu World 2014 "Education Facing Contemporary World. PP: 426-432.

Bashir, K. (2018). Modeling E-learning interactivity, learner satisfaction and continuance learning Intention in Ugandan higher learning institutions. International Journal of Education and Development using Information and Communication Technology (IJEDICT). Pp-1-21.

Bellaaaj M. et al., (2015). The continued use of e-learning system: an empirical investigation using UTAUT model at the University of Tabuk. A journal of theoretical and applied information Technology.

Berhanu, B. (2010). *A model for an eportfolio-based reflective feedback: Case study of e-learning in developing countries* (PhD thesis). University of Hamburg, Hamburg, 14, 279-290.

Bett, B. K., Odhiambo, R.O & Orwa, G.O. (2014).Modeling e-learning implementation Level for Primary Schools in Nairobi County through Stratified Random Sampling. *Mathematical Theory and Modeling* *www.iiste.org*. ISSN 2224-5804. Vol.4, No.5, 2014.

Bhalalusesa, R. *et al*. (2013). *Challenges of using e-learning management systems faced by the academic staff in distance based institutions from developing countries*: A case study of the Open University of Tanzania. *Huria Journal of OUT, 14*, pp. 89–110.

Birch, D. & Burnett, B. (2009). Bringing academics on board: Encouraging institution-wide diffusion of e-learning environments. *Australasian Journal of Educational Technology*, *25*(1), 117–134.

Browne, T., et al. (2010). *Survey of technology enhanced learning for higher education in the UK* (p. 2010). Oxford: Universities and Colleges Information Systems Association.

Buc', S and Divjak, B (2016). *Environmental factors in the diffusion of innovation model: diffusion of e learning in a higher education institution*. Central European Central Conference Information Intelligent Systems. PP-99-250.

Cameron, B. (2003). *The Effectiveness of Simulation in a Hybrid and Online Networking Course*. Pp, 42-51.

Chris M, P. and Bisimba, K.H (2007). Law and Justice in Tanzania: Quarter [sic] a Century of the Court of Appeal. African Books Collective. pp. 282 ISBN 978-9987-449-43-9. Retrieved 8 November, 2018.

Comrey, A. L., & Lee, H. B. (1992). *A first course in factor analysis.* Hillsdale, NJ: Erlbaum. Pp, 6-20.

Collins, H. (2010) "*Creative Research: The Theory and Practice of Research for the Creative Industries*" AVA Publications.

Coromina, L. (2014). *Introduction to Structural Equation Modeling with Amos*.

Cox M.J. (2010). *The changing nature of researching information technology in education.* In *Researching IT in education: Theory, practice and future directions*, pp. 11–24. Routledge: Taylor and Francis Group, Abingdon, England.

Creswell, J. W. and Plano, V. L .(2007). *Designing and conducting mixed methods research: 2nd edition:* Thousand Oaks, California: Sage Publications. Publisher: *SAGE Publications*, Inc; 2nd ed. Pp: 1-488.

Cronbach, L. J. (1951). *Coefficient alpha and the internal structure of tests*: *Psychometrika, 16*, 297-334.

Crossman, A. (2018). *Understanding purposive sampling*: An overview of the method and its application https://www.thoughtco.com/purposive sampling-3026727.

Dabbagh, N. (2005). *Pedagogical models for E-Learning:* A theory-based design framework. *International Journal of Technology in Teaching and Learning, 1*(1), 25-44.

Dede, C. (1996). Emerging technologies and distributed learning. *American Journal of Distance Education, 10,* 4-36.

DeRouin, R.E., Fritzsche, B.A., and Salas, E. *(2005).* E-Learning in Organizations: *Journal of Management* 31: 920. Available online at http//: DOI: 10.1177/0149206305279815.

De Winter, J. C., Dodou, D. (2010). Five-point likert items: T test versus mann whitney-wilcoxon. Practical Assessment, Research Evaluation, **15(11)**, 1-12.

DeWitt, S. (2000). Multicultural democracy and inquiry pedagogy. *Intercultural Education.*

DiStefano, C., Zhu, M. & Mîndrilă, D. (2009). *Understanding and Using Factor Scores: Considerations for the Applied Researcher*. Practical Assessment, Research & Evaluation. A peer-reviewed electronic journal. Pp. 1-11

Dörnyei, Z. *(2003). Attitudes, orientation, and motivations in language learning: advances in theory, research, and applications.* Language Learning, 53, 3-32.

Dowling, C., *et al*. (2003). "*Do Hybrid Flexible Delivery Teaching Methods Improve Accounting Students' Learning Outcomes*," *Accounting Education: An International Journal,* 12 (4), 373-391.

Duderstadt, J., *et al*. (2002). *Higher education in the digital age: Technology issues and strategies for American colleges and universities*. Westport,Conn: Praeger Publishers: pp 2-109.

Elfaki, K.N., Abdulraheem, I. and Abdulrahim, R. (2019). Impact of E-Learning vs Traditional Learning on Student's Performance and Attitude. *International Journal of Medical Research & Health Sciences. Volume,* 8(10): 76-82.

El-Zyat, M. (2008). A Strategy to Improve E- Learning Adoption, Implementation and Development in Higher Education in Egypt. A_Strategy_to_Improve_E Learning_Adoption_Implementation_and_Development_in_Higher_Educati n_in_Egyhttps://www.researchgate.net/publication/256669371_pt [accessed Apr 29 2018].

Engelbrecht. E. (2003). "A look at e-learning models: investigating their value for developing an e-learning strategy", 25(2), pp. 38-47.

Esselaar, S. and Adam, L. (2013). Understanding what happening in ICT in Tanzania? *Evidence for ICT policy action*, pp. 1-33.

Falvo, D. (1994). *Effective Patient Education*: A guide to increased compliance (2nd ed.).

Eze, S.C., Eze, V.C.C and Ballo, A.O (2018). *International Journal of Educational Technology in Higher Education*. The utilisation of e-learning facilities in the educational delivery system of Nigeria: a study of M-University. Volume number: 34.

Finlayson, H., Maxwell, B., Caillau, I and Tomalin, J. (2006). *E-learning in Further Education: The Impact on Student Intermediate and End-point Outcomes.* Research Report RR739; Sheffield Hallam University School of Education. ISBN 1 84478 724 9.

Fong, M. (2009). *Technology leapfrogging for developing countries in M. Khosrow-Pour (Ed.)*, Encyclopedia of Information Science and Technology (2nd ed.). Hershey, Pennsylvania: IGI Gobal, 3707-3713.

Fresen, (2010). *Critical factors for effective eLearning,* Goteborg University.

Frimpon, M. F. (2012). *A Re-Structuring of the Critical Success Factors for E-Learning Deployment*. *American International Journal of Contemporary Research*, Vol. 2 (3), pp.115-123.

Gable, G. G., (1994). Integrating case study and survey research methods: an example in information systems. *European Journal of Information Systems* 3(2):pp. 112-126.

Gaebel, M., Kupriyanova, V., Morais, R. and Colucci, E., (2014). *E-learning in European Higher Education Institutions. Results of a mapping survey conducted in October-December 2013* (Brussels, European University Association).http://www.eua.eu/Libraries/publication/elearning_survey.pdf?fvrsn=2 (accessed 26/03/2019.

Gaikwad, A. and Radhir, V. S. (2016). *E-Learning in India: Wheel of Change.* International journal of education, e-education, e-business, e-management and e-learning. Available online at http://www.doi: 10.17706/ijeeee.2016.6.1.40-45. Accessed on 8/9/2018, pp. 40-45.

Glenn D. (1992): Sampling the Evidence of Extension Program Impact. Program Evaluation and Organizational Development, IFAS, University of Florida.

Gilbert, L. and Wills, G. B. (2013) '*A Model Of E-Learning Uptake And Continued Use In Higher Education Institutions'*, pp. 423–427.

Greenberg A (2005), *ICTs for Poverty Alleviation: Basic Tool and Enabling Sector*, http://www.sida.se/publications Retrieved on 22nd August 2018.

Haddad, W. D. (2007). *Part 1: Decision maker essentials*. In ICTs for education: A reference handbook. ICT-in-education toolkit for decision makers, planners & practitioners version 2.0. Washington, DC: info Dev/World Bank.

Hair, Jr. *et al*. (2006) *Multivariate Data Analysis*: New Jersey: Prentice Hall. (6th Ed.). Upper Saddle River, *NJ*: Pearson *Prentice Hall. Pp.1-928.*

Hair, Jr. *et al*. (2014) *Multivariate Data Analysis*: New Jersey: Prentice Hall. (7th Ed.). Upper Saddle River, *NJ*: Pearson *Prentice Hall. Pp.1-739.*

Harandi, S.R (2015). *Effects of e-learning on students' motivation: 3rd International* Conference on Leadership, Technology and Innovation Management: Published by Elsevier Ltd. PP: 424-430.

Harrison, C., et al. (2002) Effect2: The Effect of Information and Communication Technologies on Pupil Learning and Attainment, London: Department for Education and Skills (DfES)/Becta. Pp 25-37.

Harold, A. L., and Murray, T. (1975). *The Delphi Method: Techniques and Applications, Addison-Wesley, Reading*, MA: pp1-52.

Harwell, M. R. (2011). Research design: Qualitative, quantitative, and mixed methods: Pursuing ideas as the keystone of exemplary inquir. In C. Conrad, & R. C. Serlin (Eds.), *The Sage handbook for research in education: Pursuing ideas as the keystone of exemplary inquir* (Second Edition ed.). Thousand Oaks, CA: Sage, pp 1-401.

Hawkins, R. (2007). *The persistent bandwidth divide in Africa: Findings for the African Tertiary Institution Connectivity study and lessons for developing knowledge infrastructure and networks in Africa*. In Integrating Science & Technology into Development Policies: An International Perspective (pp. 91 99). OECD Publishing.

Henderson, R. B. (2005). *The role of computer and internet access in business students' model of utilization. MIS Quarterly, 15*, 125–143.

Helmann, M. (1965). *Fuzzy logic an introductory course for engineering students studies n fuzziness and soft computing***:** An introduction to fuzzy logic from practical application.

Hiltz, S. R., Zhang, Y., & Turoff, M. (2001). *Studies of effectiveness of learning networks.* Newark, N.J.: New Jersey Institute of Technology, pp 3-13.

Ho, R.H.Mand McDonald, P.R (2002) Principles and Practice in Reporting Structural Equation Analyses: Psychological Methods: the American Psychological Association, Inc. 2002, Vol. 7, No. 1, 64–82.

Hoyle, R.H., and Panter, A.T. (1995).*Writing about Structural Equation Models, Sage, Thousand Oaks,* CA: pp 3-18 http://hdl.handle.net/10803/276198. Accessed on 22/3/2016.

Hu, L.-T., & Bentler, P. M. (1999). *Cutoff criteria for fit indices in covariance structure analysis: Conventional criteria versus new alternatives*. Structural Equation Modeling, 6, 1–55.

Idris, F. and Osman, Y. (2017) 'Implementation of E-learning in The University of Gezira Barriers and Opportunities', *Educational Science and Research*, 1(1), pp. 24–35. doi: 10.22496/esr2016090470.

Isaacs, S. *et al*. (2013) *Findings from the eLearning Africa Survey Report Germany*: pp.164.

Isaga, N. (2012) *Entrepreneurship and Growth of SMEs in furniture industry in Tanzania*: A thesis submitted for fulfilment of degree of Doctoral philosophy: pp 1-226.

Iskander, George (2013) *A sequential exploratory design for the e-learning maturity model in Middle Eastern countries*. PhD thesis, Middlesex University. Pp, 1 180.

Islam, M. A., Rahim, A. A., Tan, C. L., and Momtaz, H. (2011). *Effect of demographic factors on e-learning effectiveness in a higher learning institution in Malaysia*. International Education Studies, Vol. 4(1), Feb.2011, pp.112-121.

Jamieson S. (2004). Likert scales: how to (ab)use them. Med Educ. 38(12):1217–1218.

Jelfs, A and Colbourn, C. (2002). Do Students Approaches to Learning affect their Perceptions of using computer and information technology? *Journal of Educational Media*, 27(1/2) pp. 41–54.

Jethro, O., Grace, A. M., and Thomas, A. K. (2012). *E-Learning and Its Effects on Teaching and Learning in a Global Age. International Journal of Academic Research in Business and Social Sciences,* Vol. 2 (1), January 2017, pp. 203 210.

Jones, D.T (2011). *An Information Systems Design Theory for E-learning.* A thesis submitted for the degree of Doctor of Philosophy of The Australian National University. Pp. 17-431.

Jirasak, S. (2014). *Developing of Indicators of An E-Learning Benchmarking Model for Higher education Institutions*: *The Turkish Online Journal of Educational Technology*, volume 13 issue 2: pp. 35-43.

Kahiigi, E. K. *et al*. (2013). *"Exploring the e-Learning State of Art.*" The Electronic Journal of e-Learning Volume 6 Issue 2, pp77 -88, available online at https:// www.ejel.org. Accessed on 12/4/2016.

Kline, R.B. (2005). *Principles and Practices of Structural Equation Modeling* (2nd Ed). New York: The Guilford Press.

Karimi, L. and Ahmad, Y.B.T. (2013). Perceived Learning and Satisfaction in a Blended Teacher Education Program: An Experience of Malaysian Teacher Trainees. Contemporary Educational Technology, Vol. 4(3), pp.197-211.

Kavaliauskiene, G. (2011). *Case study: English for specific purposes in Moodle area*. Studies about Languages, 19, 113–118. doi:10.5755/j01.sal.0.19.954.

Kayode C.V., Ekwunife, O. & Tian-Lih, T. (2014). *The impact of transactional distance dialogic interactions on student learning outcomes in online and blended environments:* Available online at www.elsevier.com/locate/compedu. Accesed on 22/8/2018. pp. 1-14.

Keller, C., Lindh, J., & Hrastinski, S. (2007, October). *E-learning use in higher education:* The effect of organizational factors. Paper presented at 6th European Conference on e-Learning, Copenhagen, Denmark.

Khan, B. (2001). ‘‘Elements of e-learning’’, available at: http://BadrulKhan.com (accessed 20 April 2016).

Khamparia, A and Pandey, B. (2017). Impact of Interactive Multimedia in E Learning Technologies. DOI: 10.4018/978-1-5225-2489-2.ch007.

Khan, B. H. (2005). *Managing e-learning: Design, delivery, implementation, and evaluation*. Hershey, PA: Information Science Publishing: pp. 22-33.

Kim, S. W., and Park, S. S. (2011). Analysis of Factors for Adult Female Learners' Dropout in e- learning. In *World Conference on Educational Multimedia, Hypermedia and Telecommunications*, Vol. 2011 (1): pp. 1934-1939.

Kisanjara, S. (2014). 'Students' A ttitudes and Readiness Assessment towards E Learning in Higher Learning Institutions Simeo Boniphace Kisanjara', 3(1), pp. 3155–3166.

Kisanga, D. H. and Ireson G. (2014). *Challenges and strategies on adoption of e learning in Tanzanian higher learning institutions:* Lessons to future adopters: pp.1-7.Availableonline at https://www.learntechlib.org/p/151845 Accessed on 5/08/2016.

Kituyi, G. and Tusubira I (2013). *A framework for the integration of e-learning in higher education institutions in developing countries*: International Journal of Education and Development using Information and Communication Technology *(IJEDICT)*, 2013, Vol. 9, Issue 2, pp. 19-36.

Leedy, P.D. and Ormrod, J.E (2005). *Practical Research: Planning and Design*, 8th ed, Ohio, Prentice Hall.

Knight, C. *et al*. (2006). *Releasing the pedagogical power of information and communication technology for learners: A case study:* pp. 2-14.

Lashayo, D.M. and Gapar, M. (2017) "A review of e-learning systems' adoption in Tanzania universities", *South East Asia Journal of Contemporary Business, Economics and Law*, vol 13, no. 2, pp.111-118. Available online at: http://seajbel.com/wpcontent/ uploads/2017/10/K13-252.

Lashayo, D.M., Alkawaz, M.H., & Gapar, M (2018) Adoption of E-Learning Systems in Tanzania's Universities: A Validated Multi-Factors Instructor's Model. *A Journal of Theoretical and Applied Information Technology. Vol.96. No 20; pp. 6864-6876.*

Liaw, S. S. (2008). Investigating students' perceived satisfaction, behavioural intention, and effectiveness of e-learning: A case study of the Blackboard system. Computers & Education, 51(2), 864-873.

Lund Research Ltd, (2013). *Multiple Regression Analysis using SPSS Statistics*: pp.3- 44. Available online at https://statistics.laerd.com/spss tutorials/multiple-regression-using- spss-statistics.php. Accessed on 30/7/2016.

Lwoga, E. T. (2012). *Making learning and Web 2.0 technologies work for higher learning institutions in Africa. Campus-Wide Information Systems*, Paper presented at the E-Learn (2002) World Conference. Available online at http://dx.doi.org/10.1108/ET-02-2014-0014 accessed on 12/8/2015.

Lwoga, E. T., and Komba M. (2015). *Antecedents of continued usage intentions of web based learning management system in Tanzania*: Education + Training, Vol. 57 Iss 7 pp. 738–756 Permanent links to this document: http://dx.doi.org/10.1108/ET-02-2014-0014. Accessed on 23/3/2015.

Ma, W. and Yuen, A. (2011), "E-learning system acceptance and usage pattern", Technology Acceptance in Education, pp. 201-216.753 Web-based LMS in

Tanzania Downloaded by Mzumbe University At 04:47 29 December 2015.

Madar, J.M. and Willis, O. (2014). *Strategic Model of Implementing E-Learning*: International Journal of Scientific & Technology Research Volume 3, Issue, ISSN 2277-8616; pp. 235-238. Available online ahttps://www.google.com/#q=wills+model+in+2014+paper+in+e-learning. Accessed on 29/9/2016.

Maina, M. K. and Nzuki, D. K. (2015). *Adoption Determinants of E-learning Management System in Institutions of Higher*. Case of Selected Universities in Nairobi Metropolitan. *The international journal of business Science Learning in Kenya:* Vol. 6, No. 2: pp.233-248.

Malik, M. W. and Mubeen, G. (2009). *Students Satisfaction Towards eLearning*: Influential Role of Key Factors: pp. 23-32. Available online at: edem.todaie.gov. Accessed on 5/10/2016.

Maliyamkono, T.L and Mason, H (2006). *The promise*. TEMA publisher company Ltd and Siyaya publishing (pty).

Mapuva, J. (2009). *Confronting Challenges to E-learning in Higher Education Institutions.* International Journal of Education and Development Using *ICT*, 5, 3, 101-114.

Mason, R. (2006). *The university: current challenges and opportunities*. In S. d'antoni (Ed.), The Virtual University: Models and Message | Lessons from Case Studies (pp. 49-70). Paris: UNESCO.

Mbarek, R. and Zaddem, F. (2013). The examination of factors affecting e-learning effectiveness: *International Journal of Innovation and Applied Studies*, Vol. 2 (4), Apr. 2013, pp. 423-435, 2013, Innovative Space of Scientific Research Journals.

Mergel, B. (1998). *Instructional design & learning theory* (Master's thesis, University of Saskatchewan). Available online at: *http://etad.usask.ca/802papers/mergel/brenda.htm*.

Mgaya, Y.D. (2016). The Tanzania Commissions for Universities. The rolling strategic plan.

MoEVT (2007).*The Teacher Education Development and Management Strategy*. https://www.google.com/search?ei=AUTkWo2bDuO26AT89oXoDg&q=MoEVT+2011+POPULATION&oq=MoEVT+2011+POPULATION&gs_l=psy.

Msoroka, M. (2012). Financing Education in Tanzania: *Policy Transformations, Achievements and Challenges*. *GRIN Verlag. pp. 14–*. ISBN 978-3-656-11796-4.

Mtebe, J. S. and Raisamo, R. (2014). *Investigating students' behavioural intention to adopt and use mobile learning in higher education in East Africa*: *The International Journal of Education and Development Using Information and Communication Technology (IJEDICT), 10*(3), 4–20.

Mugenda, O.M and Mugenda, A.G (2003) Research Methods-Quantitative and Qualitative. Acts Press.

Mtebe, J. S. and Raphael, C. (2018). A Critical Review of eLearning Research Trends in Tanzania. A journal of learning for development-JL4D, Vol. 5, No. 2, pp. 163-178.

Munguatosha, G.M. *et al*. (2011). *A social networked learning adoption model for higher education institutions in developing countries*: On the Horizon, Vol. 19 Iss 4 pp. 307 – 320.available online at http://dx.doi.org/10.1108/10748121111179439. Accessed on 12/12/2016

Makokha, G.L. and Mutisya, D.N. (2016). Status of E-Learning in Public Universities in Kenya: *International Review of Research in Open and Distributed Learning Volume 17, Number 3*: PP. 1-19.

Muries, B and Masele, J.J. (2017). Explaining Electronic Learning Management Systems (ELMS) continued usage intentions among facilitators in Higher Education Institutions (HEIs) in Tanzania. *International Journal of Education and Development using Information and Communication Technology (IJEDICT),* 2017, Vol. 13, Issue 1, pp. 123-141.

Mwollo-Ntallima, A. (2011). 'Higher Education and Democracy: A study of students' and student leaders' attitudes towards democracy in Tanzania'. (Unpublished master's thesis). University of the Western Cape. Cape Town.

Myers, M.D. (2008) "*Qualitative Research in Business & Management*" SAGE Publications.

Nachmias, C. F and Nachmias, D. (1996*).* Research Methods in Social Sciences. 5th Edition. Arnold Publishers: London.

Nagunwa, T., and Lwoga, E. (2012). *Developing e-learning technologies to implement competency based medical education:* Experiences from Muhimbili University of Health and Allied Sciences *International Journal of Education and Development using Information and Communication Technology (IJEDICT), 8(3),* 7-21.

Namisiko, P. *et al*. (2014). Towards an Optimization Framework for E-Learning in Developing Countries: A Case of Private Universities in Kenya. Journal of Computer Science and Information Technology, Vol. 2, No. 2, pp. 131-148.

Ndume, V. *et al*. (2008), *"Challenges of adaptive e-learning at higher learning institutions: a case study in Tanzania*", International Journal of Computing and ICT Research, Vol. 2 No. 1, pp. 47–59.

Naziabanu, M.P., Armstrong, K. & Solomoni, M. (2017). Investigating factors influencing the implementation of e-learning at rural based Universities. Information Technology Journal ISSN 1812-5638.

Ndunguru, P.C. (2007). *Lectures notes on research methods for social sciences:* Research Information. New Jersey: Prentice Hall and Publications Department, Mzumbe University. Ppt 1-20.

Ndonje, T.S (2013) Factors For E-Learning Adoption in Tanzania the Case of Higher Learning Institutions in Mwanza Region.

Neyland, E. (2011). *Integrating online learning in NSW secondary schools*: Three schools' perspectives on ICT adoption. Australasian Journal of Educational Technology, Vol. 27(1), pp.152-173.

Ngai, E. W. T., Poon, J. K. L., & Chan, Y. H. C. (2007). Empirical examination of the adoption of WebCT using TAM. *Computers & Education, 48*(2), 250-267.

Njenga, J. K, (2011). *E-learning adoption in Eastern and Southern African higher education institutions:* A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy in the Department of Information Systems, University of the Western Cape: pp. 1-269.

Nicolaus J. Ashill (2018). A System's View of E-Learning Success Model: *Decision Sciences Journal of Innovative Education 16(1):42-76.* DOI: 10.1111/dsji.12144.

Norman G. (2010). Likert scales, levels of measurement and the "laws" of statistics. Advance Health Science Education Theory Practice. 15(5):625–632.

Nunes, M. B., & McPherson, M. (2007). *Why Designers cannot be Agnostic about Pedagogy:* The Influence of Constructivist Thinking in Design of e-Learning for HE. Studies in Computational Intelligence *(SCI), 62*, 7–30.

Nwana S.E.1 et al. (2017). *Awareness and Usage of E-Learning Materials among Students of National Open University of Nigeria (NOUN*. World Journal of Education Vol. 7, No. 6. Available online at http://wje.sciedupress.com.

Nyagorme, P. et al. (2017). The Awareness and Use of Electronic Learning Platforms: A Case of a Developing Country. World Journal of Computer Application and Technology 5(2): 13-23.

Olatokun, W. (2008). *Gender and ICT policy in Africa: Issue, strategies and policy options*. Information Development, 24(1), 53-65.

Obijiofor, L (2009), Mapping Theoretical and Practical Issues in the Relationship between ICTs and Africa's Socioeconomic Development, *Telematics and Informatics,* Volume 26: 32–43.

Olson. J. *et al*. (2011). *An Analysis of e-Learning Effects & Best Practices in Developing Countries*: With Reference to Secondary School Education in Tanzania: pp. 1-53.

Oproiu, G. C., & Chicioreanu, T. D. (2012). *Using Virtual Learning Environments in Adult Education*. Scientific Research & Education in the Air Force AFASES,1.

Oproiu, G.C (2014). *A Study about Using E-learning Platform (Moodle) in University.*

Ordonez, K. (2014). *Predicting International Critical Success Factors in E-learning*: A thesis Submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy: pp. 1-274.

Othman, M. S., & Musa, M. A. (2012). *Critical success factors in e-learning: An examination of technology and student factors.* International Journal of Advances in Engineering & Technology, 3, 140–148.

Owate et al. (2017). *Demographic variables and students use of e-learning resources in Public secondary schools libraries in Rivers State of Nigeria*. International Journal of Educational Administrational and Policy Studies Vol.9(2), pp. 10-27. Available online at http://www.academicjournals.org/IJEAPS.

Ozoemena, A. S. (2014). *Assessment of the Use of E-learning Facilities by Home Economics.* Teachers in Delta State, Nigeria**.** Journal of Education and Practice www.iiste.org ISSN 2222-1735 (Paper) ISSN 2222-288X (Online) Vol.5, No.16, 2014.

Painter-Morland, M. *et al*. (2003) .*Conversations Across Continents*: Teaching Business Ethics Online. Journal of Business Ethics, *48*, 75–88.

Park, S. (2009). *An analysis of the Technology Acceptance Model in understanding university students "behavioural intention to use e-Learning*. Educational Technology and Society, Vol.12 (3), pp.150-162.

Patton, M. (1990). *Qualitative evaluation and research methods* (pp. 169-186). Beverly Hills, CA: Sage.

Pappas C. 2013, Top 10 e-Learning Statistics for 2014 You Need To Know. Available: http://elearningindustry.com/top-10-e-learningstatistics- for-2014-you-need-to- know, accessed: 5.04.2015.

Pargaonkar, A ., Mishra, W. and Kadam, S. (2019).A Study on Elderly Individuals' Attitude Towards ICTs: *Proceedings of ICoRD 2019 Volume 2 DOI*: 10.1007/978-981-13-5977-4_61.

Peterson, R. A. (1994). *A meta-analysis of Cranach's coefficient alpha*. Journal of Consumer Research, 21(2), 381–39.

Remenyi, D. *et al.* (1998). *Doing research in business and management.* London: Sage.

Pham, Q., & Huynh, M. (2018). Learning achievement and knowledge transfer: the impact factor of e-learning system at Bach Khoa University, Vietnam. *International Journal of Innovation, 6*(3), 194-206. http://dx.doi.org/10.5585/iji.v6i2.235.

Riffell, S., and Sibley, D. (2005). *Using web-based instruction to improve large undergraduate biology courses*: An evaluation of a hybrid course format. *Computers & Education*, *44* (3), 217-235.

Risinger, F. (1998). *Global education and the World Wide Web*. *Social Education, 62*, 276-289.

Robson, R. (2002). Reusable *Learning Objects*. E-Learning Magazine, *3* (9), pp. 18-19.

Rodgers, T. (2007). *Measuring Value Added in Higher Education: a Proposed Methodology for Developing a Performance Indicator Based on Economic Value Added to Graduates.* Education Economics, 15, 55-74.

Rodgers, T., & Ghosh, D. (2001). *Measuring the determinants of quality in UK higher education: A multinomial logit approach*. *Quality Assurance in Education*, 9, 121-126.

Rogers, E. M. (1995). *Diffusion of innovations: 3rd edition.* New York: The Free Press. (Original publication 1962). Pp 3-253.

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). New York, NY: Free Press: pp.2-260.

Rogers, E.M. (1997). *Diffusions of Innovation Theory*: 6th edition. New York: The Free Press: pp. 4-250. Available online at http://www.tcw.utwente.nl/theorieenoverzicht/Theory%20clusters/Communication%20and%20Information%20Technology/Diffusion_of_Innovations_Theory.doc/accessedon 25/7/2015.

Rosenblit, S. G. and Gros, B. (2011). *E-Learning: Confusing Terminology, Research Gaps and Inherent Challenges*. International Journal of E-learning and Distance Education: VOL. 25, No.1: pp. 21-49.

Rostaminezhad, M.A. *et al*. (2013). Factors Related to E-learner Dropout: Case Study of IUST E-learning Centre. Social and Behavioural Sciences, Vol. 83, pp. 522 – 527.

Rudestam, K. E. & J. Schoenholtz-Read (Eds.), *Handbook of Online Learning*.

Ruiz-Moreno, A., et al. (2008). *The moderating effect of organizational slack on the relation between perceptions of support for innovation and organizational climate*. *Personnel Review*, *37* (5), 509-525.

Ryan, S.D., Magro, M.J. and Sharp, J.S. (2011), *''Exploring educational and cultural adaptation through social networking site*s'', Journal of Information Technology Education: Innovations in Practice, Vol. 10 No. 1.

Ryan, S., Kaufman, J., Greenhouse, J., Joel; She, R. and Shi, J., 2016). The Effectiveness of Blended Online Learning Courses at the Community College Level. Community College Journal of Research and Practice, 40(4), pp. 285-298.

Samzugi, A.S and Mwinyimbegu, C.M (nd). *Accessibility of Open Educational Resources for Distance Education Learners: The Case of The Open University of Tanzania.*

Sangrà, A., Vlachopoulos, D. (2011). *Towards an inclusive definition of e-learning.* Barcelona: e-Learn Centre. UOC. Pp 5-39.

Sanga, C. (2010). *A Technique For The Evaluation Of Free And Open Source E-Learning Systems:* A Thesis submitted in fulfilment of the requirements for the Degree of Doctor of Philosophy in Computer Science University of the Western Cape: PP-1-207.

Saunders, M. *et al*. (2012). *Research Methods for Business Students*: 4thed Prentice Hall Financial Times: Harlow. Page 18.

Sanya, B.C and Kinunda, M.J (1977). *Higher education for self-reliance: the Tanzanian experience.* Paris International Institute for Educational Planning. PP. 11-415.

Schwartzman, R. (2001) *Service-learning responds to technological enchantment and intellectual isolation*. College Student Journal. Available at: http://www.wlv.ac.uk/lib/systems/gt-harvard.htm (accessed April 2007)

Selim, H. (2007). "*Critical success factors for e-learning acceptance*: Confirmatory factor models". Computers & Education, 49(2), 396-413.

Sener, J. (2015). Updated E-Learning Definitions. Available online at https://onlinelearningconsortium.org/updated-e-learning-definitions-2/

Sepahpanah, M., Movahed, R. and Faran A. Y. (2015). The Study of Students' Attitudes towards the Use of Internet in Education: A Case Study of Kermanshah Azad University). Vol. 6, No. 3.

Shah, R.K. and Barkas, L.A. (2018). Analysing the impact of e-learning technology on students' engagement, attendance and performance: *Research in Learning Technology* Vol. 26, 2018.

Sharma, P. and Maleyeff, J. (2003). *Internet education: potential problems and solutions. International Journal of Educational Management, 17*(1), 19-25.

Sharpe, R., and Benfield, G. & Francis, R. (2006). Implementing e-learning universities strategy: levers for change within academic schools: Research in Learning Technology: Vol. 14, No. 2. PP 135 – 151.

Shelton, K. (2010). *A Quality Scorecard for the Administration of Online Education Programmes*: A Delphi Study. Doctoral Dissertation Faculty of the Graduate College at the University of Nebraska: pp.1-170.

Shutenko, A., Shutenko, E.N., Alekseev-Apraksin, A.M., maltseva, J. M.,Chkina, L.S. and Tegaleva, T. D. (2019). The Use of Modern ICT as Tools for

Development of Learning Communication in the Contemporary University. *Journal of Education*. Vol. 40 (Number 15).

Siddiquah, A. and Salim, Z (2017) The ICT Facilities, Skills, Usage, and the Problems Faced by the Students of Higher Education. *EURASIA Journal of Mathematics Science and Technology Education* ISSN: 1305-8223 (online) 1305-8215 (print)2017 13(8):4987-4994 DOI: 10.12973/eurasia.2017.00977

Sife, A. *et al*. (2007). *New technologies for teaching and learning*: Challenges for higher learning institutions in developing countries International Journal of Education and Development using Information and Communication Technology(IJEDICT),2007,Vol.3,Issue2,pp.5767.Available online at ttps://scholar.google.com/citations?view_op=view_citatio n&hl=uk&user HC. Accessed on 5/08/2016.

Sigh, A.S and Masuku, M.B. (2014). Sampling Techniques & Determination of Sample Size in Applied statistics Research: An Overview. International Journal of Economics, Commerce and Management United Kingdom. Vol. II, Issue 11. PP. 1-22.

Smith, D., & Hardaker, G. (2000). *E-learning innovation through the implementation of an internet supported learning environment.* Educational Technology and Society, 3, 1-16.

Sridharan, B. et al*. (2008) "Evaluating intertwined critical success factors for sustainable e-learning",* ACIS Proceedings, 2008, p.102.

Ssekakubo, G. *et al.* (2011*). Issues of adoption: Have e-learning management systems fulfilled their potential in developing countries*? In Proceedings of the South African Institute of Computer Scientists and Information Technologists Conference on Knowledge, Innovation and Leadership in a Diverse, submitted in fulfilment of the degree of Doctor of Philosophy School of Information Systems, Computing an Mathematical Science Brunel

University. Available online at https://www.google.com/#q=Abu- Al.+Aish: Pp. 3-193. Accessed on 16/8/2015.

Suhail, N.A. and Mugisa, E.K. (2009). *Implementation of E-learning in Higher Education Institutions in Low Bandwidth Environment*: A Blended Learning Approach: pp.302-322.

Sulivan, G. M. & Artino, J.R. (2013). *Analyzing and interpreting Data from likert-type scales. Journal of Graduate Medical Education: J Grad Medical Education*. 5(4): 541-542. doi: [10.4300/JGME-5-4-18].

Tabachnick, B. and Fidell, L. (2007). *Using Multivariate Statistics*: Boston: Allyn and Bacon: pp.12-21.

Taha M. (2014). *Investigating the Success of E-Learning in Secondary Schools*: The Case of the Kingdom of Bahrain: pp. 1-125. A thesis submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy in the department of Computer Science.

Tarus, J. (2011). *Adoption of E-learning to Support Teaching and Learning in Moi Technical conditions of education and training:* Unpublished PhD dissertation in the Technology Education, 6, 117- 180.Available online at http://informingscience.org/jite/documents/Vol6/JITEv6p169 180Keengwe218.pdf accessed on 15/08/2015.

TCRA (2013), "*Interconnection Rates Determination* No. 3 of 2013", available at: www.tcra.go.tz/images/headlines/determination3-2013.pdf accessed on February 2014.

Tarus, J. K. and Gichoya, D. (2015). *E-Learning In Kenyan Universities*: Preconditions For Successful Implementation. The Electronic Journal of Information Systems in Developing Countries: PP.1-14 Available online at htt://www.ejisdc.org. accessed on 17/ 3/2015.

TCU. (2016.). *Universities*. Retrieved August 09, 2017, from Tanzania Commission of Universities: http://www.tcu.or.tz/universities.html accessed on 17/03/2017.

TCU. (2010). Statistics for Universities and University Colleges enrollment of students. Available online at http://www.tcu.go.tz/uploads/file/students%20for%202009-2010pdf.

Teddlies, C and Yu, F. (2007). *Mixed Methods Sampling: A Typology With Example:* https://www.researchgate.net/publication/249831052_Mixed_Methods_Sampling_A_Typology_With_Examples.

Teferra, D., & Altbach, P. G. (2004). *African higher education*: Challenges for the 21st century. *Higher Education, 47,* 21-50.

Teo, T. *et al*., (2011). *Assessing e-learning acceptance by university students in Thailand*. Australasian Journal of Educational Technology, Vol. 27 (8), pp.1356-1368.

Terrace, O. (2011). Up to 75% of Business and IT Executives Anticipate their Software Projects will fail. Available at: http://www.geneca.com/75-business-executives-anticipate-software-projects-fail/. Accessed on Friday, January 9, 2015.

Thompson, R., Higgins, C., & Howell, J. (1991*). Personal computing: toward a conceptual Thousand Oaks,* CA: SAGE Publications, Inc.

Tossy, T. (2012). *Cultivating Recognition: A Classic Grounded Theory of E-Learning Providers Working in East Africa:* pp.1-381. Available online at http://www.elearningcouncil.com. Accessed on 2/5/2016.

Touray, A. *et al*. (2013). *ICT Barriers and Critical Success Factors in Developing Countries*. *The* Electronic Journal of Information Systems in Developing Countries, 56, 7, 1-17.

Trucano, M. (2005), "*Knowledge maps: ICTs in education"* Washington D.C.: InfoDev, The Information for Development Programme.

Trochim, W. M. K. (2006). *Research methods:* Knowledge base: pp. 1-203. Available online at http://www.socialresearchmethods.net/kb/sampprob.php. accessed on 3/03/2016.

UNESCO. (2007) ICT in Teacher Education: Case Studies from the Asia-Pacific Region. Bangkok: UNESCO. Available online at: http://unesdoc.unesco.org/images/0015/001567/1567 57e.pdf.

URT. (1997). *The Broadcasting Services Act, No. 6 of 1993*, available at: www.wipo.int/edocs/lexdocs/laws/en/ tz/tz020en.pdf (accessed 29 November 2017).

URT. (1993). *The Tanzania Communications Act, No. 18 of 1993*, available at: http://polis.parliament.go.tz/ PAMS/docs/18-1993.pdf (accessed 29 November 2017).

URT. (2003). *National Information and Communications Technologies Policy*: pp.2-64.https://www.google.com/search?q=URT+%282003%29&ie=utf-8&oe=utf-8&client=firefox-b-ab. Accessed on 2/3/2015.

URT. (2007).*National Adaptation Programme of Action (NAPA)***.**Online at ttps://www.google.com/search?ei=yELcWp2TK8uisAGzg4LYCg&q=Geographical+location+of+united+republic+of+Tanzania+2003&oq=Geographical+locatio nn+of+united+republic+of+Tanzania+2003&gs_l=psy-ab. Accessed on 22/04/2018.

URT (2015) *Tanzania in figure 2014*: National bureau of statistics ministry of finance Dar es salaam. Online at https://www.google.com/search?ei=dEXcWo3fCqzCgAaBoYHYCw&q=Current+population+from+nbs+tanzania+pdf&oq=Current+population+from+nbs+tanzna+pdf&gs_l=psy-ab. Accessed on 22/04/2018.

Valcheva, D and Todorova, M. (2005). A *model of a virtual university – some problems during its development*, Proceedings of the International Conference on Computer Systems and Technologies CompSysTech, Sofia pp IV.29-1– IV.29-7.

Venkatesh, V. *et al*. (2003) User Acceptance of Information Technology: Toward a Unified View. MIS Quarterly, 27 (3), 425-478.

Volman, M. et al. (2005). *New technologies, new differences. Gender and ethnic differences in pupils' use of ICT in primary and secondary education Computers and Education* Vol. 45 (1), August 2005, pp. 35 – 55.

Vrielink, R. (2007). *An empirical investigation of pupils' acceptance of a Virtual Learning Environment:* A comparative research among Dutch pupils aged 12-19 in secondary education. Online at: www.reindervrielink.nl/BB%20versus%20ELo%2014%20september%20

Vygotsky, L.S. (1978), Mind and Society: The Development of Higher Mental Processes, Harvard University Press, and Cambridge, MA.

Wang *et al*. (2005). *Measuring e-learning systems success in an organisational context*: Scale development and validation: pp. 3-16. https://www.google.com/?gws_rd=ssl#q=the+study+by+Wang+et+al.%2C+2 00 7+on+ELearning+Systems+Success+(ELSS). Accessed on 19/09/2016.

Wan, Z. Wang Y., Haggerty N. (2008), Why people benefit from e-learning differently: The effects of psychological processes on e-learning outcomes, Information & Management, Vol 45, Issue 8, Page(s) 513-521.

Weber, J. (1996). '7p.; In: Association of Small Computer Users in Education (ASCUE) Summer Conference Proceedings (29th, North Myrtle Beach, SC,

June 9-13, 1996); see'.

Wejnert, B. (2002). *Integrating Models of Diffusion of Innovations*: A Conceptual Framework. Annual review of sociology, 28, 297-326.

Weller, M. (2007). *Virtual Learning Environments: Using, choosing and developing your VLE* - London. Routledge. https://www.moodle.ro/.

Workman, M. (2005). *Expert decision support system use, disuse, and misuse*: a study using the theory of planned behavior. *Computers in Human Behavior*, *21*, 211-231.

World Bank Report (2006). *Information and Communications for Development: Global Trends and Policies*. Washington DC: The World Bank: pp. 1-64. https://www.google.com/search?q=Lund+Research+Ltd%2C+%282013%2 &ie =utf-8&oe=utf- 8&client=firefox-b-ab#q=World+Bank+Report+ (2006). Accessed on 12/7/2015.

Worthen, B.R and Sanders, J.R. (1987) *Educational evaluation: Alternative approaches and practical guidelines*. White Plains, NY: Longman.

Yacob, A. et al. (2012). *Student awareness towards e-learning in Education*: *Procedia* - Social and Behavioral Sciences. Pp. 93-101. Universiti Teknologi MARA, Malaysia doi: 10.1016/j.sbspro.2012.11.310.

Yew, O. F. and Jambulingam, M. (2015)."Critical Success Factors of E-learning Implementation at Educational Institutions", Jounal Interdiscip. Res. Educ., Vol. 5, No. 1, pp. 17–24.

Yin, R. (2003). *A case study Research Designs and Methods: Applied Social Research Methods.* Vol. 5 series: pp. 1-166.

Yu, C.-Y. (2002). *Evaluation of model fit indices for latent variable models with categorical and continuous outcomes*. Unpublished dissertation. Retrieved January 5, 2005, from Mplus website http://www.statmodel .com/download/Yudissertation.pdf.

El Zayat, M.F. (2016). A Strategy to Improve E- Learning Adoption, Implementation and Development in Higher Education in Egypt.

Zewayed, N.J (2012). *Students' acceptance of e-learning in Bahrain secondary schools:* A Doctoral Thesis Submitted in Partial Fulfilment of the Requirements for the Award of Doctor of Philosophy. Pp 1-416.

Zhang, D., and Nunamaker, J. (2003). *Powering E-Learning In the New Millennium:* An Overview of ELearning and Enabling Technology. *Information Systems Frontiers, 5* (2), 207–218.

Zhu, C. and Mugenyi, K. J. (2015) *A SWOT analysis of the integration of e-learning at the university in Uganda and University in Tanzani*a: pp.2-19. Available online at http://dx.doi.org/10.1080/1475939X.2015.1093537. Accessed on 16/11/2016.

Zhu, C. et al. (2009). *Chinese students' perceptions of a collaborative e-learning environment and factors affecting their performance*: implementing a Flemish e-learning course in a Chinese educational context. Asia Pacific Educ. Rev. 10. pp. 225–235. [Online] accessed at: DOI 10.1007/s12564-009-9021-4 Springe.

Zoroja, J., Skok, M. M and Bach, P.M (2015). E-learning implementation in developing countries: Perspectives and obstacles. Available online at: at: https://www.researchgate.net/publication/261875641. PP. 1-24. Accessed on 26/3/2019.

APPENDICES

Appendix A: Analysis Results

Table for Average variance extracted, Construct correlations, shared variance and Composite Reliability (CR).

Construct/Dimension	1	2	3	4	5	6
Technological Characteristics	**.80**	.43	.40	.27	.33	.44
User Characteristics	.66	**.70**	.52	.22	.20	.35
Institutional Characteristics	.72	.63	**.60**	.32	.34	.37
Pedagogical Characteristics	.47	.45	.72	**.724**	.57	.43
Social Characteristics	.58	.57	.58	.76	**.54**	.41
Environmental characteristics	.65	.59	.67	.89	.69	**.63**
Composite Reliability (CR)	.803	.840	.870	.835	.815	.896

Note: (a) The Average Variance Explained (AVE) are indicated along the main diagonal in bold for the construct; (c) the correlations are shown below the diagonal; (c) the shared variance matrix (VARMAX) are indicated above the main diagonal.

Appendix B: Questionnaires

1-B Questionnaire for students

Dear respondent,

I am a PhD student at the Mzumbe University; currently collecting data for my doctoral research. The overall objective of my research is to develop a model for effective e-learning implementation in Tanzanian Universities. You are kindly requested to fill in this questionnaire as part of data collection. Your participation is entirely voluntary and your responses will be kept confidential. Thank you very much for completing this questionnaire. In case of any question with regard to the questionnaire, feel free to ask for clarification through the below contact:

:

Name: Simeo B. Kisanjara

Tel No.: +255 784 727753

Email: simeokisanjara@gmail.com or sbkisanjara@mzumbe.ac.tz

1.0 Respondent Background Information

1.1 Sex (Tick) ( ) Male ( ) Female

1.3 Degree Program ...…… eg. (BA Sociology, BSc Food Sc.)

1.4 Year of study ……..... eg. (I, II, III ect.)

1.5 Name of your University …….

2.0 The extent of current e-learning uptake in Tanzanian universities

2.1 Please give your opinions in each of the following statements based on awareness of e-learning: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree (adapted from Taha, 2014 and Njenga, 2011)

	Awareness towards e-learning	1	2	3	4	5
1	I am aware on how to use computer (in learning activities)					
2	I am aware on online learning (learning anywhere and anytime)					
3	I am frequently downloading online academic materials for learning					
4	I am aware on how to access an academic online library resources					
5	I have participated on online courses/classes in relation to academic learning					

2.2 Please give your opinions in each of the following statements based on availability of e-learning: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree (adapted from Taha, 2014 and Njenga, 2011)

	Availability of e-learning	1	2	3	4	5
1	I find functioning computer laboratories in my university					
2	I find working internet connectivity in my university					
3	I do online academic group discussions and chating					
4	There is an online library resources in my university					
5	I do online assignments and examinations					
6	I find online learning materials from instructors					

2.3 Please give your opinions in each of the following statements based on e-learning accessibility: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree (adapted from Taha, 2014 and Njenga, 2011)

	Accessibility of e-learning	1	2	3	4	5
1	I have a computer and I can easily access the computers and do practical assignment					
2	I have access to a computer with internet connectivity					
3	I can easily access the university timetable electronically (online)					
4	I can submit assignments online and get feedback from my lecturers					
5	I can register online and access university information					
6	I can easily access academic results online					

2.4 Please give your opinions in each of the following statements based on attitude towards e- learning: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree (adapted from Taha, 2014 and Njenga, 2011)

	Attitude towards e-learning	1	2	3	4	5
1	I like learning online					
2	I enjoyed contacting my classmates via electronic learning					
3	I prefers most academic online library resources					
4	Using online learning enables me to enhance my learning practices					
5	I find e-learning useful for my academic excellence					

2.5 Please tick in the appropriate column to assess the level of frequency in using the following in learning at your Universities. Use the scale 1=Not Very Frequently, 2=Not Frequently, 3=No Idea, 4=Frequently (F) and 5=Very Frequently (adapted from Taha, 2014 and Njenga, 2011))

	Frequency of using e-learning	1	2	3	4	5
1	Computers with internet connectivity in enhancing group discussions					
2	Mobile phones in learning for group discussions					
3	Online academic materials from library within my university					
4	Online assignments and exams					
5	Social networking for learning (Facebook, twitter, Wikis, Whatsap etc)					
6	Downloaded online academic materials (books, articles etc)					
7	Online academic materials stored from instructors					

3.0 The effect of e-learning on education activities at the University

3.1 From your own experience at your university, give opinions about the effect of applying e-learning on the following aspects. Use the scale 1=Declined a lot, 2=Just Declined, 3=No Change, 4=Just Improve, 5=Improved a lot (adapted from Taha, 2014 and Njenga, 2011)

	Effect of e-learning	**1**	**2**	**3**	**4**	**5**
1	My level of satisfaction on knowledge and skills acquisition using online academic materials					
2	My effective learning using computer connected to the internet for group discussions					
3	Self confidence on accessing academic resources from online library					
4	My academic performance in continuous assessment					
5	My academic performance in end of semester examinations					
6	Satisfactions using online learning compared to face to face learning					
7	Motivation in using computer for online assignment and exams					
8	Self esteem in accessing online end of semester academic results					
9	Motivation through collaboration among colleagues within and outside					
10	Motivation on using Internet and related online services on my learning					
11	Confidence on using social networks (facebook, twitter, whatsap etc) for my academic excellence					

4.0 Factors influencing e-learning implementation in Tanzanian universities

4.1 To what extent do technological characteristics influence effective e-learning implementation? Use the scale 1=Very Low (VL), 2=Low (L), 3=No Idea (NI), 4=High (H) and 5=Very High Quality (VH) (adapted from Taha, 2014 and Njenga, 2011)

	Technological Characteristics	1	2	3	4	5
1	Capability of e-learning used at your university to disseminate information from outside					
2	Availability of e-learning that equip learners with practical and useful skills					
3	Availability of interactive and engaging e-learning with quality contents					
4	Availability of user-friendly e-learning which are easy to adopt					
5	The accessibility of e-learning platforms for learning					

4.2 To what extent do user characteristics influence effective e-learning implementation? Use the scale 1=Very Low (VL), 2=Low (L), 3=No Idea (NI), 4=High (H) and 5=Very High Quality (VH) (adapted from Taha, 2014 and Njenga, 2011))

	User characteristics	1	2	3	4	5
1	Online learning makes learners to accomplish activity timely (user motivation)					
2	Learners to experiment with online learning (user satisfaction).					
3	In general, I am hesitant to try out electronic learning for learning					
4	Among my peers, I am usually the first to try out e-learning for learning (self esteem)					
5	Online learning encouraged me to participate in discussion with my classmates (User motivation)					
6	Online learning makes learners to perform well in assignments and exams (self confidence)					

4.3 To what extent do pedagogical characteristics influence effective e-learning implementation? Use the scale 1=Very Low (VL), 2=Low (L), 3=No Idea (NI), 4=High (H) and 5=Very High Quality (VH) (adapted from Taha, 2014 and Njenga, 2011))

	Pedagogical Characteristics	1	2	3	4	5
1	Training strategy regarding to the subject of online learning					
2	The ability of students to integrate online learning with electronic contents					
3	Training prior to use e-learning content and materials is usually done					
4	The ability of student to relate online learning and learning strategy					

4.4 To what extent do Institutional characteristics influence effective e-learning implementation? Use the scale 1=Very Low (VL), 2=Low (L), 3=No Idea (NI), 4=High (H) and 5=Very High Quality (VH) (adapted from Taha, 2014 and Njenga, 2011))

	Institutional Characteristics	1	2	3	4	5
1	Budget to support e-learning related activities such as training of learners prior to use online learning					
2	ICT policies that assists students in a wide acceptance and utilization of online learning in university					
3	The University to commit to a vision of implementing and using online learning in learning					
4	The ability of management in my university to support students to apply electronic learning					

4.5 To what extent do social characteristics influence effective e-learning implementation? Use the scale 1=Very Low (VL), 2=Low (L), 3=No Idea (NI), 4=High (H) and 5=Very High Quality (VH) (adapted from Taha, 2014; Njenga, 2011 and Faleheh, 2011)

	Social Characteristics	1	2	3	4	5
1	Applications of social networks (Twitter, Facebook, whatsap) to enable online chat-rooms					
2	Productive relationship with other students on the use of electronic learning					
3	Status/Image of students due to the use of e-learning for knowledge, experience and skills					
4	Prestigious when I regularly interact and share ideas with my fellows using electronic learning					
5	Corporations among learners due availability of electronic learning					

4.6 To what extent do environmental characteristics influence effective e-learning implementation? Use the scale 1=Very Low (VL), 2=Low (L), 3=No Idea (NI), 4=High (H) and 5=Very High Quality (VH) (adapted from Taha, 2014; Njenga, 2011 and Faleheh, 2011)

	Environmental characteristics	1	2	3	4	5
1	Availability of internet that supports the flow and dissemination of information through e-learning					
2	Sustainability of electricity at my University assisting connectivity of internet					
3	Availability of bandwidth from ISP that makes internet connectivity sustainable					
4	Availability of ICT section/department/directorate in overseeing issues related to online learning					

5.0 E-learning Implementation at the University

5.1 Any other comments regarding implementations of e-learning systems in your University……

Thank you very much for your cooperation

2-B Questionnaire for academic staff

Dear respondent,

I am a PhD student at the Mzumbe University; currently collecting data for my doctoral research. The overall objective of my research is to develop a model for effective e-learning implementation in Tanzanian Universities. You are kindly requested to fill in this questionnaire as part of data collection. Your participation is entirely voluntary and your responses will be kept confidential. Thank you very much for completing this questionnaire. In case of any question with regard to the questionnaire, feel free to ask for clarification through the below contact:

:

Name: Simeo B. Kisanjara
Tel No.: +255 784 727753
Email: simeokisanjara@gmail.com or sbkisanjara@mzumbe.ac.tz

1.0 Background Information

1.1 Name of University ……. …….....……

1.2 Sex (Tick) ( ) Male ( ) Female

1.3 Academic Staff Category (Tick) ( ) Tutorial Assistant, ( ) Assistant Lecturer ( ) Lecturer ( ) Associate Professor, ( ) Professor

1.4 Age Group: (Tick) ( ) Below 30, ( ) 30 – 40, ( ) 41 – 50, ( ) Above 50

1.5 Educational level (Tick) ( ) Bachelor Degree, ( ) Masers Degree ( ) PhD

1.6 Area of specialization……e.g (Computer science, Sociology, Law, Civil e.t.c)

2.0 The extent of current e-learning uptake in Tanzanian universities

2.1 Please give your opinions in each of the following statements based on awareness of e-learning: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree (adapted from Taha, 2014; Njenga, 2011 and Faleheh, 2011)

	Awareness towards e-learning	1	2	3	4	5
1	I am aware on how to use e-learning tools (such as moodle, Ututor, blackboard etc)					
2	I prefer to teach and disseminate learning materials through e-learning tools					
3	I prefer to manage coursework assessment (assignments and exams) through e-learning tools					
4	I am aware on how to access an academic online library resources for teaching					
5	I have participated on online courses/classes in relation to teaching academic materials					

2.2 Please give your opinions in each of the following statements regarding on the availability of e- learning for teaching: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5=Strongly Agree (adapted from Taha, 2014 and Njenga, 2011))

	Availability of e-learning	1	2	3	4	5
1	I find functioning computer laboratories in my university					
2	I find working internet connectivity in my university					
3	E- learning presents what is suitable for my teaching style					
4	There is an online library resources in my university					
5	I do conduct online assignments and examinations					
6	I find an online teaching materials electronically					

2.3 Please give your opinions in each of the following statements regarding e-learning accessibility for teaching: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree (adapted from Taha, 2014 and Njenga, 2011))

	Accessibility of e-learning	1	2	3	4	5
1	I can easily access the e-learning tools and do conduct practical session					
2	I have access for internet connectivity					
3	I can easily access the university timetable electronically (online)					
4	I can submit materials online and get feedback from my students					
5	I can easily access and modify students academic results online					

2.4 Please give your opinions in each of the following statements on attitude towards e-learning: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree (adapted from Taha, 2014 and Njenga, 2011))

	Attitude towards e-learning	1	2	3	4	5
1	I like teaching online					
2	I enjoyed contacting my colleagues via e-learning					
3	I prefers most academic online library resources					
4	Using online learning enables me to enhance my teaching practices					
5	I find e-learning useful for my teaching practice					

2.5 Please tick in the appropriate column to assess the level of frequency in using the following in learning at your Universities. Use the scale 1=Not Very Frequently, 2=Not Frequently, 3=No Idea, 4=Frequently (F) and 5=Very Frequently (adapted from Taha, 2014 and Njenga, 2011))

	Frequency of using e-learning platforms	1	2	3	4	5
1	Computer with internet connectivity to enhance teaching practice					
2	Using Mobile phones in teaching					
3	Online academic teaching materials from library within my university					
4	Online assignments and exams					
5	Social networking for online teaching (Facebook, twitter, Wikis, Whatsap etc)					
6	Downloaded academic teaching materials online (books, articles etc)					
7	Academic materials stored in an online library					

3.0 The effectiveness of e-learning on education activities at the University

3.1 From your own experience at your university, give opinions about the effect of applying e learning platforms on the following aspects. Use the scale 1=Declined a lot, 2=Just Declined, 3=No Change, 4=Just Improve, 5=Improved a lot (adapted from Taha, 2014 and Njenga, 2011)

	Effectiveness of e-learning	**1**	**2**	**3**	**4**	**5**
1	My level of satisfaction on knowledge and skills acquisition using online academic materials					
2	My effective teaching using computer connected to the internet					
3	Self confidence on accessing academic resources from online library					
4	Satisfactions using teaching electronically compared to face to face learning					
5	Motivation in using e-learning tools (moodle, Ututor, blackboard etc) for online assignments and exams					
6	Self esteem in accessing online end of semester students academic results					
7	Motivation through collaboration among colleagues within and outside					
8	Motivation on using Internet and related online services on my teaching					
9	Confidence on using social networks (facebook, twitter, whatsap etc) for teaching excellence					

4.0 Factors influencing e-learning implementation in Tanzanian universities

4.1 To what extent do technological characteristics in influence effective e-learning implementation? Use the scale 1=Very Low (VL), 2=Low (L), 3=No Idea (NI), 4=High (H) and 5=Very High Quality (VH) (adapted from Taha, 2014; Njenga, 2011; Tarus and Gichayo, 2015)

	Technological Characteristics	1	2	3	4	5
1	Capability of e-learning used at your university to disseminate information from outside					
2	Availability of e-learning that equip users with practical and useful skills					
3	Availability of interactive and engaging e-learning with quality contents					
4	Availability of user-friendly e-learning which are easy to adopt					
5	The accessibility of e-learning platforms for teaching and learning					

4.2 To what extent do user characteristics influence effective e-learning implementation? Use the scale 1=Very Low (VL), 2=Low (L), 3=No Idea (NI), 4=High (H) and 5=Very High Quality (VH) (adapted from Taha, 2014; Njenga, 2011; Tarus and Gichayo, 2015)

	User characteristics	1	2	3	4	5
1	E-learning makes lecturers to accomplish activity timely (Self confidence)					
2	Ability of lecturer to do experiment through e-learning (user satisfaction).					
3	In general, I am hesitant to try out electronic learning for teaching					
4	Among my peers, I am usually the first to try out e-learning for teaching (self esteem)					
5	E-learning encourages me to participate in discussion with my staff (User motivation)					

4.3 To what extent do pedagogical characteristics influence effective e-learning implementation? Use the scale 1=Very Low (VL), 2=Low (L), 3=No Idea (NI), 4=High (H) and 5=Very High Quality (VH) (adapted from Taha, 2014; Njenga, 2011; Tarus and Gichayo, 2015)

	Pedagogical Characteristics	1	2	3	4	5
1	Training strategy regarding to e-learning contents and teaching principles					
2	The ability of lecturer to integrate online learning with electronic contents					
3	Training prior to use e-learning contents and materials is usually done					
4	The ability of lecturer to relate online learning and course curriculums					

4.4 To what extent do Institutional characteristics influence effective e-learning implementation? Use the scale 1=Very Low (VL), 2=Low (L), 3=No Idea (NI), 4=High (H) and 5=Very High Quality (VH) (adapted from Taha, 2014; Njenga, 2011; Tarus and Gichayo, 2015)

	Institutional Characteristics	1	2	3	4	5
1	Budget to support e-learning related activities training of learners/lecturer prior to use online learning					
2	ICT policies that assists users in a wide acceptance and utilization of online learning in university					
3	The University to commit to a vision of implementing and using online learning in teaching					
4	The ability of University management to support lecturer on applying electronic learning					

4.5 To what extent do social characteristics influence effective e-learning implementation? Use the scale 1=Very Low (VL), 2=Low (L), 3=No Idea (NI), 4=High (H) and 5=Very High Quality (VH) (adapted from Taha, 2014; Njenga, 2011; Tarus and Gichayo, 2015)

	Social Characteristics	1	2	3	4	5
1	Applications of social networks (Twitter, Facebook, whatsap) to enable online chat-rooms					
2	Productive relationship with other lecturers on the use of e-learning					
3	Status/Image of lecturer due to the use of e-learning for knowledge, experience and skills					
4	Prestigious when I regularly interact and share ideas with my fellow using electronic learning					
5	Corporations among lecturers due to electronic learning					

4.6 To what extent do environmental characteristics influence effective e-learning implementation? Use the scale 1=Very Low (VL), 2=Low (L), 3=No Idea (NI), 4=High (H) and 5=Very High Quality (VH) (adapted from Taha, 2014; Njenga, 2011; Tarus and Gichayo, 2015)

	Environmental characteristics	1	2	3	4	5
1	Availability of internet that supports the flow and processing of information through online learning					
2	There is sustainability of electricity at my University assisting connectivity of internet					
3	Availability of bandwidth from ISP that make internet connectivity sustainable					
4	Availability of ICT section/department/directorate overseeing issues related to online learning					

5.0 E-learning Implementation at the University

5.1 Any other comments regarding implementations of e-learning systems in your University

……

Thank you very much for your cooperation

C E-learning questionnaire– for ICT experts

Dear respondent,

I am a PhD student at the Mzumbe University; currently collecting data for my doctoral research. The overall objective of my research is to develop a model for effective e-learning implementation in Tanzanian Universities. You are kindly requested to fill in this questionnaire as part of data collection. Your participation is entirely voluntary and your responses will be kept confidential. Thank you very much for completing this questionnaire. In case of any question with regard to the questionnaire, feel free to ask for clarification through the below contact

Name: Simeo B. Kisanjara

Tel No.: +255 784 727753

Email: simeokisanjara@gmail.com or sbkisanjara@mzumbe.ac.tz

1.0 Background Information

1.1 Name of University ……. …….....……..

1.2 Sex (Tick) ( ) Male ( ) Female

1.3 Staff Category (Fill) ……

1.4 Age Group: (Tick) ( ) Below 30, ( ) 30 – 40, ( ) 41 – 50, ( ) Above 50

1.5 Educational level ( ) Diploma, ( ) Bachelor Degree, ( ) Masters Degree ( ) PhD

Other…….

1.6 Experience in using E-learning in years ( ) Below 5, ( ) 5 – 10, ( ) 11 – 15, ( ) Above 15

2.0 Information about ICT Infrastructure at the University

2.1.1 Who is your Internet Service Provider if any (Fill) ……

2.1.2 What are the bandwidths for UPLINK (Fill)…… and DOWNLINK ……connectivity

2.1.3 How do you assess the bandwidths (Please Tick) ( ) Low ( ) High ( ) Very High ( )

2.1.4 Do you have a backup system connection for the internet connectivity ( ) Yes, ( ) No

2.1.5 Do you experience any internet connectivity problems (Please Tick) ( ) Yes, ( ) No

2.1.6 The internet connectivity problems (Please tick whichever appropriate)

(a) Electricity power breakdown ( )
(b) LAN/WAN infrastructure ( )
(c) Insufficient bandwidth ( )
(d) Computer viruses ( )
(e) Problem from ISP ( )
(f) Other (specify) …….

2.1.7 Do you have a well functioning LAN/WAN at your University (Tick) ( ) Yes, ( ) No

2.1.8 If the answer in 2.1.7 is No select reason/s from the following options (Please tick all that apply)

(a) Shortage of funds to support the implementation ( )

(b) Shortage of human capital to support the implementation ( )

(c) Lack of ICT policy to support the implementation ( )

(d) Lack of ICT awareness in the university community ( )

(e) Lack of commitment by the university management and other stakeholders ( )

(f) Other (Specify) ……

2.2. Please give your opinions about the level of availability of the following e-learning facilities.

E-learning Facilities	Very Low	Low	Moderate	High	Very high
Online library management system					
Online centralized printing system					
Centralized Database system					
Online registration system					
Online academic results processing system					
Computers					
Electric backup system					
Domain Name Server					
Web Server					
Mail – POP					
Mail – SMTP					
Proxy					
Other (specify)					

2.3 What are the reasons for unavailability of some of the e-learning facilities above? (Please tick all that apply)

(a) Shortage of funds ( )

(b) Shortage of human capital ( )

(c) Lack of ICT policy ( )

(d) Lack of ICT awareness in the university community ( )

(e) Lack of commitment by the university management and other stakeholders ()

(f) Other (Specify) ……

2.4 Please give your opinions about the level of availability of the following e-learning platforms used in learning

E-learning Platforms	Very Low	Low	Moderate	High	Very High
Blackboard LMS					
Moodle LMS					
LMS QStutuor					
ATutor					
Web learning LMS					
My Tutor LMS					
Mindflash Online Training					
uLearn LMS					
Other (specify					

2.5 What are the reasons for unavailability of some of the e-learning platforms used in universities? (Please tick all that apply)

(a) Shortage of funds ( )

(b) Shortage of human capital ( )

(c) Lack of ICT policy ( )

(d) Lack of ICT awareness in the university community ( )

(e) Lack of commitment by the university management and other stakeholders ( )

(f) Other (Specify) ……

3 E-learning Implementation at the University

(adapted from Taha, 2014; Njenga, 2011; Tarus and Gichayo, 2015**)**

3.1 In general, what do you think are the main challenges encountered in the implementation of e-learning activities at your university? (Please Tick the appropriate reason/s)

(a) Lack of community awareness in e-learning ( )
(b) Lack of commitment in e-learning activity implementation ( )
(c) Shortage of funds to support e-leaning ( )
(d) Shortage of human capital to support e-learning ( )
(e) Reluctance of e-learning users to change ( )
(f) Others (Specify) ……

Thank you very much for your cooperation

D Questionnaire type for management

Dear respondent,

I am a PhD student at the Mzumbe University; currently collecting data for my doctoral research. The overall objective of my research is to develop a model for effective e-learning implementation in Tanzanian Universities. You are kindly requested to fill in this questionnaire as part of data collection. Your participation is entirely voluntary and your responses will be kept confidential. Thank you very much for completing this questionnaire. In case of any question with regard to the questionnaire, feel free to ask for clarification through the below contact.

Name: Simeo B. Kisanjara
Tel No.: +255 784 727735
Email: simeokisanjara@gmail.com or sbkisanjara@mzumbe.ac.tz

1.0 Background Information

1.1 Name of University ……. …….....……

1.2 Sex (Tick) ( ) Male ( ) Female

1.3 Academic Staff Category (Tick) ( ) Tutorial Assistant, ( ) Assistant Lecturer
( ) Lecturer ( ) Associate Professor, ( ) Professor

1.4 Position Held (Fill) …….

1.5 Age Group: (Tick) ( ) Below 30, ( ) 30 – 40, ( ) 41 – 50,
( ) Above 50

1.6 Educational level (Tick) ( ) Bachelor Degree, ( ) Masters Degree
( ) PhD

2.0 Extent of current E-learning usage at your University
(Adapted from Taha, 2014 and Njenga, 2011)

2.1 How do you assess the level of availability of e-learning facilities at your university?
1. Very Low ( ) 2. Low ( ) 3. Average ( ) 4. High ( ) 5. Very High ( )

2.2 How long has e-learning system been in place at your university? Please Tick appropriate Period in years: ( ) below 5, ( ) 5 – 10, ( ) 11 – 20,
( ) above 20

2.3 To what extent is the current e-learning system facilitating educational activities at your university?
1. Very Low ( ) 2. Low ( ) 3. Average ( ) 4. High ( )
5. Very High ( )

2.4 How do you assess the level of frequency of using e-learning facilities in educational activities at your university?

1. Not Very Often ( ) 2. Not Often ( ) 3. Average ( )
4. Often ( ) 5. Very Often ( )

3.0 Effect of E-learning usage on educational activities at your University (adapted from Taha, 2014 and Njenga, 2011)

3.1 To what extent has e-learning improved teaching and learning at your university

1. Not Very Effective ( ) 2. Not Effective ( ) 3. Somehow ( )
4. Effective ( ) 5. Very Effective ( )

3.2 To what extent has online learning effected students' performance?

1. Not Very Improved ( ), 2. Not Improved ( ), 3. Average ( )
4. Improved ( ) 5. Very Improved ( )

3.3 In which of the following categories of activities has e-learning been effective at your university (Please Tick all that apply)

a) Teaching and learning ( )
b) Research ( )
c) Student registration ( )
d) Library services ( )
e) Communication ( )
f) Rate of students enrollment ( )
g) Management of students records/information ( )

3.4 How has e-learning utilization affected running cost per student compared to traditional method?

(Please Tick)

(a) Decreased ( )
(b) No change ( )
(c) Increased ( )

3.0 Factors influencing e-learning implementation

(Adapted from Njenga, 2011; Tarus and Gichayo, 2015)

Select 1=Strongly Disagree, 2=Disagree, 3=Uncertain, 4=Agree or 5=Strongly Agree to assess the Influence of the following factors on effective e-learning implementation at you university

Statement	**1**	**2**	**3**	**4**	**5**
There is a need to conduct training regarding e-learning sensitization					
Availability of ICT policy facilitates e-learning implementation					
Is availability of funds necessary for facilitation of e-learning					
ICT policy incorporates e-leaning issues at the university					
Effective e-learning required well planned infrastructure					
The government provides e-enough funds to support e-leaning					
Globalization as a source of social pressure for e-learning adoption					
Management commitment is not necessary for e-learning implementation activity					

Thank you very much for your cooperation